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EDITORIAL NOTES—GAS, &c.

The Calorific Standard—A Comparison.

THE publication in the "JOURNAL" last week of a translation of Professor H. Bunte's lecture on the subject of what quality of gas best meets the requirements of consumers at the present day, comes opportunely immediately after the publication of the text of the calorific power clauses of the Gaslight and Coke Company's new Act. The provisions of these clauses were referred to in our "Editorial Notes" on the 21st ult.; but since they may be regarded as suggestive of the lines for similar enactments in respect of other gas undertakings at home and abroad, a comparison of them with the provisions which a number of German gas-works' chemists in conclave are reported to have considered as reasonable, will now be of interest.

The German chemists debated the question of the proper quality of gas for present-day requirements, and came to the conclusion, which Professor Bunte endorses, that the gas supplied should have a gross calorific power equal, in English terms, to 543 B.Th.U. per cubic foot as standard, and that fluctuations from that standard should be as small as possible, and the value in any case should not fall below 522 B.Th.U. It is stated that the Berlin Corporation undertaking is observing the standard calorific power approved by the chemists. The Gaslight and Coke Company's new Act prescribes a standard calorific power of 125 calories net per cubic foot, which, assuming the net figures are 10 per cent. below the gross, is equivalent to a standard of 550 B.Th.U. gross per cubic foot. This is rather higher than that which the German chemists consider reasonable. But the Gaslight and Coke Company are liable to incur a forfeiture if the calorific power of their gas falls below 112½ calories net, which is equal to about 496 B.Th.U. gross per cubic foot. This figure is lower than the minimum value which the German chemists approved. But it is not clear that they would be willing to accept that minimum if their gas undertakings were to be liable to a substantial penalty on every occasion on which the gas supplied might chance to fall slightly below it. Moreover, their willingness to accept such a minimum counts for naught; for the manager of the gas-works would certainly not entertain it, and it is the manager and not the chemist of a gas-works who is ultimately responsible for the maintenance of the proper quality of the gas supplied. The manager may be willing to accept 543 or even 550 B.Th.U. gross as an ideal to which he would endeavour to work; but he will not at the bidding of his chemist agree to supply gas which shall never fall below 522 or even 500 B.Th.U. gross per cubic foot. He will demand some more reasonable latitude for a depression in quality which, in the stress of manufacture in that concatenation of adverse working conditions which it is beyond his power always to escape, is sooner or later bound to occur. It should be remembered, further, that the German figures refer to testings made at the gas-works, and that some allowance must be made for depreciation of the value of the gas on occasion in transit to a testing-place (say) 8 miles from the works. It will therefore be seen that, even on the basis of the German chemists' standard, the new Act of the Gaslight and Coke Company imposes too high a figure for the calorific power of the Company's gas. Other gas undertakings should clearly refuse to work to a standard exceeding 500 B.Th.U. gross per cubic foot, or be penalized for gas which is not below 450 B.Th.U. gross per cubic foot. The Gaslight and Coke Company have on this occasion agreed—if we read the clauses of the new Act rightly—to submit to a penalty of £25 to £100 if two testings of calorific power on any one day show a mean of less than 106½ calories net per cubic foot, which is equivalent to about 470 B.Th.U. gross. This is altogether too high a figure for catch-penalty testing, even if reasonable for the average of three days' testings.

When considering the action of the German chemists in

expressing approval of a comparatively high calorific power for gas, it must be remembered that the bulk of the gas supplied in Germany is coal gas pure and simple. There is but little carburetted water-gas plant on German gas-works, owing to the high import-duty levied on petroleum and its products, and the advantages of a supply of mixed gas of lower calorific power than neat coal gas are less marked in Germany than here. It has remained for Professor Strache, of Vienna, to enter a forcible protest against the acceptance by the gas industry on the Continent of the standard of calorific power approved by German chemists. He went further and urged managers to do their utmost to prevent the industry being fettered in regard to the quality of the gas supplied. He gave the very cogent reason for this advice, that it was by no means settled that gas of the proposed calorific power was as serviceable to the consumer as gas of considerably lower quality. The gas industry should be left free to adapt the quality of its supply to the advances in processes of manufacture and in the construction of burners for lighting and heating. And Professor Bunte, in replying, has had to confess, in effect, that the proposed standard of calorific power had been selected without regard to future developments in the manufacture and use of gas. Could anything have been said more detrimental than this confession to the proposal of the forty odd German chemists?

Vertical Retort Position at Home.

THE question of carbonization in vertical retorts has now in this country reached a most interesting stage, as entry is about to be simultaneously made into experiences by comparatively large installations under home working conditions. This week it is our pleasure to be in a position to publish a description of the installation of nine settings of four vertical retorts on the Woodall-Duckham system at the Burnley Gas-Works, which settings are accommodated in a fine large retort-house (with coal-stores adjoining), constructed to the designs of the Engineer, Mr. J. P. Leather. The buildings and their equipment incorporate some special features which supply the interesting detail for the descriptive article. This Burnley installation presents us with one design of a house that is specially suited for vertical retorts; in the description of the Kensal Green installation that was recently published, there was an account of a simple method of giving a little more headroom in an existing house, which was not quite high enough, immediately over the settings, for the superstructure. It is in such details that the engineer (who is already fully acquainted with the features of the new systems) will find interest in considering what his own procedure would be in adopting one or other of the vertical retort systems. In the Burnley installation, one main feature is that the stanchions supporting the roof from the ground level, also serve to carry the bed (9 feet above the ground level) of the vertical retort settings, act as buckstays to the settings, and carry the overhead coal-hoppers. Thus they are made to serve four distinct purposes. However, the whole of the principal points of constructional interest are collected together elsewhere. Of general interest is the coincidence of entry into working of installations of verticals on different systems. The Woodall-Duckham settings erected at Kensal Green and Burnley are now within a few weeks of being ready for gas making; the Sunderland installation of Dessau verticals is only waiting to commence gas making for the finish of the complete scheme of works reconstruction that Mr. C. Dru Drury has had in hand. The two settings on the Glover-West system at St. Helens continue, without hitch, to keep up their good record of results; and it will not be a great while before the Manchester Corporation will be having an installation on this system, which may be, if the results confirm anticipation, simply the precursor of a larger one. The members of the Manchester District Institution of Gas Engineers will shortly be paying a visit to St. Helens to witness the operation of the Glover-West settings,

and to make personal inquiry into the working. They, as well as other readers, will be greatly interested in the third set of tests that Dr. Harold G. Colman has made of further varieties of coal in the St. Helens settings. In comparing the results obtained by Dr. Colman as published on June 8, July 20, and now this week, sight must not be lost of the different coals employed. The results of the trials published this week with 57 tons of Yorkshire silkstone, and about 82 tons of Wigan Arley coal, indicate that the make in the Glover-West retorts is probably about 1000 cubic feet per ton better than is realized under fairly good horizontal working with these coals, though perhaps a little is forfeited in respect of illuminating power. But the calorific values are good, and the analyses of the gas indicate a low content of inert constituents. The general position of vertical retort installation at home is such that interest will be further stimulated; and the results of the coming winter's operations under normal conditions will no doubt cause a spurt in adoption next constructional season.

A Wide Review.

IF among the administrators of the gas industry there be any who harbour doubts as to the necessity of a gas engineer and manager of a gas undertaking being a man of many parts—talented in engineering and management and in commerce, and having a comprehensive grip of multitudinous affairs—then we counsel them to quietly peruse the Presidential Address of Mr. T. H. Duxbury to the North of England Gas Managers' Association last Saturday; for there they will find more than sufficient to dissipate their doubts. The address gave full expression to the faith of the President on numerous topics affecting the daily work of the gas engineer and manager. Their very number would make the task of enumerating them far easier than that of finding, by the most painstaking inspection, the subjects occupying current thought that are not touched upon. There is a broad appreciation, in the early part of the address, of the technical and the commercial requirements of the gas engineer and manager, and of individual capacity, which requirements and capacity have expanded in proportion to the technical and commercial changes of the age in connection with gas production, distribution, and application. Works of greater value in constitution and capacity are now under care of the engineer than formerly; and his operations have to be shaped to the commercial needs outside the gates of his works, where, again, the keenest instinct and ceaseless activity have to be brought to bear to meet the competition of the day. There is an increase of responsibility all round; and the quality of work that served a former day after a fashion is no longer good enough. Gas company administrators must recognize this; for in a contented and skilful engineer and manager they have the greatest protection of their interests.

But with all this expansion of responsibility and diversity of service, we should realize that human efficiency must be rapidly impaired if there is not some relief; and this points to a certain amount of devolution—not from capital responsibility, but in a greater departmentalizing of the work, with, at the department head, a chief responsible to the Engineer. We have sympathy with the President in his objections to there being any cleavage of the technical and commercial work of a gas undertaking, unless there is likewise a supreme technical head. There are, of course, instances where there are managers of the commercial interests of a gas undertaking distinct from the officials in whom the chief technical responsibility reposes. That such division has been financially successful is not proof of the correctness of the system, but is rather proof of the fitness, aptitude, and diplomacy of the individuals occupying the positions. It is quite conceivable, as Mr. Duxbury says in other words, that all the arduous endeavour of a technical official to put gas into the distribution mains cheaply, and to produce economically his bye-products in a form to secure the best prevailing market advantages, may all be swamped, in the financial issue, by a mediocre conduct of the commercial department. There he puts his finger on the danger spot. However, in the official life of the gas industry, opportunities for position, credit, and (we hope we may add) reward were never so great as now; and, we venture to say, they will be even greater still. We do not believe in making positions to fit men; but the mutations of recent years in connection with the work and trading of large and even moderate sized gas undertakings have made many positions which must be filled by men of suitable qualification and capacity. The most important thing in the

whole administration of the industry is to get the right men. With the right men in official positions, the correct policy will be submitted to, and be adopted by, Directors and Committees, if obstinacy and egotism (which are usually conjunctive attributes) are not allowed to overrule.

The President is one who holds views on the affairs of his technical and business life that have about them the evidence of the originality that comes from personal examination and thought. Mr. Duxbury is quite in agreement as to the necessity for the amendment of the Gas-Works Clauses Acts. They have a heavy weight of obsolescent provisions to be cleared away; and big deficiencies to be filled. But he thinks the time, in the present state of the political atmosphere, is inopportune for movement to this end, and that there should be a little delay in the matter. At the same time, there can be no two questions that the sooner there is revision, the better will it be. If the fear only of fresh impositions is to keep one back from pressing forward for what is known will be an advantage, then the lane will be a long one to the goal. Whether or not we wish to wait, we are perforce compelled to do so through the position of the work of an ambitious Government. They have no room for anything more than is now in hand. When, however, the General Gas Acts are brought up to date by revision, excision, and amplification, it will help to modify the costliness of obtaining private statutory powers over which the President makes complaint, and which costliness does not fall directly on the responsible combatants, but on the ratepayers of the town concerned, and, if gas consumers, on them in their dual capacity. The President has much to say on parliamentary and statutory matters. The sliding-scale of prices and dividends that most of us agree came to the gas industry as a boon and a blessing, he looks at a little askance, because of an experience at South Shields. It is thirty years ago since the sliding-scale was applied to the Company in the stead of a maximum price; and while it was for a period an excellent thing for consumers and shareholders, it was a bad thing for the works, which—in order that low prices for gas might be charged, and the payment of higher dividends be allowed—were not maintained in the position in which they should have been. Thus upon the President has largely fallen the duty of repairing the inevitable mischief of such short-sighted procedure. But this was not the fault of the sliding-scale; it was a fault of the administration. The administration alone were censurable for an abuse of a privilege and liberty; and when Mr. Duxbury says—relative to the advantage of the sliding-scale as against the maximum price principle—that every case requires to be dealt with on its merits, his own illustration suggests that the first point to be considered is as to whether the Board of the undertaking concerned is worthy of confidence in exercising the new powers. Administration such as that referred to as being of the history of South Shields must bring retribution at some time or other, but is not alone sufficient to condemn a principle.

Still on statutory questions, and regarding the President's feeling that it is a pity the Gaslight and Coke Company accepted a calorific power standard and test without the illuminating power test being abrogated, we are afraid that Mr. Duxbury does not fully comprehend the forces that impel to a good many disagreeable things in Metropolitan gas politics, owing to the number and influence of the authorities and interests concerned. In this matter, he appears to be conjuring up *ignes fatui* unnecessarily. This was an agreed insertion of penalty testing for calorific power, and is not a precedent created by Parliament. Parliament has this session declined to create any such precedent; and we have sufficient faith in the parliamentary authorities who have influence in such matters as this to believe that they will continue to recognize the injustice of placing the industry under a dual standard of quality for a single commodity, and that such an eventuality need not be a disturbing factor at the present time. The position, however, will have to be watched carefully; and if there is any sign of such an injustice being perpetrated, then there will have to be stern resistance. There is no such sign at present; the indications of the past session being of a diametrically opposite order. Another objection that the President apparently entertains to the test is the use of the Boys calorimeter, owing to the limit in its range when working under winter conditions with mixed coal gas and carburetted water gas. This, however, is a matter we will not attempt to probe too critically; and in his reference to it the President, we observe, is cautious, though suggestive.

One of the most interesting sections of the address was that in which the coal position and the influences of prices and quality are discussed. Mr. Duxbury spoke well and to the point in these matters, though he opened the door to political controversy by defending a tax on exported coal. Our view is identical with his; and it has been confirmed by events and experience since the tax was removed. "It is an economic error," say those of different opinion, "to suppose that inflicting a tax on foreign-bound coal for the purpose of reducing its export is advantageous to the country; seeing that it restricts the money brought into this country, and the labour required for producing and handling the coal." What, on the other hand, have the last few years taught us? We have learned that the demand for coal from abroad can be made the means of maintaining the prices of coal at home (although home conditions do not warrant the high prices) to the detriment of home industry and labour and of the living costs of the community. This being the experience, we fail to see the economic error. Conjointly with the restriction of coal exports by taxation, the President thinks that, conservation of the supply might be effected by the universal substitution of gaseous for coal fuel. Not only should such a change be favourably regarded from the point of view of conservation of the coal supplies, but from that of the economic advantage of saving much that is useful, but which is lamentably wasted by the crude process of obtaining heat by the ordinary coal fire. Mr. Duxbury shows how since 1896 the price of coal has consistently been maintained at considerably higher levels than before; and the trend of events points to those levels being maintained, if not even raised, in the future. This indicates the great care requisite in coal selection for the purpose of gas manufacture; and on the question of coal-testing prior to effecting contracts, the President made some direct and valuable points.

There was more topic in the address than can possibly be commented upon here. The review of gas manufacturing practices and of commercial methods brought before us the judgments of a discriminating mind. One point only in connection with trading may be emphasized by reference, and that is on the question of free maintenance which is so very much in the air at the present time. For two years, this has been the practice at South Shields (the period alone is a testimony to foresight); and the results are described as being "very satisfactory." That is the experience of others. There is in the address the portrayal of a strong common-sense and prescience dominating the executive activities of the South Shields Gas Company; and so long as this continues, so long will—given good times industrially—progress and prosperity attend the undertaking.

Work and Economy in the Gas Industry.

THERE were many wise things said on the gas themes of the day at the meeting of the Welsh Association, in the old-world town of Tenby last Wednesday, under the presidency of Mr. A. H. Brookman, the Engineer and Manager of the local gas-works, the Directors of which extended a warm-hearted welcome to the visitors. Mr. Brookman's address was a model of terseness, and of original thought from the outlook of one who has the responsibility on his shoulders of the successful working of a comparatively small undertaking. The word "responsibility" induces the passing remark that the responsibility of the official conduct of a gas undertaking of relatively small size is sometimes heavier than in the case of a larger works, where the chief usually has several trusty lieutenants who share with him his responsibility, and so give him relief. The value of district organizations to the managers of these smaller sized concerns (as well as to those of larger ones) is unquestionably immense. This was a point in the presidential address; and it is quite true, as said there, that the District Associations occupy a position the Institution can never possibly fill. In every way—in ease of assembling the members, in the degree of town visited, in collecting the views of men in all sorts of working spheres, and of all shades of opinion and levels of experience—the District Associations possess mobility and influences which cannot be claimed by the larger Institution. The special usefulness of such Associations could not be extracted from, nor could their special fuctions be merged in, the more influential central organization. The President of the Institution (Mr. James W. Helps) was, as he ever is on such occasions, a welcomed visitor at the meeting; and he spoke on the subject of unity being strength, and of the advantages of the professional organizations being

interwoven as they are by the simple process of affiliation and participation in the directive counsels of the Institution. It has often occurred to us that the District Associations are as important to the Institution as—perhaps more so than—the Institution is to them; for they serve as a means of frequent communication and as intermediaries between the Institution and the sources of finance in a way that no ordinary circularizing can effect. In the collection of funds for carrying on the technical work of the industry, the District Associations have been very helpful to the Institution; and in fortifying the resources of the Benevolent Fund they have also done exceedingly well. This meeting, too, afforded Mr. Helps an opportunity of making yet another appeal to Directors and Committeemen for assistance in carrying on the technical research work of the industry. We do wish very sincerely over this matter, that the President of the Institution could obtain such assurances of financial support that he would not have occasion to feel after each appeal, through the sparseness of result, that his voice had been as that of one crying in the wilderness.

There was much said at this meeting about economy—a word which is much abused, and a word to which curious meanings are applied in some quarters of the gas industry through a singular form of mental depravity or of selfishness. With some administrators, "parsimony" is synonymous with "economy." It cannot be seen by them that the provision of funds for technical investigation is, through ultimate advantage, an economical proceeding; nor can they see anything but economy in offering starvation wages to men specially educated to look after the interests of gas undertakings. The President in his address shot some well-directed shafts—we hope they will reach their destined place—on this question. To what practical end, he asks, is the higher education of the young men of the gas industry being directed in their own interests? Judging from advertisements that have come before him, he finds that the only practical end is the serving of the industry, and that the "practical end" for the educated young man is frequently inadequate remuneration. It is a serious charge; but it is a true one. There are many gas administrators who are bad payers, and who assist to bring obloquy upon the industry, and to detract from it as a field of service. In this respect they are the enemies, and not the benefactors of the industry. This ought not to be; and those who find economy in parsimony may be asked to ponder well, and consider the meaning and effects of, the words in the address: "Until a reasonable financial inducement is much more in evidence than it is at present, the best abilities will not be attracted to the gas industry."

There were other directions in which "economy" was considered at the meeting. They are found in both the address of the President and the paper by Mr. J. H. Canning, of Newport. The chief of a small gas undertaking finds one of his most serious responsibilities is in properly determining whether or not the adoption of a new process or plant will be economical. His limitations are very great in making such a determination. A wrong decision may land an undertaking whose resources are restricted into grave difficulty. Hence the reticence so often seen in the matter of improvement in small works. Mr. Brookman's own works are a testimony to perspicacity in this regard. While economy of capital must be kept well in view in relation to improvement, it must not be worshipped so blindly that the economies of working from improvement are lost to sight; and it was with these latter economies that Mr. Canning was chiefly concerned. We have known small works where there was sufficient waste going on daily through adherence to antiquation as would alone have provided sufficient recompense to meet the financial charges arising from the provision of more economical plant. Decision in these matters requires discretion. Again, what may be economical in one works may be absolutely ruinous in another. That is one of the many precepts in regard to gas-works economies standing in Mr. Canning's paper; but it is a view of the question that is all too frequently disregarded. As he says, it is impossible to lay down any general scheme of effecting economies which shall be beneficially applicable to any and every works. And so the only thing to be done is to take every case independently, and make a thorough investigation into the probable profitable issue of change—adopting that which appears to be, from the thorough investigation, the "most economical" means available under the special conditions of the works concerned.

Mr. Canning looked, in his communication, illustratively into several matters, the seats of waste or economy in gas

works—in the retort-house, in the application or otherwise of mechanical operation, in the use of various forms of power, and in smaller affairs. In all of which, environment must have, or should have, large influence in decision. The paper was full of pithily expressed wisdom in relation to the subject. A few words more. It was learned by the members that in the search for economical practices Tenby had, many years ago, taken a part that is extremely interesting in these days. The late Mr. G. W. Stevenson made trial at the works of a continuously operated vertical retort, through which ran a shaft with short lengths of worms or screws keyed on at intervals. Failure of this retort came through the impossibility of the shaft standing the intense heat to which it was subjected. Had Mr. Stevenson used a portion of the worm-girt shaft outside the top of his retort and a portion at the bottom for extracting the spent charge, it is possible he might have saved the inventors of continuous carbonization in these latter times a great deal of trouble and worry; but he might also have robbed their generation and times of the interest and fascination that their work has given.

Free Space and High Temperatures in Verticals.

FROM the time the Dessau vertical retort system reached the degree of perfection that can be now claimed, in respect of the carbonization of intermittent charges, we have pointed out that those who produced the workable and efficient combination now commonly known by the above appellation deserved all honour and full protection of any rights to which they have clear title under their patents. Possibly there are few of our readers who could really define the full claims without reference to the text of the several patent specifications which incorporate the system as now designed and worked; and it is not for us to presume to offer an opinion as to how far those claims could be legally sustained. It is an uncommon thing to find in "JOURNAL" editorials reference to advertisements appearing in its columns; but in the advertisement published by the Vertical Gas-Retort Syndicate, Limited, in this issue, there is an extract from the Dessau patent specification (No. 1393 of 1904), which at this time is particularly interesting to gas technicians who have made themselves intimately acquainted with the vertical processes that are offered for acceptance. In this one extract from the patent is the kernel of the Dessau system. We do not know—and it is not our business to inquire—whether the publication is intended as a challenge, or merely as a gentle reminder. But whatever the intention, the fact remains that this excerpt distinctly claims, as part of the Dessau system, the avoidance of free space in vertical retorts and the use of higher temperatures than had hitherto been usually employed in gas manufacture. In the German patent of July 29, 1903, the claim as to the exclusion of free space is emphasized by the unambiguous phrase, "completely filled with coal, so as to avoid any 'free space in which tar might be separated below.'" It will be remembered that the German Law Courts have given a decision in favour of the validity of the German patent, including these points as to the avoidance of free space, and as to higher temperatures than had hitherto been commonly applied in carbonization for gas manufacture. A summary of the judgment appeared in our issue for July 13 last (p. 96); and it is specially interesting to-day. It awards to the patentees of the Dessau system the rights to the discovery of the advantages following avoidance of free space. If—we emphasize the word "if"—such a claim could be upheld in this country (which claim is distinctly made in the extract which suggested this comment), then there is no form of vertical retort, continuous or intermittent, in which the retort is filled by the charge of coal, that would not infringe this particular right. It is a broad and comprehensive claim; and the publication implies a desire that it should be recognized.

In Smoother Water in Dublin.

In the address delivered by Alderman W. F. Cotton, the Chairman of the Alliance and Dublin Gas Company, when moving the adopting of the report at the half-yearly meeting last Thursday, there were gratifying indications that the relations between the Company and the Corporation are more amicable than they at one time were. Not very long ago, it seemed that there were people in and about the Council Chamber who were continually on the look-out for an opportunity to pick a quarrel with

the Company; and it was a good thing that, in their Chairman, the shareholders had an able representative to repel the attacks made upon them collectively. No one denies the right of the Corporation to safeguard the interests of the general body of rate-payers when they consider these are being interfered with by a private concern; but the right may be exercised in a particularly offensive way. The Company have lately passed through the ordeal of a parliamentary inquiry; and while in the House of Lords their Bill was passed without material alteration, in the House of Commons it was not allowed to do so, being opposed by the Corporation and some of the out-townships. Here was an opportunity for incurring costly litigation; but the Directors of the Company, with a desire to avoid it, met the representatives of the opponents in a friendly spirit, and, after several interviews, an arrangement was practically come to. The points in dispute were ultimately settled in Committee, and the Bill passed. Its scope was fully indicated in the "JOURNAL" last week; but it may be mentioned that as from the 1st of January next, the standard illuminating power of the gas will be 14 candles instead of 16, tested by the latest method, and supplied at reduced prices. A hope may be expressed that the new conditions may give all-round satisfaction, and lead to an increase in the Company's business. Owing to the general depression in trade, there was a falling off in the receipts for gas in the past half year; and the net profit was insufficient by £4034 to pay the full dividends. However, after drawing upon the reserve fund for this amount, there was left to its credit about £40,000. The Directors and officers have had a trying time; and they well deserved the vote of thanks that was accorded to them by the shareholders.

Three Coalite Reasons—The First.

Winter is again close upon us; and there has been no booming of coalite such as to cause the householder to delay stocking his cellars with coal in favour of the material that was to bring about elysian conditions in our cities and towns. This being so, the shareholders in the Coalite Syndicate and the British Company may continue to entertain the belief that their gratification in respect of dividend is something that has still place among the great uncertainties. The only coalite booming has been in the share market; and the shares of the parent concern and of the British Company have been creeping up to higher prices than those at which they stood, with a drooping tendency, for some considerable time. The cause of this share exhilaration is not distinctly known, but that centre of profound knowledge—the "Daily Mail"—has published three reasons for the upward movement. There is only one of the three that is definitely stated. The "Mail" mentions that it has official authority for the statements; so that we presume it may be taken as true that the "Syndicate has now liquidated about half its obligations to British Coalite on the underwriting contracts, and that British Coalite has accordingly been put into possession of a considerable amount of cash." The underwriting exploits of the Syndicate in connection with the British Company, it will be remembered, landed them with large responsibility in the matter of shares that an ungenerous and unappreciative public declined to take up; and the Syndicate could not discharge that responsibility. It may therefore be surmised that in the market animation a considerable parcel of these shares has gradually been landed upon those who have been looking for quick profits on the rise (by whatever means effected) of the market quotations. We have no doubt the British Coalite Company are glad enough to get hold of some cash; for there has been little coming in, but a constant drain has been going on.

The Second and Third.

Well, now, as to the other two reasons for the apparent moderate rehabilitation of confidence in coalite in the share market. These reasons are founded on shifting sands. Negotiations are said to be pending with continental applicants as to coalite patent rights, and are "nearly" complete; and two or three big deals favourably affecting Coalite, Limited, and British Coalite "may" thus be carried out. There is nothing very tangible about this; there is doubt reposing in that word "may." The official information is very guarded, and necessarily so in self-protection. As between negotiation and completion of deal, as the Coalite people have learned well by experience, there may be many a slip. Regarding the third reason, the announcement is made that "British Coalite has obtained, or is obtaining,

important contracts with gas companies." Observe, again, the guarded form of this announcement. Information as to "important" movements in the gas industry generally reaches us; but there is confessedly no knowledge of "important" dealings with gas concerns other than those—if they may be classified as important—of which publication has already been made. The question, however, as to the degree of importance can be reserved until there is more information as to the nature of these esoteric contracts. A communication from our "Coalite" friends assures us that they have nothing to add to, or withdraw from, the statements in the "Daily Mail." However, our morning contemporary, which is not always so precise in giving evidence of wariness in the acceptance of information, ends the announcement with the remark: "These are official statements; for conclusive definite information as to the position, we must await the report, which, it is stated, will be issued about two months hence." These protective words contain a slight on the "official" veracity of the Coalite concerns. Things have come to a pretty pass in the matter of confidence when even the "Daily Mail" thinks well to qualify its news in this manner.

The Ways of Promoters.

Dated Aug. 3, a prospectus was issued by the South Lincolnshire Water Company, asking for subscriptions to £3000 first mortgage $4\frac{1}{2}$ per cent. debenture bonds at £10 each. It seems that this, to use a colloquialism, was merely a "bit to go on with"—if obtained. Last week the daily papers circulated, in big advertisements, the information that the Company's Directors were prepared to receive applications for £20,000 of ordinary capital and £6000 of $4\frac{1}{2}$ per cent. debentures, with respectively a guaranteed dividend and interest of 5 and $4\frac{1}{2}$ per cent. for three years. The Directors who issued this invitation, it is noticed, are J. Lewis Hampton, Richard Barnes, George Capes, and A. H. Brown. George Capes was (or is) a Director of the Bude Gas Company and of the Brockenhurst Gas Company; and Mr. Brown is also a Director of the latter. His name did not appear in the South Lincolnshire prospectus issued in August; so that apparently between then and now he has been appointed. But these names indicate the connection of the South Lincolnshire Company with the professional promoting group in which the names of Preston and Painter have prominence. It is unnecessary to go any further in making a critical examination of the prospectus. Incidentally, however, it may be noticed that the promoters have got into trouble with Mr. Otto Hehner, the well-known analyst. He has addressed a letter to a daily contemporary complaining that these people have in the prospectus used his name, and a qualified report of his on a sample of water, taken by someone he does not know, and in a manner unknown to him, and which sample was unfit for bacteriological examination. Organically his analysis showed the water to be pure; and there were no indications of pollution. But in his report Mr. Hehner would not go further. He was requested to support the Bill promoted in Parliament by these company promoters; but he had had no opportunity of investigating the supply, and his information was all too scanty to justify him doing so. Naturally and properly, on these grounds, he protests against his name being used in connection with the present promotion.

Successful Profit-Sharing.

As has been the case elsewhere, the experience of profit-sharing in connection with the Chester United Gas Company has been a pleasant one. Success of a pronounced type has been the result; and, judging from the proceedings at the annual meeting of the profit-sharing employees an account of which appears in the "Miscellaneous News" columns to-day, everybody is—as would naturally be expected—thoroughly satisfied with the scheme. Chester was among the pioneers of profit-sharing in gas-works; their scheme having been introduced as long ago as 1901. The undertaking is, of course, not a very large one, and so the employees are not numerous. But bearing this fact in mind, the figures quoted in the report are of a highly encouraging character. Since its inception, an appreciable amount of stock has been acquired by the employees under the scheme; and in addition there is a substantial amount of money standing to their credit. Emphasis may here be laid on the following statement in the report: "The bonuses accumulated under our profit-sharing rules have in some cases of illness been of great assistance;

while the considerate efforts made by the employees to relieve the anxiety and suffering of ailing workmen have been frequent and liberal, and the development of such good-will and brotherly feeling can only be secured by following the true spirit of co-partnership." Evidently at Chester "co-partnership" in the widest and best sense of the word is thoroughly understood; and both the Company and the employees are to be congratulated on the fact—for nothing but good to all parties concerned can come of it. Mr. J. G. Frost, the Chairman of the Company, in the course of an interesting speech proposing the adoption of the report, pointed out that as a result of the scheme there was an amount equivalent in cash to practically £1600 standing to the credit of the employees in the books of the Company, and that those who were young had thus a golden opportunity of laying up a substantial provision against adversity or old age. But, as he rightly remarked, the beneficial effect does not end here. Profit-sharing should—and, as is shown at Chester and other gas-works where it has been adopted, does—operate in the direction of urging the men to greater individual effort; the result of which is gain both to the employer and employed. The Chairman embodied in his remarks some excellent advice, of a homely, but wholesome, character, to the younger men and boys; and what he had to say will, it is to be hoped, where needed, be carefully considered, not only by those who heard it, but by those who may subsequently read it.

Municipal Sinking Funds.

There are some remarks of interest on the subject of municipal sinking funds to be found in a recently issued special report of the Select Committee on Local Legislation, who sat as two Committees during part of the session—meeting first about the middle of March. To this Committee were referred "all Private Bills promoted by municipal and other local authorities, by which it was proposed to create powers relating to police, sanitary, or other Local Government regulations in conflict with, deviation from, or excess of the provisions of the general law." In all, twelve Bills were considered by them. On the question of sinking funds, the Committee say that power was again sought to apply these funds in exercise of new borrowing powers. In granting this to Lisburn the Committee required an annual return to be made to the Local Government Board for Ireland, showing the sums applied under this power, and the securities in which such sums are invested. In so doing, they point out that they acted on recommendations of the Select Committee appointed to inquire into this matter. In the case of Oldham, the Committee found an unusual power had been given to the Corporation in 1886, enabling them to apply a portion of each sinking fund to maintain a balance at the bank. They thought it inadvisable to interfere with this power so far as regards existing loans; but they regarded it as inadvisable to extend it. The Committee instructed the Chairman (Sir Francis Layland-Barratt) to ask for a parliamentary return of the securities in which local authorities have invested their funds—distinguishing between investments of sinking funds and other corporation capital.

American Illuminating Engineering Society.

In accordance with the intimation given in the "JOURNAL" for the 31st of August, the third annual meeting of the above-named Society was held in the United Engineering Societies' Building, New York, from Monday to Wednesday last week, under the presidency of Mr. T. Cummerford Martin. The titles of most of the papers prepared for the meeting have already been given; but the following additional communications are contained in the complete programme which has since come to hand:—

"Work of Dr. Carl Auer von Welsbach in the Field of Artificial Illumination," by Mr. G. S. Barrows.

"Illuminating Engineering from the Educational Standpoint," by Mr. F. K. Richtmyer.

"Notes on the Chemical Luminescence of Rare Earths," by Dr. Angelo Simonini.

"The Light of the Firefly," by Drs. H. E. Ives and W. W. Coblentz.

"The Physiological Effects of Radiation," by Dr. Charles P. Steinmetz.

"Allowable Amplitudes and Frequencies of Voltage Fluctuations in Incandescent Lamp Work," by Mr. H. E. Ives.

"Standard Relations of Light Distribution," by Mr. A. J. Sweet.

In addition to the papers, reports were to be presented by the Sub-Committees on the Unit of Light and on Photometric Units. The general proceedings at the meeting, as well as the principal papers, will be noticed in subsequent issues of the "JOURNAL."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 69.)

THE Stock Exchange had a more satisfactory time last week from the professional point of view. As soon as the settlement of the long account was concluded (not without one small failure), there was a marked increase in activity, bringing relief to all who were sick of a calm. This burst was to a great extent confined to good speculative lines. The more serious markets—such as Home Government securities—stood magnificently aloof, although Home Railways had a share in the cheerfulness. The week opened very quietly—the settlement being foremost in view; and the high-class departments were dullish. But Americans and South Africans began to look up. Tuesday was quite quiet, and disposed to be flat in several quarters; but Consols managed to pick up $\frac{1}{16}$. On Wednesday, Consols lost their little fractional gain; Railways were still doing poorly; and things in the speculative lines moved irregularly. Thursday brought some promise of improvement with signs of increasing business. Railways initiated a better tendency, which endured quite to the close; and in various other quarters there was a much brighter outlook. Activity increased on Friday, coupled with firmness in some important departments. Home Governments were not among these; but Railways were in better demand, and several popular speculative undertakings were on the rise. This general state of things was continued on Saturday; and the week had a cheerful termination. In the Money Market, there was a distinctly firmer tone. The demand for the Stock Exchange and for the end of the quarter was good; and discount rates were firm. Business in the Gas Market was a good average volume in the aggregate, but unevenly distributed; the two leading Metropolitan Companies monopolizing by far the larger part of it. The tendency continued very firm, and several further advances in quotation were made. In Gaslight and Coke, the ordinary was strong and active. After changing hands early on Monday at $105\frac{1}{2}$, it left this figure behind, and mounted up to $106\frac{3}{8}$ at the close—a rise of $\frac{1}{4}$. The secured issues were quiet and firm; the maximum marking $88\frac{1}{2}$ and 89 , the preference from 104 to 105 , and the debenture $86\frac{1}{4}$ and $86\frac{1}{2}$. South Metropolitan was in demand at the same figures as the week before ($119\frac{1}{2}$ to $120\frac{3}{4}$); and the quotation was put up a point. The debenture marked $86\frac{1}{4}$. In Commercials, the only business was a couple of deals in the 4 per cent. at $109\frac{1}{2}$, and the quotation rose 1. Among the Suburban and Provincial group, Alliance and Dublin old was done at 19 (a rise of $\frac{1}{2}$), Brighton ordinary at $150\frac{1}{2}$, Brentford old at $254\frac{3}{4}$ (a rise of 1), West Ham ordinary at $125\frac{1}{2}$, and ditto preference at $127\frac{1}{2}$. Some other issues (not dealt in) had rises in their quotations. In the Continental companies, Imperial recovered a point, and marked from $179\frac{3}{4}$ to $180\frac{1}{2}$. Union was done at from $95\frac{1}{2}$ to $96\frac{1}{2}$, and Tuscan at $9\frac{3}{8}$. Among the undertakings of the remoter world, Buenos Ayres changed hands at $14\frac{1}{2}$, Melbourne 5 per cent. at $104\frac{1}{4}$ *cum div.*, Monte Video at $12\frac{7}{8}$, Primitiva at $7\frac{1}{2}$, ditto preference at from $5\frac{1}{4}$ to $5\frac{3}{8}$, River Plate at 17, and South African at $13\frac{1}{2}$ and $13\frac{3}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

Tariffs and Difficulties—The Overcharged and the Undercharged—Electrical Socialism—Arc Lamp Position—The Metallic Filament Diverting Attention from the Arc—Absurd Claims—Pressures and Ignorance.

THE question of electricity tariffs has largely been on the shelf of late. It offered a fruitful field up to recent times in which electricians could exercise ingenuity, with the one result that highly technical systems of charging were evolved, and not attractive commercial ones. In their effects, the adopted systems have turned out to be, more or less, what has been described as "economic failures," for the simple and sufficient reasons that the public cannot understand them, and so cannot be got to put their trust in them. Just lately Mr. Seabrook has come out at Marylebone with his "telephone system" of charging, which was put forward as though it had an indisputable claim to perfect originality, and that there was no indebtedness to anyone else for the idea. The trumpetings of West Ham are being repeated at Marylebone. The wonderful Marylebone report on electrical tariff reform has had extensive notice in the technical and daily press. By such means are reputations made. But so far as we have seen, the noise made over the report has been greater outside Marylebone than inside; while the stimulus it has given to applications for electrical connections has not been of any corresponding or striking order. There is no doubt, however, that electricians have got to do something to compensate for the depressions caused in revenue by the metallic filament lamp. And the favourite idea appears to be to charge a definite sum based on the maximum demand of the consumer, with a small charge per unit for the electricity consumed; this being accompanied by an attempt to cultivate a larger business in cooking and heating. This system of charging has the advantage that it does overcome the difficulties of two rates, two meters, and two sets of wiring. But it has no other. In fact, the fixed charge is an objection to the less affluent class of consumers. But the idea that such a system will give an impetus to cooking

and heating by electricity is being derided by experience at every turn. It is no small difficulty to get consumers to adopt cooking and heating by electricity—first cost, running cost, and efficiency are all opposed to the best efforts in this regard of the distribution or commercial man of the electricity supply undertaking. We have heard his plaint. The electrical engineer urges the much harassed commercial man to push (let us say) the "Therol" water-heater for all it is worth; and he makes trial, is disheartened, and confesses to his intimates out of hearing of the engineer that it is useless. Consumers are staggered at the first cost, and the smallness of the supply of hot water for the great expenditure of current. And they want to know of the electrical commercial man "What he takes them for?" It is ludicrous to affect that a heater of the kind is an economical success. But this is all in line with the general pretence that is witnessed in the electrical industry, and with the amazing tariff schemes that have for their main object the delusion of the householder.

In an article by Mr. F. Fernie in the "Electrical Review" recently, there was, in the first part, what amounts to a bare-faced admission that the tariffs of electricity undertakings are so arranged that some people pay more than cost price, while others pay under cost price. If these undercharged consumers tend to improve the station-load factor then, it is argued, the overcharging of a proportion of the consumers would appear to be sound. That is to say, if you rob one person and hand the proceeds over to another person, there is an all-round benefit. This is electrical socialism; and we cannot defend it as being either sound or virtuous. However, "in this way" it is held, "the all-round cost per unit would be lowered;" so that the overcharged consumer "might eventually" be charged a lower rate per unit than the original cost of supplying him. We like the latent potentiality in the words "might eventually." If, in the general run of electricity undertakings, there is one class of consumer that obtains less consideration than any other, it is the lighting or overcharged consumer. He is the burden-bearer of the electricity undertaking. He is the last to receive consideration; the first to be menaced with an increase of his lighting rates if he adopts more economical lighting appliances. What it all comes to is that the electricity undertaking managers have to descend from the altitudes of their fanciful, mystifying tariffs, to something that, in this matter of charges, is plain, practical, and commercial. But the difficulty is for these managers to dissuade themselves that electricity supply for lighting, power, &c., is not something that is above the application of ordinary commercial practices. The peculiarity is that the new-fangled principles of charging in this branch of electricity supply is not applied to the conveyance of passengers by electric tramcars or electric trains, or to the sending of telegrams. If we are not greatly mistaken, the time will come when the aged practices of charging in trading will have to be applied to electricity supply as they are, practically universally, to other commodities and conveniences.

Not much has been heard lately of electric arc lamps. They seem to have dropped out of discussion; the cause being the concentration of attention on the metallic filament lamp. Arc lamps have never properly got over their congenital complaints; and every improvement in any direction that has been made in them has been effected at the sacrifice of something or other in another direction. This is clearly, though perhaps not intentionally, shown by Dr. Monasch in a German contemporary. Up to 1895, open arc lamps held the field; but even now some people prefer them because of the absence of injurious vapours and the whiteness of the light. Then 1895 saw the advent of the enclosed long-burning arcs. But the consumption rose to about 1 watt per hemispherical candle power. An advantage was that "the direction of the maximum light emission was favourable to uniformity in street lighting." They did not, nor do they now, make any profound impression upon us in respect of uniform distribution. There are examples of these lamps in London at present for which high prices are drawn from the pockets of the ratepayers. We will examine them again at an early date to see if our views as to light concentration and not light diffusion should undergo some change. There is no desire on our part to harbour unworthy thoughts even over an arc lamp. Another disadvantage is that the inner globe got densely coated after (say) 200 hours; and this, with the dusty appearance of the outside, led to the intermediate type of lamp, which, although enclosed, is fitted with thin carbons. These, in turn, burn for about 22 hours only. Then we come to the Bremer lamp of 1900. Some of the early troubles of this form of lamp are still with us. In the later forms, there has to be suitable ventilation of the globes to "minimize" the harmful effect of the white deposit given off by the carbons, both as regards the mechanism and the obscuring of the globes. There is nearly a 5 per cent. reduction of the light from this cause after burning only eighteen hours. Then trouble with the regulating mechanism in flame arc lamps led to the design of lamps without such mechanism; but these fell short of the "quality" of those with mechanism. Then there came the Carbone lamp, about which a great deal was heard—temporarily. Upon the Blondel lamp, Dr. Monasch confers honour both for uniformity and consumption. Some of our British firms consider their productions quite as good, judging from their advertisements. This brief reference to the learned Doctor's historical account of the forward movement in arc lamps shows that it has been a besetting sin of this type of electrics that they could not grow in grace in one direction without losing virtue in another.

In a recent issue of the "Electrical Review," there is a spirited

defence, by "Pam," of the enclosed arc lamp against the metallic filament lamp. There is no question that the business in arc lamps has felt a bit of a draught through the coming of metallic filaments. In the experience of the writer, he knows of several shopkeepers who have, without regret, abandoned arcs for clusters of metallic filaments. It is quite true, as "Pam" says, that arc lamps want a good deal more selling than most things. But the uncomfortable time Osrams and their fellow-filaments have given arcs, we do not believe is on account of any greater lighting efficiency, but because the metallic filament lamps do not require trimming, and, in appearance, are far and away more attractive than the enclosed arc lamps. But "Pam" thinks the changing preference is due more to the apathy of manufacturers and those interested in arc lamps generally; and he asserts, with a boastful air, that they have enough fighting material at hand to swamp all the adherents of other artificial illuminants if they could only muster enough energy and intelligence to put things plainly before the general (electrical) public. The last few words are very nasty. The statement is either a slander, or it is not. If it is not, then the arc-lamp makers have not that swamping fighting material of which friend "Pam" brags. These vain pretensions are completely knocked on the head by the results of trading; and there would have been no occasion for saying that arc lamps want more selling than the usual run of things if the extraordinary merit hinted at was really at the back of the lamps. That merit would alone act as a propelling force of a no mean order.

But "Pam" has come across people who think that arc lamps are not as efficient as metallic filament lamps; and this he asserts is a direct result of unintelligent advertisement. Then he cries "if the arc people would only give a few details as to what they actually can do in regard to candle power for carbon and watt consumption!" We have found that they do give figures—not of what they "actually can do," but of what they actually cannot do. "Pam" himself relates how a certain firm sent inquiries to several dealers for flame arc lamps for shop lighting. "The current was specified as 10 amperes, the voltage 200, and the lamps were to run four in series; and tenderers were requested to state the mean hemispherical candle-power of the lamps offered. Now one firm actually gave this as 4000, and another as 3000. This, mark you, for an expenditure of only 500 watts, which shows 8-candle power per watt!" And these firms do not stand alone in this particular form of sinning. The absurdity of a 1000-candle power difference in the quoted candle power, the absurdity of any such claim as 8 candles per watt can, and must do, as indignant "Pam" says, a lot of harm. But in proof of his assertion that the enclosed arc lamp is cheaper than metallic filament lamps, he takes the case of an ordinary shop, using four lights for either inside or outside lighting, and assumes that it is desired each lamp should give about 600-candle power; the voltage being 200, and the charge for current 5d. per unit. In the case of metallic-filament lamps, a life of 1000 hours has been allowed, although "700 to 800 would be nearer the average." The result of the calculation on the hypothetical case is as follows:

Enclosed Arc Lamps.		Cost per Annum
Four lamps complete at £2 10s. each = £10; 20 per cent.		£2 0 0
Trimming and carbon, ten visits at 4s.		2 0 0
Energy, 600 watts × 1000 hours × 5d. per unit . . .		12 10 0
		£16 10 0
Metal Filament Lamps.		
Four lamps, depreciation on lanterns, &c., say 25s. each		£5 0 0
Energy, 800 watts × 1000 hours × 5d. per unit . . .		16 13 4
		£21 13 4

The enclosed arcs, on the price basis taken, certainly come out the cheaper. But enough of this, or we shall have gas managers' mouths watering for business on the basis of the supply of light equal to 600 candles for 1000 hours at £21 13s. 4d. and £16 10s. A cheque for £3 would pay for the 24,000 cubic feet, at 2s. 6d., required in the 1000 hours for the light of 600 candles, using inverted gas-lamps at ordinary pressure.

"The consumer purchases a mantle which, when brand new, supplied with suitable fittings, and burnt at a given pressure, affords the advertised candle power. It is adjusted by the company's gas expert at six o'clock in the evening and burns silently; at ten or eleven o'clock the same night it acquires an asthmatic roar; blue flame flits round the top of the microbe crematorium, the light wobbles, much candle power seems to have gone off duty for the night." "Meteor" of the "Electrical Times," writing on the subject of gas pressures, wants to know what we have to say to this. Our reply is "nothing," except that what he has written is very silly, that he would not find truth any more expensive than the opposite quality, and that it is time he was informed that, owing to the day gas-load having reached from 30 to 50 per cent. of the twenty-four hours' output, gas pressures are kept more uniform now than they were in the days of flat-flame lighting and the Victorian days of incandescent gas lighting.

The death occurred on the 24th ult., at "Larchfield," Barkston Ash, Yorkshire, of Maud Emily Dalcho, youngest daughter of the late Mr. William John Warner, for many years Engineer and Manager of the South Shields Gas Company.

PRESENTATIONS TO MR. AND MRS. DOIG GIBB.

LAST Wednesday evening, further proof was furnished of the respect and esteem which Mr. W. Doig Gibb has won during his tenure of the position of Chief Engineer of the Newcastle and Gateshead Gas Company, by the presentation to him, at a large gathering of the officials and workmen at the Elswick Works Rifle Range, of a solid silver centre-piece, which was accompanied by a silver afternoon tea service for Mrs. Gibb, and a gold pendant for each of their two sons. Mr. Thomas Hardie, the new Chief Engineer, presided.

The presentation was made by Mr. G. L. Swallow, the Manager of the Elswick Gas-Works, who said the company had assembled to ask Mr. Gibb, their Chief Engineer, to accept, on behalf of himself, Mrs. Gibb, and their family, some tokens of esteem and regard from the officials and workmen at the Elswick and Redheugh Gas-Works, on the occasion of his leaving to take the responsible position of Chief Engineer to the South Metropolitan Gas Company—a Company with historic traditions. They all regretted that he was leaving them; but they not less sincerely rejoiced at his promotion to so important a post, which he was eminently qualified to fill. They felt it was a great honour that the Metropolis of the North should supply the necessary talent and ability to the great Metropolis of the South. During the many years they had known Mr. Gibb, his ability, integrity of character, and unfailing courtesy had impressed and influenced them more and more. Intimacy with him had but revealed deeper wells of kindness and genuine consideration for subordinates and equals alike; while regard for his ability, no less than his other personal qualities, had been shared by them in common with the gas industry generally. But there were many traits in his character and kindly nature which were best known to those then assembled, with whom he had been closely associated. His frankness and unreserved trust in his dealings with all had resulted in the very best efforts being drawn out of those around him. His high ideals of duty, his thoroughness, his sincerity, and his straightforward character, had impregnated all with whom he had come in contact. He had taken a kindly interest in their personal affairs, had sympathized with them in their trouble, and rejoiced in their success and happiness. Mr. Swallow concluded by wishing Mr. Gibb "God-speed" in his new sphere of labour, and, on behalf of the subscribers to the testimonials, from the heads of the works down to the smallest boy, by expressing the hope that he and his family might have long life, health, and prosperity.

Several other officials also testified to the high character of Mr. Gibb, congratulated him on his appointment, but regretted his departure from Newcastle; the Chairman associating himself with the remarks which had fallen from the previous speakers.

In returning thanks, Mr. Gibb, who was very cordially received, said he was going to take up very responsible duties, and the knowledge that he had the good wishes of those who had assembled that evening would certainly encourage him to do his best. If he had succeeded, as he thought he had, in winning their affection and esteem, it was perhaps in the first place because, however imperfectly, he had always tried to follow up one simple little doctrine in which he believed with all his heart—to do to others what you would others should do to you. As they knew, he was going to a Company where co-partnership was carried out. He was a very firm believer in this, and he was not without hope that something of the kind might come to Newcastle some day. If ever it did come, it would be much easier than in some other places, because the first step had already been taken in the co-partnership existing between the men and the officials of the Company. He concluded by heartily recommending his successor.

Last Friday evening, in the distribution department of the Company in South Street, Newcastle, a presentation was made to Mr. Gibb by the employees of the department. It took the form of a handsome silver salver, suitably inscribed; and it was presented by Mr. John Lewis, the Superintendent, who presided. In asking Mr. Gibb to accept the gift, he extended to him the hearty congratulations of the employees on his new appointment, and expressed their regret at his departure from Newcastle. Mr. Malcolm Nichol, the oldest employee, spoke on behalf of the men, and assured Mr. Gibb of their high esteem. Mr. Gibb, in returning thanks, alluded to the value of the gift, and said it would be the best testimonial he could possibly have had to take to the workmen of the South Metropolitan Gas Company, to show them that he was not so bad as they might expect him to be. Alluding to a remark of one of the speakers, he said he had gone through the shops, not as a premium apprentice, but as a working one, and had learned to esteem his fellow-workmen then and since. He had always felt that so long as a man or a boy was doing his work to the best of his skill, fairly, straightly, and honestly, he was as much entitled to one's respect as any other man who happened to be in a better position. The same evening, Mr. Gibb was presented with a testimonial by the Grainger Street staff of the Company; Mr. Waddom, the Secretary, making the presentation.

The Rev. C. K. Robinson, D.D., Master of St. Catharine's College, Cambridge, and for many years a Director of the Cambridge Water Company, left estate of the gross value of £18,750.

THE LATE SIR GEORGE LIVESEY.

Workmen's Memorial Services.

ON the 4th of October last year, the gas industry in general, and the South Metropolitan Gas Company in particular, sustained an irreparable loss by the death of Sir George Livesey. Yesterday, therefore, was the anniversary of the sad event; and it was only to be expected that fitting notice should be taken of it by those who had special reasons for cherishing the memory of their far-seeing and large-hearted benefactor. Accordingly, at the unanimous request of the workmen's section of the Co-Partnership Committee of the Company, arrangements were made for holding a memorial service, to which the employees and their wives and families were invited, yesterday evening, in Christ Church, Old Kent Road, the Vicar of which (Rev. Frank Hobson) readily consented to its use for the purpose. Possibly a more appropriate building could not have been selected; for it is not only closely associated with the works with which Sir George had a lifelong connection, but it was always an object of interest to him, as testified by his liberal contributions to its funds. It may not be uninteresting to reproduce, from the Company's "Co-Partnership Journal" for December last, a few particulars in regard to this church. Its predecessor, built in 1838, stood on ground which is now occupied by a portion of one of the retort-houses. An extension of the works being called for, the church, after an existence of thirty years, was demolished, and the one in the Old Kent Road erected to replace it. The removal was as necessary for the comfort of the worshippers as it was for the purposes of the Company; as the contiguity of the works to the sacred building was by no means agreeable. The new church was consecrated in 1868. Yesterday evening it contained a very large congregation when the memorial service was opened by the singing of the hymn, "Jesu, Lover of my Soul." Then followed prayers and a lesson from Rev. vii., 9; after which came the hymn, "How Bright those Glorious Spirits Shine," which was followed by an address by Canon Ransford, who conducted the funeral service at Nunhead Cemetery. Taking the words "This do in remembrance of Me," he directed his hearers' attention specially to the religious side of Sir George Livesey's life. At the close of the address the hymn "Now the Labourer's Task is O'er" was sung; and then the Apostles' Creed was repeated, and portions of the Burial Service and a few collects were read by the Vicar, who briefly addressed the congregation. The concluding hymn was "Abide with Me;" and the Benediction brought the impressive service to a close. Before it commenced, the organist played Mendelssohn's "O Rest in the Lord;" and at the end Spohr's "Blest are the Departed." On the previous afternoon, a service for workmen was conducted at the Vauxhall Institute by the Rev. Richard Dixon, Vicar of St. Michael's, Stockwell.

Yesterday afternoon, members of the Co-Partnership Committee, on behalf of the employees, placed a wreath on Sir George Livesey's grave in Nunhead Cemetery.

In the newspapers last week, statutory notices were given by Messrs. Hicklin, Washington, and Pasmore, the Solicitors for the Executors (Messrs. Frank Bush and Harry Hawes Keddel), that all claims upon the estates of Sir George and Lady Livesey are to be sent in writing to them on or before the 25th inst., after which date they will proceed to distribute the assets of the estates among the persons entitled thereto.

Obituary.—The death has occurred, under distressing circumstances, of Alderman W. A. Massey, J.P., of Hull. Deceased had not been in good health for two years, and on this account had had to relinquish his position as principal of the firm of Messrs. Massey and Co., and give up his important public work. He was returning from Folkestone, where he had been staying for two or three months, and died on the journey. He negotiated the purchase of the Kingston Gas-Works for £90,000, and made a working agreement with the British Gaslight Company to supply gas to the old part of the city (within the docks) at a cheap rate, equal to a reduction of 2d. per 1000 cubic feet on the previous charge.

Successful Artesian Boring at Slough.—For nearly three years, Messrs. Horlick have been drilling for a good water supply at their Slough works; and after going down 1100 feet, they have been successful to an extent almost beyond their expectations. Last Thursday morning, the search culminated in an unprecedented manner, for without warning water rushed up with tremendous force, putting the pumps and machinery out of action, and flooding the ground adjoining the works. A quantity of fine sand came up with the first rush; but when the flow had become clear, an examination took place, and this proved that the water is likely to be the clearest and purest in the district. The pressure fluctuates every twelve hours; and this leads to the idea that the underground springs are affected by ocean tides. After getting through the surface and a depth of silting sand, the operators continued drilling through 700 to 800 feet of chalk. They then came upon hard clay soil; and it was not until they had gone nearly 300 feet through this that they came into sand. As soon as the clay had been removed, the water began to make itself evident. The boring is 18 inches in diameter at the surface and 6 inches at the bottom; while the estimated yield is between 30,000 and 40,000 gallons per hour. The work has been carried out by Messrs. Isler and Co., of Southwark, under the supervision of Mr. A. G. Christiansen, Messrs. Horlick's Engineer.

GAS ACTS FOR 1909.

[THIRD ARTICLE.]

IN continuing the review of the Acts of Statutory Companies passed in the current session of Parliament, we find there are six more in this class requiring notice.

The Harrogate Gas Company have obtained the desired extension of their limits of supply; but the clause has been removed by which sanction was asked to the acquisition of certain small private gas plant in the parish of Birstwith. Power has been secured to construct a railway (1 mile 5 furlongs 8½ chains long), commencing at the Bilton Junction sidings on the North-Eastern Railway, and terminating in the coal-store on the Company's works. The construction of subways and necessary works subsidiary to this railway are authorized, together with the acquisition of certain lands and easements. Arrangements are legalized between the Company and the Corporation, whereby the former may, as a matter of business, undertake the delivery over the new railway of coal required by the electricity works. New clauses appear for the protection of public rights in connection with the railway. The North-Eastern Railway Company have also obtained protection in a number of respects; but they are not "in any way to interfere with the works of the [Gas] Company until they shall have made all such arrangements as the Company may reasonably require for preventing any loss of gas, or any interruption in the supply of gas." In connection with the railway, the West Riding County Council are likewise protected; and since the promotion of the Bill, they have obtained an extension of protection in respect of the laying of pipes. Power is given for the purchase of scheduled lands (comprising 1 acre 2 roods 29 perches) upon which to manufacture and store gas and residual products. The auction clauses of the Company's Order of 1897 are amended in manner to give the Company greater liberty in the issue of stock, after it has first been submitted to sale by auction or tender—the Company's employees and consumers of gas being linked up with the holders of ordinary and preference stock in having new issues offered to them. The creation of a special purposes fund is authorized; and superannuation and other allowances to officers and employees generally are provided for. The Directors have also power granted to them for subscribing to hospitals, &c. The clause giving power to the Company to provide and work independent installations of gas plant has been altered, so that it now reads as follows:—

The Company may, at the request of the owner or occupier of any premises within the limits of supply which cannot conveniently, or without undue expense, be supplied from any existing main for the supply of gas from their authorized gas-works, provide, and fix upon such premises upon, and subject to, such terms and conditions as to payment and otherwise as may be agreed between the Company and such owner or occupier, engines, motors, dynamos, generating and other apparatus, stoves, ranges, pipes, fittings, and appliances necessary or convenient for the purposes of the generation, supply, use, or consumption upon such premises of acetylene, gasolene, or suction gas, or any other gas, and may enter into, and carry into effect, contracts or agreements with any such owner or occupier as aforesaid for the working and use of any such engines, motors, dynamos, generating, and other apparatus: Provided that nothing in this section shall exempt the Company from any indictment, action, or other proceeding, for nuisance in the event of any nuisance being caused, or permitted by them, upon any such premises as aforesaid.

The new business authorized by this section is to come under the ordinary controlling power-gas clauses. The explanatory clause that appeared in the Bill regarding the charge for gas used for public lighting has been deleted; so that the clause in the Company's Act of 1863 regulating the supply and price of gas to the public lamps will still define unamended "the lowest price charged, for the time being, by the Company to any private consumer." Three succeeding clauses are of sufficient interest to quote *in extenso*:

Notwithstanding anything contained in section 66 (Company to Supply Gas in Certain Events at Request of Owner or Occupier) of the Act of 1863, it shall be lawful for the Company, in any case in which they may think fit so to do, to provide, at their own expense, the whole, or any part of so much, of any service-pipe as shall be laid upon private property, or as shall be laid beyond 30 feet in length.

Section 41 (Power to Refuse to Supply to Persons in Debt for Other Property) of the Order of 1897 is hereby repealed; and in lieu thereof the following provisions shall have effect: If a person requiring a supply of gas from the Company has previously quitted premises at which gas was supplied to him by them without paying to them all gas or meter rent due from him to the Company, and all moneys so due in respect of the supply or letting on hire to him by the Company of engines, motors, dynamos, stoves, ranges, pipes, fittings, apparatus, or appliances, the Company may refuse to furnish to him a supply of gas until he pays the same.

Notwithstanding anything contained in any enactment to the contrary, the Company shall not be obliged to give from any main a supply of gas for any purpose other than lighting in any case where the capacity of such main is insufficient for such purpose; or if, and so long as, any such supply would, in the opinion of the Company, interfere with the sufficiency of the gas required to be supplied by means of such main for lighting purposes.

There is nothing special about the remaining clauses. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Heckmondwike and Liversedge Gas Act gives the Company power to acquire certain lands for the manufacture and

storage of gas and residual products; but upon part of it, in protection of a private property owner, they are limited to the storage of gas. For £2407 10s., the Company are allowed to purchase the mains, pipes, and other works of the Mirfield Gas Company in the ecclesiastical parish of All Saints, Roberttown, in the township of Liversedge; the rights of the Mirfield Company ceasing on the completion of the purchase. Clauses protecting the Bradford Corporation and the Lancashire and Yorkshire and the London and North-Western Railway Companies have been introduced. Power is accorded in regard to the conversion of the capital on a 5 per cent. basis. Additional capital to the amount of £60,000 has been granted, to which the new auction clause will apply. Borrowing powers are allowed in respect of the converted capital to the amount (including £13,500 already borrowed) of £21,000; and the additional capital will carry the right up to one-third the issued amount. The Board have secured the following powers:

The Directors of the Company may, at their discretion, appoint, suspend, remove, or dismiss such managers, treasurers, secretaries, engineers, collectors, clerks, agents, and servants, as they from time to time may think proper for the better carrying on of the business of the Company, and may determine their respective salaries, wages, commissions, or other emoluments, and may require security from all or any of such officers, clerks, or servants, to such amount as they may think fit. The provisions of sections 110 to 114 inclusive of the Companies' Clauses Consolidation Act, 1845, shall apply to all such officers, clerks, and servants, and to their duties and accounts.

The clause that stood in the Bill giving the Directors discretion in regard to the inspection, &c., of the list of shareholders, has been expunged. Power is given for the creation of special purposes and reserve funds. The carry-forward of profits is limited to the equivalent of a year's dividend. The standard price mentioned in the Bill has receded by 3d. to 3s.; and the sliding-scale is to apply on the basis of penny changes in price varying the dividend by 2s. 6d. per cent. The standard illuminating power of the gas is to be 14 candles, tested by the Carpenter "Metropolitan" No. 2 burner. The "power" gas clauses that were in the Bill as introduced have been removed. The name of the Company has been changed from the Heckmondwike Gas Company to the Heckmondwike and Liversedge Gas Company. A suspensory clause appears in the Act in favour of the Heckmondwike and Liversedge District Councils, in the event of their moving for purchase powers next session; but this clause nor the present Act does not prejudice or prejudice the question of purchase. [Parliamentary Agents: Messrs. Sherwood and Co.]

The Leyland Gas Company is the title by which the Leyland and Farington Gas Company will in future be known; the change having been confirmed by their Act. The limits of supply will in future embrace the two parishes of Eccleston and Heskin in the county of Lancaster. Included in the Act are clauses for the protection of the Lancashire and Yorkshire and the London and North-Western Railway Companies. The additional capital powers asked for in the Bill have been granted—viz., £5000; but, as requested, this will only carry one-fourth borrowing powers. The new auction clauses will apply to the issue of this additional capital. The creation of special purposes and reserve funds is allowed. The now common restriction as to the carry-forward of profits being only equal to a year's dividend is inserted. With a standard rate of dividend, and a standard price of 3s. 10d., the sliding-scale will operate yearly by variations of 2s. 6d. per cent. in dividend by changes in price of a penny. In the Bill the standard price was placed at 4s., with the sliding-scale operating half-yearly on the usual terms; so that there have been modifications in these respects. The standard quality of the gas mentioned in the Bill was 14 candles. This has gone up by 1 candle; and the determination of the quality is to be by the aid of the "Metropolitan" No. 2 burner. The proposed power in the Bill to supply Mond gas or any of its developments has been extirpated. [Parliamentary Agents: Messrs. Sherwood & Co.]

A large part of the Pontypool Gas and Water Act refers to the water undertaking of the Company; and the provisions will be duly noticed in the review of the Water Acts. In the section devoted to the gas undertaking, it is ordained that the standard illuminating power shall be 14 candles, tested by the "Metropolitan" No. 2 burner. Powers are conferred to compulsorily purchase additional lands adjoining the present gas-works for both manufacturing and storage purposes. The old 10 and 15 per cent. discounts clause has been adopted. The prepayment meter clause has been varied in one small particular: "If no fittings are supplied with the prepayment meter, the maximum charge for the hire of such meter shall not exceed 7d. per 1000 cubic feet of gas supplied in manner aforesaid, or 10 per cent. per annum on the cost of the meter, whichever shall be the highest." Of £75,000 of additional capital authorized, a sum of £10,000 is allocated to the gas undertaking; the remainder to the water concern. The ordinary additional capital is to be entitled to a dividend at the rate of 7 per cent.; and the preference capital to not exceeding 6 per cent. The borrowing powers may equal one-third of the capital raised. In issuing the additional capital, the new auction clauses apply. [Parliamentary Agents: Messrs. Rees and Freres.]

Quite a large number of now ordinary powers appear in the Wells Gas Company's Act. Those particularly referring to the Company include the conversion of the preference shares into one class of preference stock to the amount of £5000, bearing a rate of interest of 5 per cent. per annum. The ordinary shares are also to be converted and consolidated into one class of stock. Confirmation has been given to the application for additional

capital powers to the amount of £15,000, half only of which may be issued as preference stock. In the issue of the additional capital, the new auction clause will operate. Regarding borrowing powers, the Company may borrow (inclusive of the £3300 already borrowed) £6666; and one-third on the additional capital. Dividend on the ordinary consolidated stock is not to exceed 5 per cent. A special purposes fund may be formed. A standard illuminating power of 14 candles is prescribed, as tested by the "Metropolitan" No. 2 burner. The ordinary form of prepayment clause has been adopted; and the Company are granted power to apply for an Electric Lighting Order if they think fit. [Parliamentary Agents: Messrs. Martin and Co.]

In the Yorktown and Blackwater Gas (Electric Lighting, &c.) Act, the limits of gas supply are extended; but nothing in the section is to prejudicially affect the right of the War Department to manufacture gas for the purposes of their own property. So much of the Order of 1877, the Order of 1890, and the Act of 1896, as authorizes the Aldershot Company to supply gas within the part of Frimley specified in the Act are repealed. The Company are, if required, to supply gas in bulk at the gas-works in Sandhurst of the Secretary of State for War for use on his property within the limits of the Company, at a price not exceeding four-sevenths of the price charged to the ordinary consumers, and not exceeding 2s. per 1000 cubic feet when the price to the ordinary consumers exceeds 3s. 6d. Protection is accorded to the London and South-Western Railway Company, the South-Eastern and Chatham Railway Company, and the South-Eastern and Chatham Railway Company's Managing Committee. In regard to the supply of gas to Wokingham, the Company have the pipes defined that they are to compulsorily lay. The pipe distinguished as No. 1 is to be completed within eighteen months of the passing of the Act, and the other pipes within two years. The Company have secured electricity supply powers in so much of Frimley as is comprised in their gas-supply limits, and so much of Hawley-with-Minley and Yateley as is comprised within the gas limits, together with the parishes of Sandhurst, Crowthorne, Finchampstead, and Wokingham Without. But the Company are not to be entitled to supply electricity within any part of Frimley unless either the District Council shall have given their consent, or a period of one year has elapsed from the passing of the Act without the Council having applied for electricity powers. The Surrey County Council have obtained the insertion of certain protective clauses. Lands are scheduled (now held for purposes of the gas undertaking) for a generating-station. To the clause giving power to effect agreements for the supply of energy to any Government department, local authority, company, or person, there is a proviso that the Company are not to exercise the powers within the authorized area of supply of the Aldershot Company without their previous consent. All the ordinary powers referring to the supply of electricity are conferred; but the overhead wires clause that appeared in the Bill has been deleted. Powers are given to local authorities to purchase so much of the electricity undertaking as is in their respective districts, upon giving six months' notice in writing, at the expiration of 21, 28, or 35 years from the passing of the Act. The clause referring to the change of the title of the Company has been expunged. Additional capital powers to the amount of £50,000 are granted; and to this the new auction clause applies. Borrowing powers to the extent of one-third the issued capital are allowed. A special purposes fund may be created; but the renewal fund proposal has gone. It is ordered that separate accounts are to be kept of the gas and electricity undertakings. It is also provided that, whenever the revenue of the electricity undertaking exceeds the sum-total of the expenditure (including any payments to the special purposes fund), and of a sum equal to 7 per cent. on the capital, the Company shall make such rateable reduction in the charges for electrical energy as, in their judgment, will reduce the surplus to the maximum rate of profit. Protection is given to the Berkshire County Council. [Parliamentary Agents: Messrs. Hargreaves and Crowthers.]

Estimation of Water in Tar.—In a recent number of the "Chemiker Zeitung," Herr H. Beck described a new apparatus for the estimation of water in tar. According to an abstract translation of the article in the "Chemical Trade Journal," the object of the apparatus is to reduce the time and attention required for this estimation by older methods. The author makes use of the usual 2-litre metal flask; but, instead of distilling from this a litre of tar, or, in the case of tars of high water content, a tar mixed with its own bulk of dry oil, he works on a much smaller sample as follows: The still is charged with 500 c.c. of anhydrous tar or tar oil, and heated up to 250-270° C. On to this hot oil, 200 c.c. of the sample is run drop by drop or in a thin stream, according as it contains much or little water. As each drop falls, a slight explosion results; but once a convenient rate of addition has been found, the apparatus may be left to itself until all the tar has been added. The temperature is then raised to 300° C., and in from 20 to 35 minutes, according to the moisture content of the tar, all the water will have been collected in the receiver, which, with the condenser and a dropping apparatus, constitutes the whole equipment. The method described saves a three or four hours' distillation of a material which, especially when very wet, is inclined to bump and froth, and demand much attention. A series of experiments is recorded, which shows the method to be accurate as well as quick.

CONTINUOUS CARBONIZATION AT BURNLEY.

The Woodall-Duckham Vertical Retort System—West's Coal-Storage Plant.



View of the Retort-House from the South-West.

SOME four or five years ago, it was apparent to Mr. J. P. Leather, the Engineer and Manager of the Burnley Corporation Gas-Works, that the time was not far distant when serious consideration would have to be given to the provision of additional carbonizing plant and to the final abandonment of one of the retort-houses containing direct-fired settings, which were used as a sort of stand-by to the inclined retort-settings in another house. Mention of this reminds us that, in its gas manufacturing record, Burnley has been progressive. The Corporation Gas Committee, advised by their Engineer, were pioneers among gas authorities in this country

in adopting inclined retorts; and they were the very first to determine to make a large installation of the Woodall-Duckham continuous system of carbonization, although Kensal Green and Burnley are running almost a neck-to-neck race in the matter of the completion of the settings on this system. But this is anticipating in our story the course of events. We were saying that Mr. Leather has been considering for some time the question of carbonization extensions and changes. Turning up a report of 1905 by him, it is seen that then, acting on instructions by his Committee, he made a report on the capacity of the plant under his care, and on its relationship to immediate and prospective requirements. In that report,

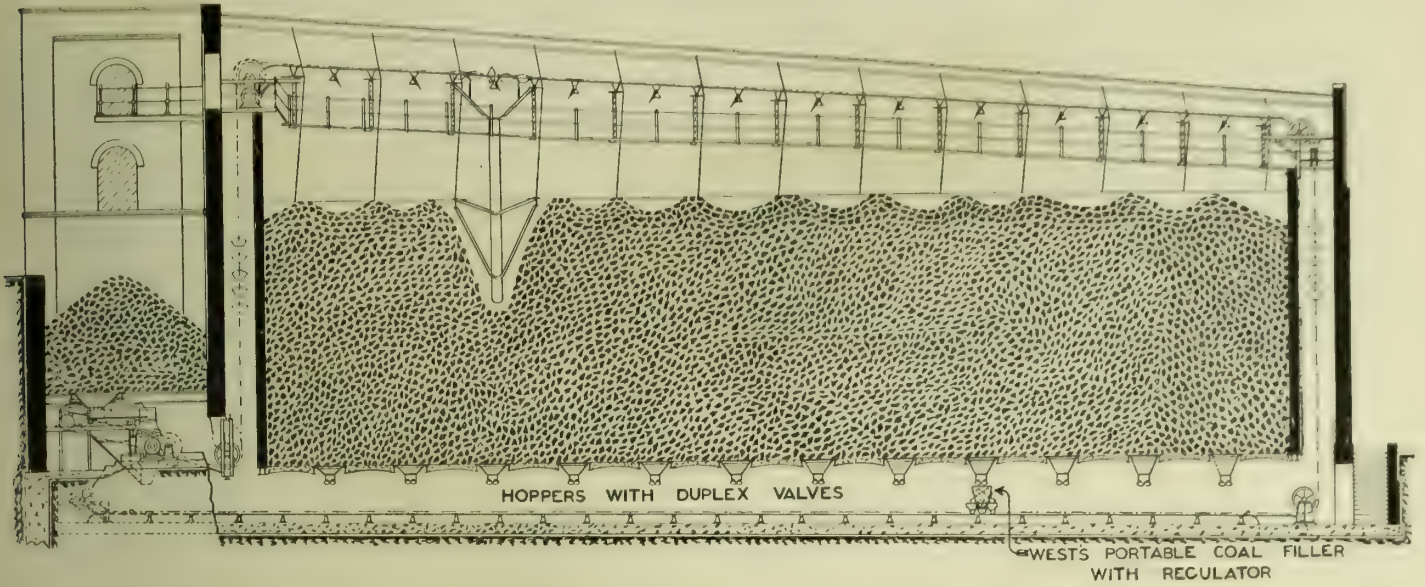


PLAN SHOWING THE GENERAL ARRANGEMENT OF THE BURNLEY CORPORATION GAS-WORKS.

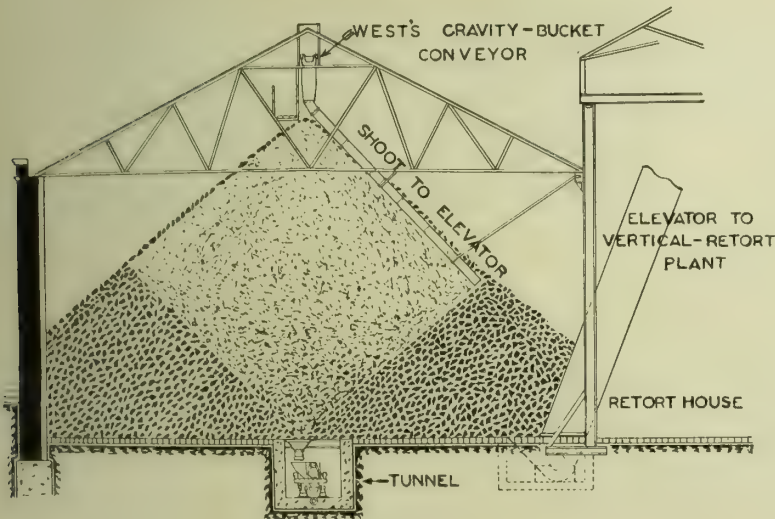
[It will be noticed that there are no Gasholders at these Works, beyond the one used as a Relief Holder for the Carburetted Water-Gas Plant. The Holders for Storage are about Half-a-Mile away; all the Gas being sent to them as made, and distributed from the Storage Station.]

there is a table showing that year by year the undertaking had been expanding its business, and that the maximum day's demand had grown considerably. The table dealt with a period of twelve years. In the year ending on March 31, 1894, the make of gas was 406,017,000 cubic feet; and the maximum day's make 2,500,000

cubic feet. In the year to March 31, 1905, the annual make was 589,997,000 cubic feet; and the maximum day's make, 3,241,000 cubic feet. These are considerable increases; representing 29.6 per cent. in the maximum daily consumption of gas, and 45.3 per cent. in the annual make. In the succeeding four years, the



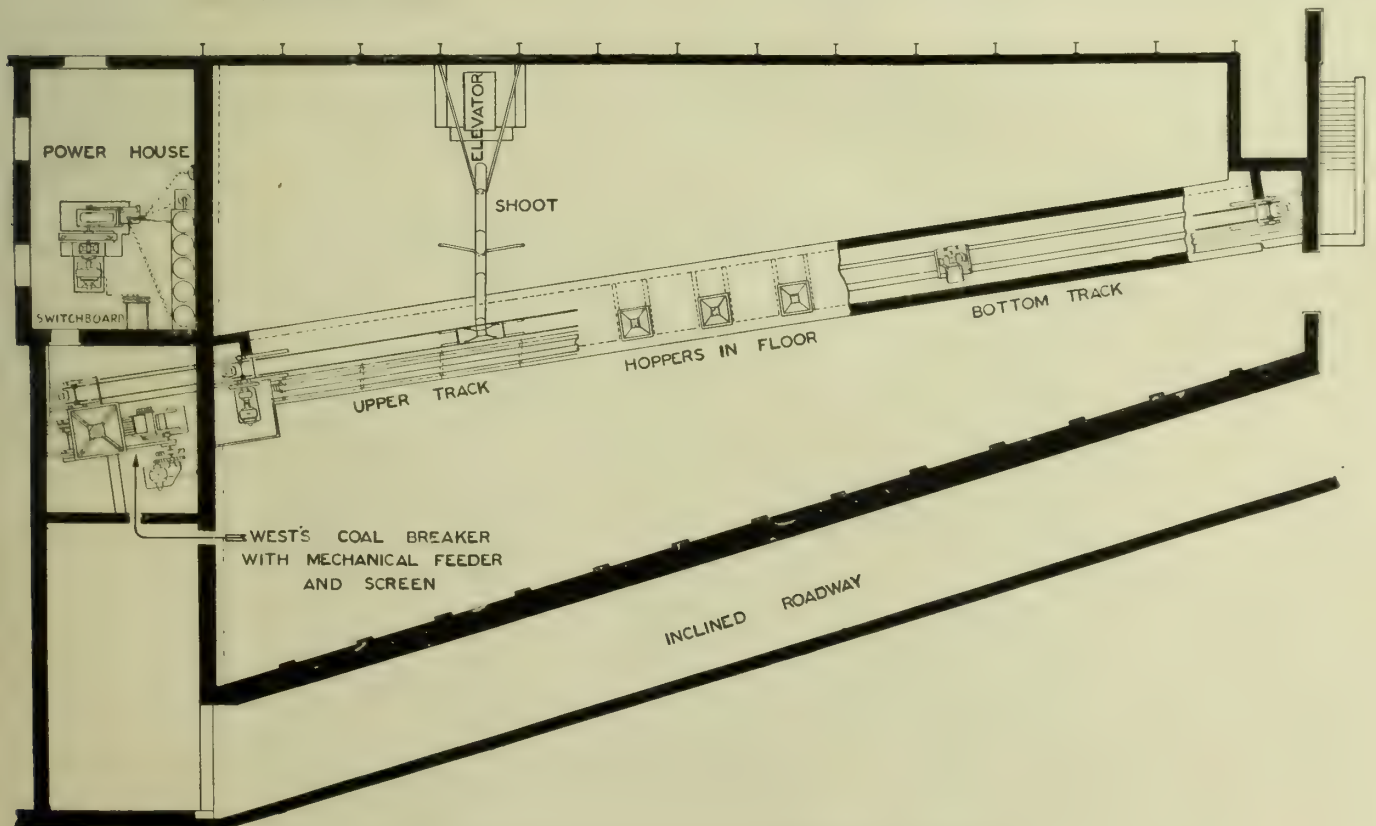
Longitudinal Section of Coal-Store.



Cross Section of Coal-Store.

demand on the works was progressive in volume, until, in the year ending March 31 last, the make of gas was 672,095,000 cubic feet, while the maximum day's consumption was 3,489,000 cubic feet. This expansion of business is not surprising, when it is learned that Burnley enjoys a supply of gas at 2s. 3d. per 1000 cubic feet for lighting purposes, and at 1s. 7d. for power, both less 5 per cent. The figures as to output are the proofs of the correctness of Mr. Leather's diagnosis of the position of the manufacturing plant four years before, and of his predictions that plans would soon have to be formed for new carbonizing plant.

For some time past the old uneconomical direct-fired retort-house has but rarely been used; there having been dependence on inclined retorts and carburetted water-gas plant. The inclined retort-house contains 156 retorts, 15 ft. long by 24½ in. by 16 in.; and, regarding the productive capacity of it, as much as 2 million cubic feet per day have been made from the installation. But normal working is not quite up to this level. In due course, however, the time arrived when it was seen that reliance on existing conditions could not be continued indefinitely; and so the Gas Committee confirmed their Engineer in deciding to clear away the old



Plan of Coal-Store, Showing Tunnel for the Bottom Track of Conveyor.



Back of Retort-House and Coal-Stores—From the Canal Embankment.

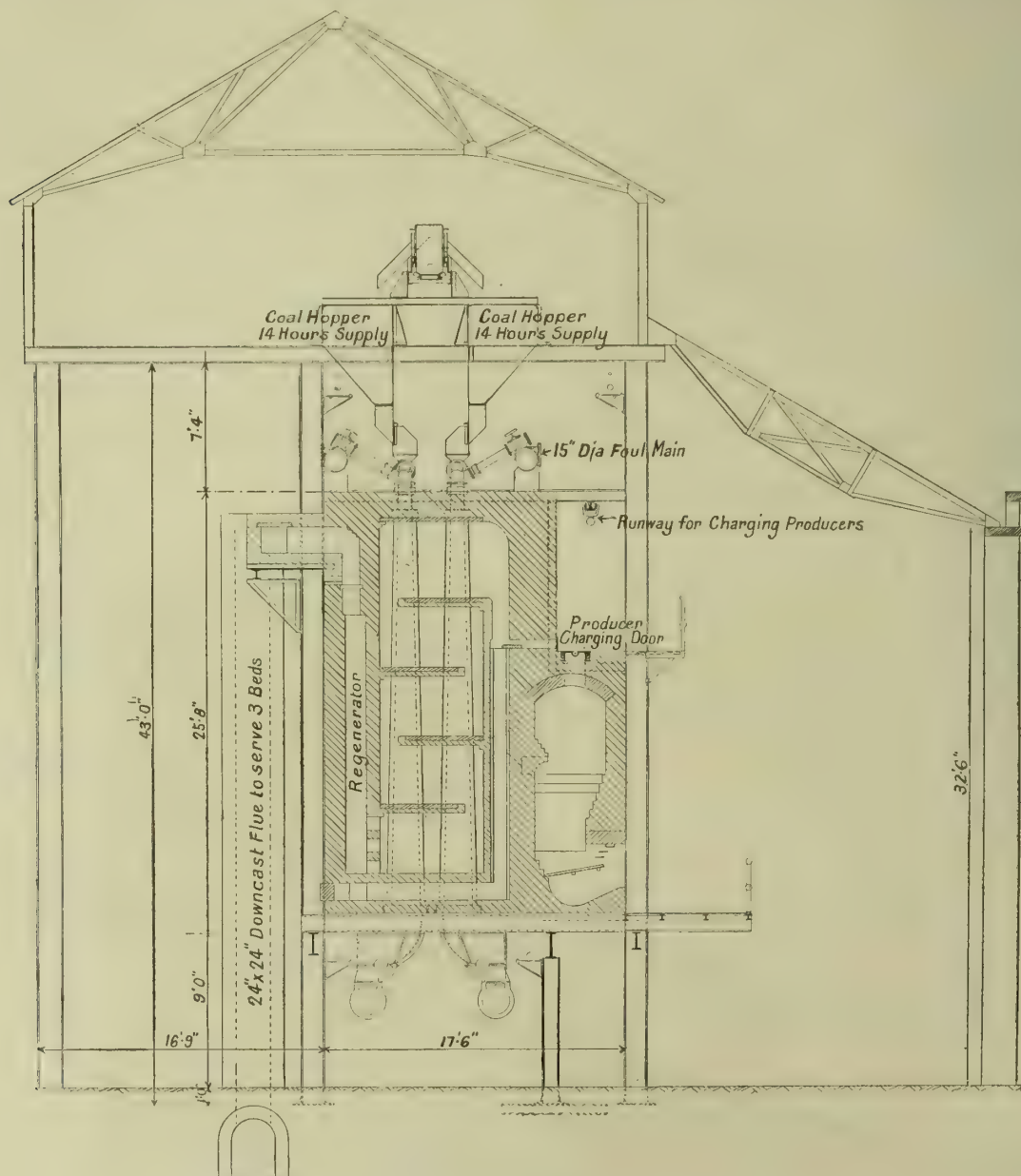
No. 1 retort-house and to build a large new retort-house with spacious coal-store adjoining on another part of the gas-works site.

THE NEW RETORT-HOUSE AND COAL-STORE.

Erected together, the new retort-house and coal-store are handsome buildings, and an imposing feature of the works. They were built from Mr. Leather's plans, by direct labour; and the design is such that it gave absolute freedom in the choice of the carbonizing plant to be installed. At the time the plans were made, and the construction of the buildings had been commenced, the position of affairs was changing in connection with carbonization; and there was a natural desire to be on the safe side while erecting the new buildings, so that any form of plant could be subsequently introduced. There was wisdom in this; for now that the

die has been cast in the matter of system, and the first retort-bench is nearing completion, it is seen that the house which would have afforded comfortable habitation to an inclined bench gives with the verticals abundant freedom for movement and for any work that may hereafter be required in the house, and likewise the spare space adds greatly to the ventilation of the building, and to the making of the conditions of the workers all that could be desired.

The retort-houses and coal-store have the same architectural characteristics. The walls are of red brick, with a stone course on top of the base; above, there is plain brickwork; then another stone course; and above this again pannelled brickwork, with coping-stones at the top. The retort-house is built with entrances, ample in number and spaciousness, from the yard. On the front of the house, there are no less than nine of these archway entrances, which are Norman in design, and two at the north end, while above there are circular openings for light and aids to ventilation. The roof is a light steel one; the principals being 10 feet apart, and the slates attached to angle steel purlins with lead nails. At the apex, and for the full length of the house, the roof is completely open, to a width of some 3 feet; while between the lower portion of the roof at the side and the higher portion of the roof covering the vertical retort-settings, there is a louvre-ventilator, also the full length of the house. The sectional drawing of the retort-bench and the photographs of the building, will show the character of the roof, and the appearance presented by the variations in height. The span of the highest part of the roof is 36 feet, and this covers the vertical settings. The lower portion of the roof (which supplies cover for platforms and the free space in front of the settings) forms a sort of lean-to on to the higher or main part of the building—this descending to the eaves to 32 ft. 6 in. from ground level, while to the apex of the main roof the height from the ground is about 60 feet. This higher part of the roof is entirely supported on rolled steel stanchions, two lines of which, at 17 ft. 6 in. centres, also furnish support for the bench; while (as shown in one of the drawings) the third line of stanchions supplies support to a 14-inch concrete wall between the retort-house and the coal-store—the stanchions being each anchored to two H irons in the floor of the coal-store; so that in every way provision has been made for security in withstanding the thrusts and strains



Cross-Section of the Retort-House with the Woodall-Duckham Vertical Retorts.



View showing Stanchions supporting the Roof and End of Bench of Vertical Retorts.

occasioned by the storage and the movement of large bodies of material. The retort-house, which by the way abuts on to the embankment of the Leeds and Liverpool Canal (by which coal is brought to the works), is 208 feet long by 55 feet wide, inside measurements.

The coal-store is not so long as the retort-house; being 138 feet long—its length for one thing being curtailed by the engine-house at one end and by site restrictions. The latter occasions the peculiar shape of the store—it being 78 feet wide at one end and only 38 feet wide at the other; so that every principal of the roof has a different span. The roof in other respects is just the same in character as that of the retort-house. The store having an average width of 58 feet, and the length being 138 feet, and it being possible to store by conveyor to an average depth of 30 feet, the capacity of the new store will be about 5000 tons without trimming.

WEST'S COAL STORAGE AND HANDLING PLANT.

The coal-storage plant is the principal feature of this new coal-store. The coal is brought to the works by the canal (which is

about 40 feet above the level of the store and retort-house floors) and it will be transferred from the barges to the store over a short bridge, by means of small waggons of 4 cwt. capacity, which will be pushed by men. By means of a tipping arrangement, the waggons will be overturned, and the coal shot into the receiving-hopper, which marks the commencement of the contract that was obtained by West's Gas Improvement Company for the coal-store plant. This plant has distinctive features; and its scheme comprises the breaking, elevating, and storing, or delivery into a shoot which feeds the elevator in connection with the installation of vertical retorts. The floor of the store is so prepared that, when it is necessary to take coal from store, it may be emptied through outlets and feeders to the coal-store conveyor, re-elevated, and delivered to the retort-house elevator for transport to the coal-hoppers over the retort-bench. It will be seen that the coal-handling plant supplies quite a variety of methods for dealing with the coal as delivered or from store.

To describe the plant in a little more detail, and starting at the receiving-hopper. Below this there is a mechanical reciprocating feeder and screen, which will screen the fine coal, and pass the large pieces forward to a breaker fitted with two pairs of claw rolls. Shoots direct the coal from the screen and breaker to a gravity-bucket conveyor. This conveyor is continuous, and extends the whole length of the store—the upper track (right up in the apex of the roof) being fixed to the main roof principals, and the lower track is accommodated in a tunnel (7 ft. wide by 6 ft. deep at one end, and enlarging to 7 ft. 9 in. at the other end) built centrally below the coal-store floor. The vertical runs are carried through brick shafts at either end of the house, which shafts are large enough for men to climb so as to give any needed attention to the conveyor. The roof was specially designed for the reception of the upper track of the conveyor. The coal-store floor is provided with outlets and valves for feeding the coal to a West's travelling filler and regulator, for supplying the coal in even quantities to the conveyor buckets; the same filler being utilized for both receiving the coal from the store or from the breaker and screen.

Among miscellaneous points about the plant, it may be mentioned that it is capable of dealing with 30 tons of coal per hour—the small coal of $1\frac{1}{2}$ -inch cube passing through the screen, and the large pieces being broken to that size by the breaker. The gravity-bucket conveyor is fitted with West's type of chains, similar in general design to those which are adopted by the contractors in the construction of their elevators and conveyors, with cast-steel renewable bushes, which provide for a sufficient area of bearing surface for the joint pins. The gravity buckets of the conveyor are of pressed steel plate, and made without seam or joint. The upper conveyor track is provided with dumping gear placed at suitable distances apart for discharging the coal from the buckets. The buckets are arranged so that they can be removed from the conveyor without disconnecting the chain. For attending to the working parts of the upper track, there is a platform the full length of the conveyor, with handrail and standards on both sides.

Electric driving has been adopted for the plant. The motor provided for operating the coal-breaker and screen is of 15 brake horse power at 600 revolutions per minute; that for driving the coal-conveyor is of 7 brake horse power at 650 revolutions per minute. These motors are of the totally enclosed and dust-proof type; and the electrical starting gear is fitted with auto no-volt and overload release.

At the canal or coal-receiving end of the coal-store is the engine-house, in which is the electricity generating plant. This installation (which is also part of West's Gas Improvement Company's contract) comprises a 42 effective horse power gas-engine, which is directly coupled to an electrical generator of 26 kilowatts, 220



The Vertical Retort Bench under Construction.



Stanchions Supporting the Roof and End of the Bench of Vertical Retorts.

volts, continuous current. The plant is, of course, complete with switchboard and all other necessary electrical fittings. The working will be so arranged that the coal and electrical plants will only be in operation during the day.

The walls of the engine-house are carried to a height somewhat greater than the retort-house roof; and on top a water cistern of 20,000 gallons capacity has been placed. For works' purposes water is pumped from the Lancashire Calder. But Mr. Leather has been hitherto somewhat hampered in this regard; and so, while building, he made ample provision for the future in this direction.

THE WOODALL-DUCKHAM SETTINGS.

From the plant for the removal of the coal from the coal-store to the hoppers above the retort-bench in the new house, to the construction of the bench complete, the entire contract was given to Messrs. Woodall and Duckham; and for them the

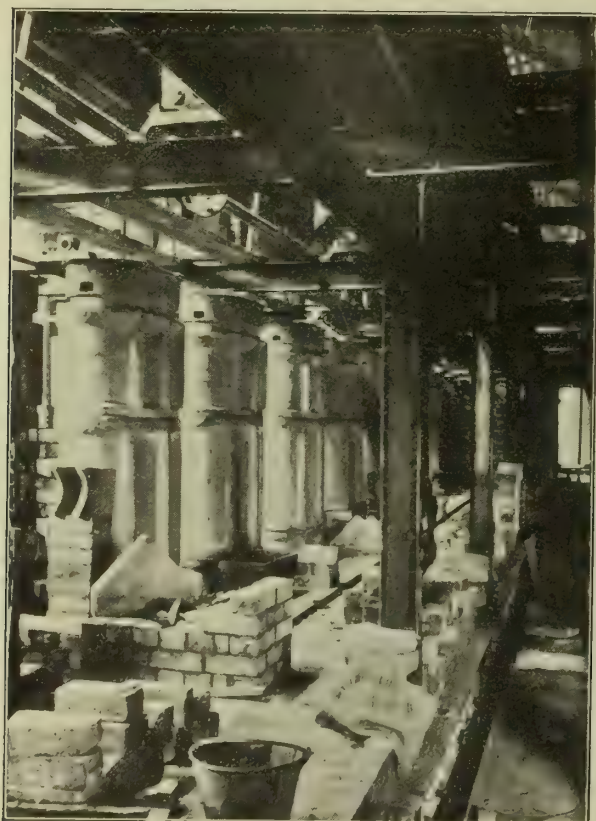


The Combustion Chambers of the Vertical Retorts.

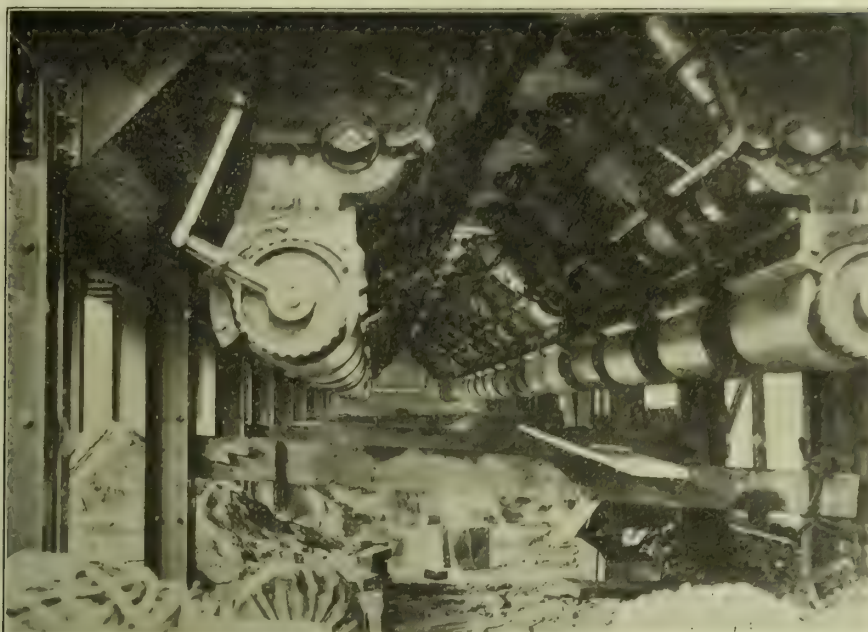
mechanical parts and the fire-clay work has been executed by Messrs. Gibbons Bros. It will have been seen that the coal is broken before it is put into store; so that it is ready to be transferred to the overhead hoppers without further preparation. This being so, it will be fed direct (as far as possible by gravity) into the boot of the elevator, which is situated at a spot in the coal-store central in the length of the retort-house. The length of the elevator is nearly 60 feet between centres. It feeds on to a band conveyor, running down between the two continuous lines of hoppers, and discharging into them on either side. The capacity of this portion of the coal-handling plant is 30 tons an hour. The two lines of hoppers have each a length of 90 feet; and their capacity is equal to some fourteen hours' supply to the retorts.

Disposing of the coal-handling plant, leaves us free to devote attention solely to the Woodall-Duckham vertical retort-settings. The greatest feature of interest in this installation is that it is the first, on the Woodall-Duckham system, that has such a continuous length. The Kensal Green installation is a larger one by four retorts. There are at those works ten settings of fours; but they are in two parallel blocks of five settings. Here we have nine settings of fours in one length, 10 feet centres and 17 ft. 3 in. from the front to the back buckstays; and it is a novel sight to view the full length from one end either below, above, or in front. But these nine settings only occupy one-half of the new house; and there is sufficient room left to allow of 10 feet space between this bench and one of corresponding size in the vacant part of the building. From which it will be seen that Mr. Leather has provided in his design for a house and plant with a carbonizing capacity of 180 to 200 tons a day.

The settings are carried on three pillars composed of rolled steel joists. The two outside ones (which are 16 in. by 16 in.) are those to which reference has been made in describing the means of supporting the roof. They also carry the coal-hoppers, and act as buckstays to the settings. So that their service is manifold. The middle pillar is composed of two 10 in. by 6 in. joists, and only runs up to the concrete floor of the settings. All the vertical supports are carried on a substantial bed of concrete in the floor of the retort-house. The floor of the settings (which is 9 feet from the ground level) is composed of 14 in. by 6 in. rolled steel joists, on which sit the cast-iron mouthpieces for the retorts. The space between these joists and round the mouthpieces is filled in with concrete, and this forms a solid floor. The bottom discharging gear and hoppers are clamped on to the underneath of this floor by means of bolts bedded in the concrete. There is, of course, a similarity with the Kensal Green settings in many of the constructional details; but no excuse is needed for a little repetition to make this article as complete as possible, in order that readers may not have to fill in the details on their own account by reference to what has been previously published. To proceed, then, while underneath the settings, with the bottom fittings—the coke hoppers and extractors. The hoppers are each formed with a sloping back plate, upon which rests the charge of coke in the retort. At the bottom of this plate, is situated the extractor-roll with its helical blades, which remove the coke from the retort. Below this is the discharging drum, which is faced, so as to keep the bottom of the retort gas-tight. The speed of the extractor-roll is variable; being driven by means of a toothless ratchet, the



The Two Upper Lengths of Vertical Retorts.



Bottom Mouthpieces and Discharging Rolls of the Vertical Retorts.

throw of which is regulated by means of a screw attachment on the main driving-shaft. The actual working speed of the extractor-roll is $1\frac{1}{2}$ revolutions an hour; and therefore very little power is required for its operation. Only one revolution is made by the discharging drum in about twelve minutes. The plant is driven by an 8-horse power gas-engine; and, after the speed has been suitably reduced, a rocking motion is imparted to both the bottom and top driving shafts by means of cranks. The speed of the bottom shaft is actually two rocks a minute; that of the top, fifteen rocks a minute. Arrangements are made so that both the extractor-roll and discharging-drum can be worked by hand, should there be any reason for so doing. There will be no conveyor underneath the bench (at all events at present) for the removal of the coke; but the coke drums will discharge direct into wooden barrows, which will be wheeled out under the producers into the yard—a distance of about 50 feet—for stacking.

Proceeding to the work above the bed of the settings. The retorts attached to the cast-iron mouthpieces are 25 feet long, with a continuous taper from bottom to top; the dimensions at the bottom being 29 in. by 20 in. and at the top 21 in. by 9 in. They are made in 3 feet lengths, with the ends flanged, in order to give a larger surface at the joint. Each retort is finished at the top by a cast-iron mouthpiece, to which is attached the feeding device and the gas take-off pipe. The feeding device is a faced cylinder drum, which rotates at such a speed that it always contains an excess of coal in proportion to the coke extracted. A short movable shoot brings the coal from the overhead hoppers to the feed-roll. As the coke is extracted at the bottom, the whole charge in the retort gradually descends, to allow the coal to enter the retort from the coal-feeding device. From which it is seen that the regulated speed of the coke-extractor governs the rate at which fresh coal enters the retort, and the passage of the charge through the latter.

Concerning the heating of the settings. They are of the regenerator type—the generator being built on the same concrete floor as the settings; and the back wall of the generator forms one of the vertical walls of the setting. The primary gas enters two flues at the back of the generator, and is taken upwards to the combustion chamber which is situated round the top of the retorts. The gases descend through cross flues to the bottom of the setting, where they enter the regenerator (built in the opposite wall of the setting to the generator). The waste gases are taken from the regenerator by down-cast flues, in accordance with Mr. Leather's own special wish, to a main waste-gas flue, running underground, to the works' chimney. The secondary air enters the top of the regenerator, descends it, and is taken across to the generator side of the setting in flues built around the retorts. It then ascends to the combustion chamber, in parallel flues, with the producer gases. There are four sets of nostrils of large dimensions; and the gases are lighted in the combustion chamber before they impinge on the retorts. The combustion chamber is entirely built in silica; and the retorts are separated by means of special wing-tiles over their broad sides, which prevents any deformation or cracking in this most particular part.

The producers are charged by cold coke, which will be raised, by a mechanically worked lift, to the producer floor in $\frac{1}{2}$ -ton skips, and will then be carried from producer to producer by a runway arrangement. The top of the producer is formed with tiles, and is perfectly level; so that the coke for charging can be dumped on it before filling the producers. An interesting feature is the producer charging-door. It is of a French type, and consists of two separate covers—an inside one fitting into the opening itself, and an outside hood—the whole finishing quite flush with the surrounding tiles. In charging the producers, the man lifts out the first or heavier lid; and then, when he is absolutely ready

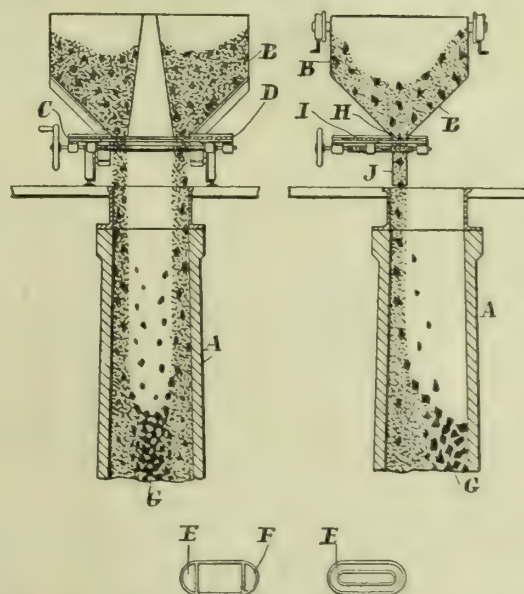
to put in the coke, he has only to lift out the light inner one, and push the coke into the producer. The advantage of this double door is that a very effective seal is formed, and there is no flaring away of the producers while the men are charging them. With a single heavy door for the producer, there is trouble in keeping it quite gas-tight. The settings are provided with a chequer-plate platform to serve as a clinking-stage; and in every other way facilities are given for the conduct of the work, and for ready examination of the bench and its equipment.

It is expected that the retorts will be under slow fires in about a fortnight's time; so that very shortly now Mr. Leather will be gaining experience with his new carbonizing plant, which is as great an advance on his inclined retort-settings as—indeed, a greater advance than—these were on the direct-fired ones.

[We have to thank Mr. Leather for his assistance in obtaining the particulars on which this article is founded during an inspection of his new plant, and for providing the accompanying interesting illustrations. The Burnley gas undertaking has made excellent records in the past; we look for a continuance of that excellence under the new order of things.]

CHARGING VERTICAL RETORTS.

THE number of our contemporary "Le Gaz" for the past month contains the specification of a French patent taken out by Messrs. Robert Dempster and Sons, Limited, of Elland, for a system of charging vertical retorts. The following is a translation of the principal portions of the document.



In what are called intermittent vertical retorts, which are charged in a single operation, the hot coal, at a certain point in the process of distillation, forms a more or less plastic substance from which the gas escapes with difficulty, except at excessive pressure. It is consequently regarded as an advantage to fill the

retort by means of streams of small coal and lumps, so as to facilitate the passing of the gas through the lumps to the outlet-pipe. For this purpose, it has been proposed to screen the coal before filling the retort, and then put the lumps in the centre or on one side, while the small coal and dust are placed round the edges or on the other side. The experience of the inventors, however, has demonstrated that, in practice, it is impossible to run simultaneously a stream of small coal and lumps through the retort at a regular and previously fixed rate of speed, because the coal is sometimes dry and sometimes wet, and consequently the proportion of lumps to small will vary. Moreover, the average sizes of the lumps will also vary.

All these conditions tend to give one stream of coal greater speed than the other, and consequently the surface of the coal in the retort is inclined. The inventors have found that when the angle of inclination becomes steep enough, the coal falls, rolls, or slips to the lower side, so that the small and lumps are more or less mixed, and the object aimed at is not attained. They have also observed that, in falling from the hopper, the lumps, owing to their greater density, come more rapidly under the action of gravity than the small pieces, and do not cease moving so quickly as these when they come into contact with the coal already in the retort, but tend to place themselves in the lowest part of the surface of the coal. On the other hand, the lumps, in falling more quickly than the small, rapidly form a cone or slope which tends to distribute them in such a manner that at the outset those falling to the centre roll to the sides and mix with the small, whereas at the moment when the retort is full the lumps are almost uniformly distributed, so that the effects of preliminary screening are almost nullified.

According to the present invention, the coal is run unscreened into the retort in one or more thin streams, in proportion to the section of the retort. Thus various rates of speed, and the different tendencies to rolling and slipping of the large and small pieces, are utilized, as well as their rebound from the sides of the retort and the slope of the heap of coal, to form a column of lumps. One or several openings can be made in the hopper, truck, conveyor, or other device employed for charging the retort. These openings are relatively narrow, and in the form of a semi-circle or other shape, through which the coal is discharged at a point near one of the sides or at points adjacent to opposite sides of the retort. If the coal is discharged on one side only, the lumps will form a column on one side; but if it is discharged round opposite sides, or right round the sides, the lumps will form a column in the centre.

The accompanying illustrations are examples of the application of the invention either to form a column of lumps in the centre or at the side of the retort. A is a part of a retort, and B a hopper or annular or other truck, capable of moving along the top of a setting. The hopper has two sliding doors C D, worked simultaneously by means of a hand-wheel and screw with contrary threads, or some other similar device. These sliding doors, when brought together, close the two openings E F of the hopper, shown in the first of the small diagrams, which is a view from below. The outlet orifices allow of the discharge of relatively thin streams of coal at adjacent points or opposite sides of the retort. When the doors are moved away from each other, they open the orifices E F, and the coal falls in two streams immediately forming a basin. The small pieces stop quickly, while the lumps roll, slip, or bound into the centre, as shown at G. The orifices E F may be replaced by an annular outlet, as shown at F in the second of the small diagrams; the opening being effected by any suitable means. The hopper or truck has a discharge orifice—controlled by a damper I. A shoot or trough J, relatively narrow compared with the width of the retort, can be added, to prevent the scattering of the coal. This shoot can be fixed on hinges, so as to avoid the upper lids of the retorts. In this case, the coal falling from the outlet H, and discharged on one side of the retort, forms a slope along which the lumps roll or glide, and from which they rebound—in this way forming a slightly compressed column of lumps along all the height of the side opposite to where the shoot delivers the coal to the retort.

Various methods can be adopted to charge retorts with relatively thin streams of coal; and the devices represented are here merely given as examples, without any restriction on the manner of applying the invention. Its essential feature is the charging of a vertical retort in a single operation with coal run on one or several sides of the retort, which can be done equally well without a hopper or feeding-trough specially constructed for the purpose. In a slight modification of the invention, a relatively narrow stream of mixed coal is discharged in the centre of the retort, in which case one or several columns of lumps are formed around and along the sides. This method is not so good as the discharge of the coal near the sides; but it gives practical results when the retort has a large section, and must be regarded as coming within the scope of the invention.

Mr. James Grieve, who was for nearly thirty years Secretary of the Moffat Gas Company, and latterly also a Director, died recently in his 65th year.

From the 42 applicants for the position of Engineer and Manager of the Carlisle Gas-Works, in succession to Mr. W. J. Smith, B.Sc., who has been appointed Gas Engineer to the Bolton Corporation, six have been selected as the most suitable; and their qualifications are being investigated.

FLETCHER, RUSSELL, AND CO.'S NEW GOODS.

RECENT numbers of the "JOURNAL" have furnished testimony to the activity of the makers of gas appliances in the production of new goods for the approaching season; and to-day we are able to call attention to what has been done by Messrs. Fletcher, Russell, and Co., Limited, in this direction.

Below are given illustrations of the firm's "Madeira" and "Aden" fires, both of which are of artistic, graceful, and original design, and are constructed with large canopies to prevent any fumes from entering the room in which they stand. They are fitted with the firm's latest improvements, patent non-lighting-back burners with single or double row of fuel, single or grid pattern fire-bars, as required, and are suitable for rooms up to 18 feet square. The firm's "Nubian No. 2" stove is identical with their



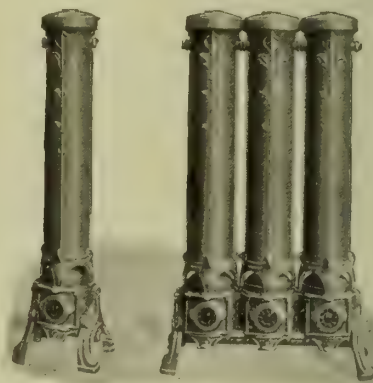
The "Madeira."



The "Aden."

ordinary "Nubian" stove introduced last year, with the exception that it has their patent single-row fuel and single fire-bar. It is also fitted with the non-lighting-back burner with an adjusting screw-jet, in order to regulate and maintain the maximum consumption at any pressure; and it is suitable for rooms up to 14 feet square. The "H" Register stove is an adaptation of the firm's well-known "H" pattern to the register type of fire.

The "Ariel" radiator, of which an illustration is given below, is constructed on a new patented principle; each tube or column being self-contained. It embodies the same advantages over steam, hot water, and other gas-heated radiators that are claimed by the firm for their "Floral" pattern—viz., that there is no necessity for excavating and building a heating chamber, and that no boiler, expansion-tank, pipe-runs, &c., are needed. Only a small connection for the gas supply is required; and the radiator can be brought into immediate use. The necessity for building a flue is obviated; and a complete installation can be fixed in a few hours. Useful work commences immediately after the radiator is

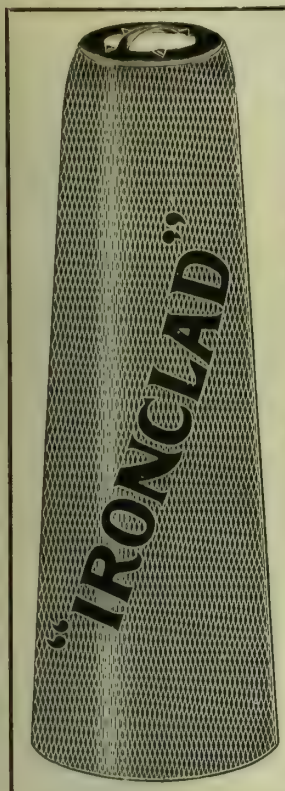


The "Ariel" Radiator.

lighted; there being no necessity to first heat up a large body of metal and water. Other advantages claimed for the radiator are that its action does not give rise to smell or dangerous fumes, as the flame does not come in contact with any metal or other substance. There is nothing to get out of order, or give the slightest trouble, no "furring up" of tubes, and therefore no necessity to "dismantle" and reassemble the parts. As, in addition to these qualities, the cost of maintenance is stated to be *nil*, the firm appear to be justified in claiming this as the "ideal" radiator; being rapid in heating, clean, safe, and economical in use.

Any of the above, and any pattern of the firm's fires, can be supplied in a variety of finishes; special attention being drawn to the Majolica enamel, in black or colours, and the Chimatto enamel in two or three colours. It is claimed that these enamels have the advantage of being absolutely permanent, and only require dusting or washing. The colours and shades are most delicate and artistic in appearance, and admit of the finest decoration in colours at a low cost.

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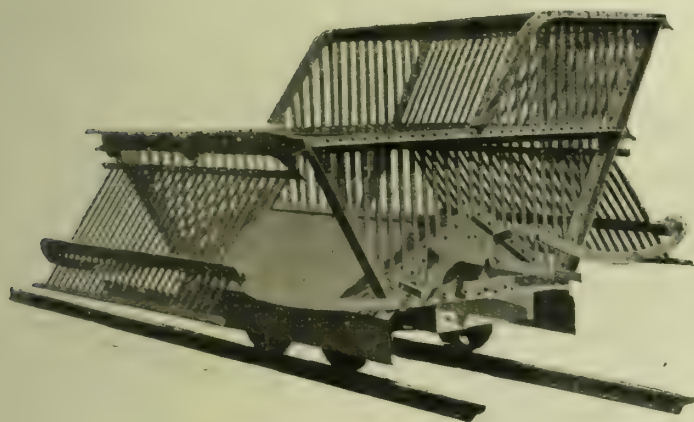
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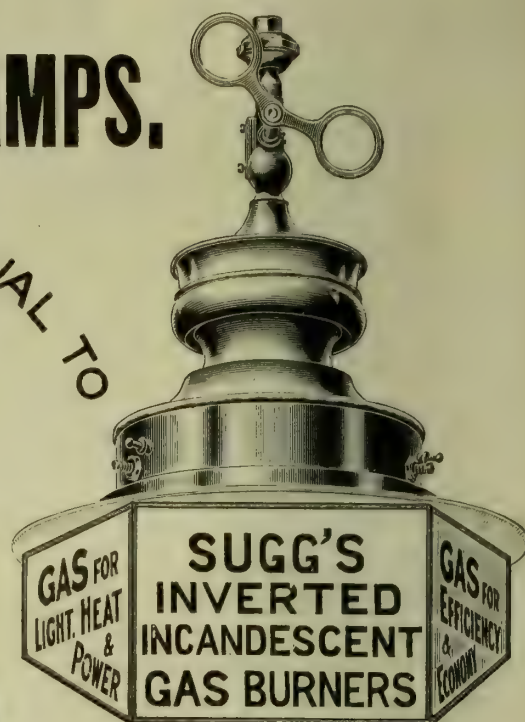
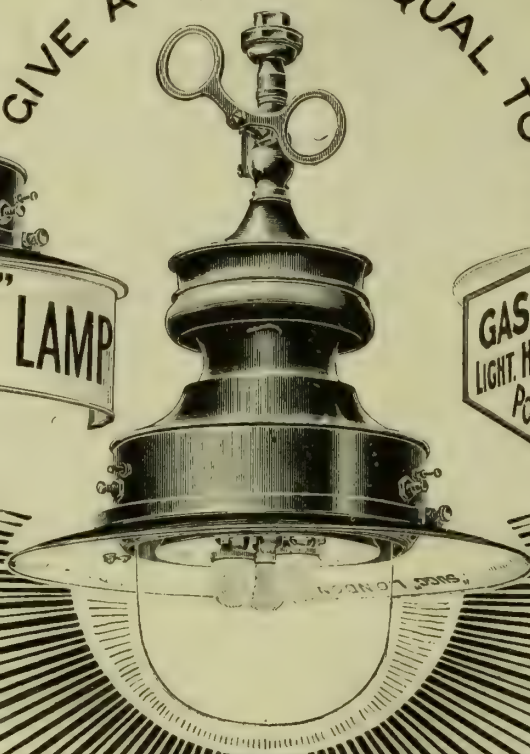
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NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting at South Shields.

The Sixty-Fifth Half-Yearly General Meeting of the North of England Gas Managers' Association was held in the Crown Assembly Hall, South Shields, last Saturday. On account of the interesting nature of the proceedings, there was a larger attendance of members than usual, as well as of visitors. Mr. T. H. DUXBURY, of South Shields, the President, occupied the chair.

WELCOME BY THE GAS COMPANY.

Dr. J. F. ARMSTRONG, J.P., the Chairman of the South Shields Gas Company, on behalf of the Company, extended a very hearty welcome to the Association. He remarked that the first meeting of the North of England Gas Managers' Association ever held took place in South Shields; and he believed that three times since they had had the pleasure of entertaining the Association. Those who were there on the last occasion inspected the Oyston Street works of the Company; and when those present visited the works that day they would find that a great transformation had taken place. They had been all recast and remodelled, under the able direction of the present Manager, their President. He thought such meetings as the one at which they were assembled ought to do a great deal of good. They very often gave rise to original ideas, which were of considerable benefit to the industry; and as far as the South Shields Gas Company were concerned, they would give the members every encouragement. To get the maximum quantity of gas from a ton of coal, and to use it to the best purpose, ought to be the main object of these meetings. The Company would be very glad to see the Association again.

THE LATE MR. J. H. COX.

The PRESIDENT, referring to the recent decease of Mr. J. H. Cox, of Sunderland, said he thought it would be fitting if a vote of condolence were sent direct from the meeting to the bereaved family. He would be glad, therefore, if the meeting would signify their approval by standing.

This request was at once complied with.

APOLOGIES FOR ABSENCE.

The HON. SECRETARY (Mr. H. Lees, of Hexham) intimated that apologies for absence had been received from Mr. Charles Wood, of Bradford, Mr. A. Clement Hovey, of Milan, Professor Bone, of Leeds, and a number of others.

NEW MEMBERS.

The following were admitted to the Association:—

Members.—Mr. R. S. Duncan, Birtley; and Mr. Horatio Morris, Maryport.

Associates.—Mr. W. Andrew Cowley, of Spennymoor; Mr. Norman S. Mitchell, of Cockermouth; and Mr. Arthur Pickering, of South Shields.

THE PRESIDENT'S ADDRESS.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—I thank you for the honour you have conferred upon me by placing me in the presidential chair of the Association for the current year. Knowing my own limitations and shortcomings, however, very much better than anyone else, and recognizing the high standard which your Past-Presidents have set, including our much-esteemed and highly-respected ex-President, Mr. Ford, who so ably filled this chair last year for the second time, I candidly confess the reluctance with which I consented to nomination by your Committee. I hope that on the termination of my year of office, the interests of the Association may not have suffered.

Before entering upon gas topics generally, I wish to express regret, with which I am sure you will all join, at the loss since our last meeting of three members of the Association. I refer to the late Mr. J. H. Cox, of Sunderland, Mr. George Keyte, of Workington, and Mr. W. W. Morris, of Maryport.

Mr. Cox was one of the founders of the Association, and always had its interests at heart. Until recent years, he was in regular attendance at the meetings. He was most highly respected, and has left an honoured name in the North of England, with a life's work truly worthy of emulation.

Both Mr. Keyte and Mr. Morris were at one time in the employ of the South Shields Gas Company. The latter I did not know personally, but Mr. Keyte was my chief assistant for some time after I came to South Shields. I can therefore personally vouch for the conscientious and sterling character he possessed, and for his knowledge and ability in matters appertaining to gas.

I wish also to refer to another loss which the Association is about to sustain by reason of Mr. W. Doig Gibb's removal from the North of England to London. This loss, though of quite a different character to those already mentioned, will, nevertheless, be tinged with regret by all who have had the pleasure of meeting Mr. Gibb either professionally at these meetings or in the closer ties of personal friendship.

I also wish to congratulate Mr. Thomas Hardie on his appointment to the chief engineership of the Newcastle Gas Company

and, as such, to welcome him on this, his first appearance at a gas meeting since being actually installed in his new and responsible position. The Newcastle Gas Company are to be congratulated on the fact that they had such an efficient and able staff of officers in their service as to enable them to fill all the recent vacancies by promotion. This is as it ought to be. Continuity of service is a valuable asset to any undertaking (providing, of course, that it does not degenerate into lackadaisical indifference to progress with the times), because it means progressing along preconceived general lines of policy—modified and adapted, of course, from time to time as circumstances require.

GAS OFFICIAL STAFFS AND EMPLOYEES.

The duties of gas engineers and managers have always been very varied and multitudinous; but they have increased considerably in recent years, and there is every indication that the accompanying responsibilities will continue to increase by reason of the competition which now abounds. The old adage, "the survival of the fittest," will, therefore, so far as success in the gas engineering profession is concerned, be more than ever applicable in the future.

A higher standard of work than formerly is now demanded from all classes of gas men—chief officials and subordinates alike. The ratio of this necessary increase in human efficiency is, however, very much greater as applied to the official staff than to the workmen, by reason of the extension of machinery, improved methods of manufacture and distribution, and to the steps which have now to be taken to secure new business. Efficiency and success of machinery in gas-works, while easing manual labour, necessitates strict supervision on its upkeep and maintenance to prevent breakdowns occurring.

The training for gas engineers was admirably laid down by Mr. Gibb in his presidential address; but it may be mentioned that the endowment of the Livesey Chair in Gas Engineering at the Leeds University now enables students to obtain a diploma in gas engineering and (or) to qualify for the degree of "B.Sc." with gas engineering as the recognized principal subject. There is also the fellowship in gas research which has been established by the Institution of Gas Engineers at the Leeds University; considerable benefits ought to result to the gas industry from this combination—both being under the same professorship.

Apart from the technical training, however, much depends on individuality as to the extent of success in the profession, which success is gauged primarily by the balance-sheet, combined with ability displayed in meeting obstacles which continually arise.

A good share of common sense, tact, physical fitness, and a fondness for hard work during any of the hours that God sends, are essential requirements. To the right class of man, the duties of a gas engineer being so very varied in their character, they induce not only keen interest in one's work, but an actual fascination for it. To such I strongly commend the gas profession.

The extent to which technical matters are interwoven in a gas company's business render it more essential than formerly for the chief official to be a technical man. But he must have a good commercial knowledge. Further, an engineer is a skilled man, and must perforce have devoted some years of his working life, for little or no pay, in qualifying himself. It is only natural, therefore, that this in time should bring its own reward.

In any case, a secretary can only efficiently (or otherwise) handle to the best advantage the money earned by the engineer's good working. If this working be not good, a secretary—no matter how clever he may be—cannot make the company so prosperous as it might otherwise be. Alternatively, an engineer's good working can very easily be ruined by indifferent commercial handling of raw materials and residuals. Therefore the man who is responsible for the working should have the say with the directors in the commercial handling, to ensure the best financial results being obtained.

I know that in this matter I may be treading on somewhat dangerous ground; but I will at once make myself quite clear by recognizing and appreciating to the full the good work done by several secretarial managers with whom I have personally come in contact, and, further, I say that purely secretarial work in all but the smaller gas companies would occupy too much of the engineer's time, even if he were able to undertake it. So my remarks are not intended to depreciate the necessity for secretaries' services. In the medium-size and larger gas companies, there is much responsible work for them to do, and it is of the utmost importance for the success of the undertaking that the secretary and engineer should work amicably together, as I am pleased to recognize has been the case with my much-respected colleague, Mr. Penney, and myself.

These points have been recognized for some time by the large London Gas Companies, who have gone further and appointed gas engineers of eminence on the directorate and also in the position of Chairman of Directors—notably, Mr. Charles Carpenter in the case of the South Metropolitan Gas Company, Mr. Corbet Woodall, of the Gaslight and Coke Company, and Mr. Charles Hunt, of the South Suburban Gas Company. This feature is one worthy of emulation by Provincial gas undertakings.

Owing to the important part which the distribution department now plays in a gas undertaking, it is absolutely essential in all but

the very small works to have a distribution superintendent, to devote the whole of his time to this branch. There is an opening in this direction for many aspiring gas managers, who I am certain would do infinitely better for themselves by specializing in gas distribution work—because higher salaries will be paid to distribution superintendents in medium-sized gas-works—than to the managers of small works.

The training for a distribution superintendent's position should follow in the initial stages along the lines of the training of the gas engineer, but omitting structural engineering, and developing in its stead extended knowledge of gas supply and electricity.

The separate examination in gas supply (as distinct from gas engineering) recently introduced by the City and Guilds of London Institute will prove the specialized knowledge of candidates for positions of distribution superintendents. The higher standard of training must also be extended to employees outside the official staff, especially in the distribution department, where it is impossible for a foreman to see every job, owing to the men being scattered over the district of supply. Individual intelligence is, therefore, particularly necessary among distribution employees; and it is to the interest of all gas undertakings to encourage them to thoroughly appreciate the importance of their work, also to assist the younger men in attending classes and lectures preparatory for the City and Guilds of London examination in gas supply.

In my opinion, however, last year's examination paper in the Ordinary Grade was too stiff for the general class of distribution employees. It may be argued that the standard of these examinations must be kept high, in order to raise the qualifications of distribution superintendents; but my answer is that the Honours Grade covers them. The effect of the examinations so far will, I am afraid, frighten the greater number of the working employees from making another attempt, because they feel that it is beyond them; and this is not in the best interests of the gas industry.

If my surmise be correct, and the standard of the questions in the Ordinary Grade be not lowered at any rate for a few years, then other steps should be taken with a view to increasing the knowledge of the general body of distribution employees, by instituting special courses of lectures at our respective works.

It is to the benefit of all industries, gas included, that an amicable relationship should exist between the management and the workmen. The ideal arrangement appears to be co-partnership, which has been such a success with the South Metropolitan Gas Company, and which is now being worked on a practical scale by the Walker and Wallsend Gas Company, from whom we shall be interested to learn their impressions in due course.

Meanwhile, it is worthy of mention that while Trades Unionism has in recent years obtained a much stronger hold with all classes of labour, my experience is that both workmen and their Union leaders are much more amenable to reasonable argument than they were formerly. The recent letter of Mr. John Wilson to the Durham miners clearly indicates that all the men's leaders are not of the revolutionary type that some would have us believe.

ADVICE TO JUNIORS.

The formation of a Junior Gas Association such as exists in many other districts, is perhaps hardly advisable in the North of England owing to the scattered area covered by the membership of this Association, and the relative number of small as against large gas undertakings, whereby the number of assistants is naturally limited. But we welcome juniors as associates of this Association, and personally should like to see them play more prominent parts therein.

While I am a comparatively young man myself, much as it may therefore seem out of place, I venture to offer some advice to juniors, based on my personal experience of gas company's directors, corporation committees, and former chiefs, under whom it has been my privilege and pleasure to serve.

I say then: Recognize throughout that hard work kills no one; and while one's ordinary vocation may involve only a specific amount of what is termed duty, something more than this is essential. It is the extent of this excess service and duty (which may not always be known to directors or chiefs) that goes a long way towards securing ultimate success in one's career. Endeavour to anticipate the requirements of chiefs, and loyally carry out their wishes and instructions. Consider nothing too menial, and be content (within limits, of course) with your position for the time being, as continual unrest and constant looking out for a move are not satisfactory features. To quote Shakespeare, "there is a tide in the affairs of man which, taken at the flood, leads on to fortune," which I transcribe into meaning that one should avail oneself of the opportunity when it arises. "Having the opportunity" and "availing oneself of it" are, however, two quite different things; and I am afraid that a lot of young men of the present day are not properly availing themselves of the opportunities they have. Temporary success is worse than useless; and a weak man—just as a weak link in a chain—must soon be found out under the stress of present-day requirements.

STATUTORY POWERS AND PARLIAMENTARY LEGISLATION.

From time to time, mention has been made of the advisability of seeking to have the Gas-Works Clauses Acts, 1847 and 1871, amended; and while I agree with the necessity for this on many points, it must be recognized that whenever such revisions are put forward, there is certain to be opposition from various quarters. With the precedents of Parliamentary Committees under the present Government before us, and their leaning towards muni-

cipalization as against private enterprise, it is probably better to wait a little before moving in the matter, because after all "tis better to bear the ills we have than fly to others that we know not of;" and it is possible that the remedy in this case might prove worse than the disease.

Only those who have been intimately associated with the promotion of a Private Bill and its progress through Parliamentary Committees against formidable opposition, can fully appreciate the work entailed. Such was my fortune (or misfortune) in connection with the South Shields Gas Company's Act of 1904.

I do not purpose dealing with the details of either the promotion or the opposition; but I wish to refer to the costliness of the whole thing, and to express the opinion that it is time the procedure appertaining to the promotion of Private Gas Bills should be altered so as to reduce such costs.

Led by Parliamentary Agents whose principle appears to be to make the cases last as long as possible, local authorities frequently oppose Gas Company's Bills apparently for the purpose of showing their authority by having a shot at the company; the result being that the costs of promoters and opponents alike are run up enormously. The brunt of both parties' costs have to be borne by the gas consumers, who constitute the main body of ratepayers; for they have to pay the opponents' costs through the rates and the gas company's costs by the price of gas being increased or a reduction in price being deferred. The prevalent impression, that such costs come out of the proprietors of a gas undertaking, is a fallacy. They only suffer to a very small extent, even under the sliding-scale; and if local authorities fully appreciated this, opposition and its accompanying costs would be considerably curtailed.

As to the advantage of the sliding-scale as against maximum dividends, every case requires to be dealt with on its own merits; and it would be inadvisable to lay down a hard-and-fast rule for one or the other system to be applied to all gas companies. I am satisfied that it would have been better for the former shareholders of the South Shields Gas Company if it had continued on the maximum dividend basis, instead of going on to the sliding-scale in 1879; for at one time gas was sold at too cheap a rate so as to allow of higher dividends being paid. Meanwhile the works suffered in point of maintenance, and subsequently the greater portion had to be reconstructed within a short period. The price of gas had then to be increased, and the dividends payable and the market value of the stock fell accordingly. Matters are now righting themselves; and I hope it will not be very long before we can again reduce our selling price.

It appears to me that many electrical undertakings also have been selling current cheaper than was justified—on the principle of "business at any price." The proprietors will, if I am not very much mistaken, suffer to a very much greater extent than ours have done.

Respecting recent gas legislation, by far the most important feature is the insertion of a calorific power test in the Gaslight and Coke Company's Act, notwithstanding the fact that it was by agreement on the "give-and-take policy" between the Company and the London County Council. While, perhaps, it is no business of a Provincial gas engineer to question the action of the Gaslight and Coke Company in this matter, the excuses I have for doing so are that my remarks cannot have any effect upon them, and I feel the subject is of great importance to the gas industry.

Having reference to the difficulties under which gas undertakings work by reason of parliamentary obligations and restrictions, and to the trouble that has been caused to those gas companies who have sought a reduction in illuminating power to the now generally recognized 14-candle power standard, it does appear to me to be unfortunate that, even by mutual agreement, a calorific power test with penalties should have been inserted in a Gas Act without the illuminating power test being abolished altogether. If this had been the *quid pro quo*, then nothing could have been said against the "principle" as apart, of course, from the limitations under penalties of a new standard.

The gas industry ought not to have any additional fetters placed upon it. Relief from some of its present obligations should rather be sought for and fought for when opportunity offers—considering the altered present-day conditions, as against the years 1847 and 1871, when the Gas-Works Clauses Acts were passed.

I am not a supporter of the argument that the recognition by Parliament of a calorific power standard may be welcomed by the gas industry as a preliminary step towards the abolition of illuminating power tests. I confess that my fear is that the Gaslight and Coke Company's case may rather operate as the thin end of the wedge towards an additional obligation being placed upon gas suppliers, unless determined opposition is provided to thwart it.

Respecting the limitations of the above-mentioned calorific power test, I have been considering them as if applicable to the South Shields Gas Company, where an illuminating power standard of 14 candles has been in operation for four years, and a Boys calorimeter (the type specified in the Gaslight and Coke Company's agreement) has been used intermittently—for my personal information and guidance only—for three years. My experience of the Boys calorimeter is that it has a limited range, and that when working under winter conditions with mixed coal and carburetted water gas, the application of the Gaslight and Coke Company's test would place the South Shields Gas Company under greater disadvantages than now exist.

It is of considerable interest to note that the Governor of the Gaslight and Coke Company has subsequently given very strong evidence before a Parliamentary Committee against the provision

for a calorific power test being put in the Bury Gas Bill; and as a result of this, such a test has not been inserted therein. All attempts to enforce a calorific power test on any gas undertaking should be strenuously resisted—at any rate, until illuminating power tests are abolished entirely.

COAL.

When discussing the future prospects of gas and electricity, it has been put to me that, while gas has more than held its own, and is likely to do so for a long time to come, it must eventually succumb whenever the coal supply is exhausted. No one can, of course, refute this; but meanwhile it is interesting to note that the estimated quantity of unworked coal in this country, according to the report of the Royal Commission, will last from 500 to 800 years on the present rate of consumption, making ample allowance for an increasing output each year. This is sufficient to satisfy the most pessimistic gas shareholder that, on this score, his descendants for many generations to come may be expected to continue to benefit from their forefathers' original investment in gas stock.

While coal is essentially the raw material requisite for gas manufacture, it also plays a most important part in the cost of generating electricity. In the case of gas, the greater portion of the cost of coal is regained by residuals; the net cost of coal less residuals being only 20 per cent. of the net cost of gas sold, including manufacture and distribution. With electricity generating, no residuals are recovered, and the cost of coal represents about 30 per cent. of the cost of generating and distributing the current. Market fluctuations in the price of coal affect, therefore, not only the costs of gas manufacture, but of electricity also.

The latest Board of Trade statistics, issued last February, showed that the world's output of coal in the year 1907 was approximately 1,000,000,000 tons; and of this vast amount 267,831,000 tons were provided by the United Kingdom—an increase of 17,000,000 tons over the preceding year. This increase was primarily due to the larger demand for English coal from Germany, Holland, Belgium, France, and Italy; the total export coal trade being over 50,000,000 tons per annum. It may be mentioned that the quantity of coal used by authorized gas undertakings in the British Isles during 1907 was 15,406,753 tons.

Colliery proprietors have naturally worked, and are working, those seams which are the best and least expensive to work; but as these become exhausted, the deeper measures will be tapped at increased costs, which subsequent coal users will have to pay. Sir William Ramsay prophesies that in 200 years the high price of coal will render the conditions of living in this country very difficult; and he urges conservation of its coal stores. We have no Niagara from which power may be obtained; and the manufacturing industries of this country, including gas and electricity, are dependent, either directly or indirectly, upon the coal supply. The great British Empire has been built up on it; and the continuation of our national supremacy depends on it being obtained at a reasonably cheap rate. Even the domestic household must have it in one form or another; and, in point of fact, it is a commodity used by and (or) affecting everyone.

I contend, therefore, that coal does constitute the real capital of this country; and, as such, its conservation is a matter of national importance. This conservation can be effected by substituting gaseous fuel for open coal-fires in dwelling-houses, gas power for initial energy in manufacturing concerns, and by restricting the export coal trade. The adoption of gaseous fuel and gas power would abolish the smoke problem and minimize the dense fogs which periodically envelop manufacturing towns.

Gas coal prices in this district have increased since 1896, though the increases have in themselves fluctuated. The following table, calculated from the tendered prices for one particular coal throughout the intervening period, shows the percentage increase in price each year compared with that paid in 1896.

Year.	Increase, Per Cent.	Year.	Increase Per Cent.
1897.	8'3	1904.	41'6
1898.	50'0	1905.	41'6
1899.	52'7	1906.	58'3
1900.	166'6	1907.	112'5
1901.	58'3	1908.	75'0
1902.	54'16	1909.	58'3
1903.	50'0		

Though colliery costs of working have undoubtedly increased during the aforementioned period, by reason of deeper and thinner seams being worked, underground haulage costing more through greater distances travelled, higher wages, Workmen's Compensation Acts, and extended precautionary measures for the safer working of mines, it is very doubtful whether the increases shown in the selling price of coal have been justifiable, even with these extra costs, while in coal boom periods they have certainly not been justified. The comparative high market value of coal during the serious depression which for some time has permeated the United Kingdom in all other industries is unprecedented and, in my opinion, operated to a great extent in accentuating that trade depression by forcing manufacturing costs out of all proportion to the decreased market value of the manufactured goods. The home trade has certainly not justified these high coal prices; and I contend that they have resulted from the large export trade done by coalowners, which made them considerably more independent of the home trade than they otherwise would have been.

I recognize that I am bordering on the vexed question of Tariff

Reform; but I assure you this is not my object, for I am no politician, and hope I shall not be misconstrued. I claim to be dealing with coal on its merits as a universal commodity requiring special consideration; and I am convinced that if in recent years a sufficient tax had been imposed on its export, a restriction in the output would have resulted. This would have had the effect of causing greater competition among colliery proprietors for the home consumption, accompanied by a levelling-down of prices to the home manufacturers. What has taken place in the past is lost, and cannot be regained; but the remedy can be applied for the future; and the sooner this is done the better for the country.

Though the price of coal has increased so enormously, the "quality" of coal for gas-making purposes has not improved at all, but rather depreciated (to wit, the working out of the Hutton Seam in the County of Durham); and inferior coals now command both a ready sale and, in some cases, a fictitious value relatively with some of the better qualities. The only real check upon this, so far as the gas industry is concerned, is to frequently test the coal as delivered, preferably by keeping a testing plant in continuous operation; for even coal drawn from the same pit varies considerably in its gas-yielding properties, according to the seam from which it is worked. The following tables give figures obtained in a series of careful tests conducted on a small gas-works plant (not a laboratory apparatus), on coals obtained from different seams in two pits. Obviously, it is inadvisable to give either the names of the pits or a description of the seams.

No. 1 Pit.

Seam.	Gas per Ton. Cubic Feet.	Illuminating Power. Candles.	Pounds of Sperm.
A	10,900	17'96	671'20
B	11,200	17'13	664'00
C	11,000	17'77	670'17
D	11,700	17'15	686'53
E	11,300	18'35	710'93
F	11,200	16'58	636'60

No. 2 Pit.

G	10,900	19'23	718'65
H	11,000	16'05	605'30

In No. 1 Pit, the difference in sperm value (which is sufficient for this comparison) between the best and worst seams shows 10'45 per cent. deficiency, while in No. 2 Pit, it is 15'77 per cent. deficiency; and if the coal were to be purchased on the best seam yield, it is obvious that the buyers would suffer considerably if the worst seam were substituted or mixed in deliveries. The first step requisite in connection with coal testing is correct and careful sampling from bulk; and the above figures indicate the extent to which one might be misled through careless sampling in cases where coal is supplied by the colliery from two or more seams, with or without the consent of the gas company.

So far as coal testing on a gas-works is concerned, I am satisfied that small laboratory apparatus results are comparatively worthless, and that the best method is to isolate one retort (or preferably one setting) from the ordinary carbonizing plant, conducting the gas therefrom through a separate miniature gas plant. Much as I am in favour of this, however, I regret that as yet such an arrangement has not been in operation here—due primarily to lack of ground space. Therefore I have to resort to using one particular coal at a time exclusively throughout the retort-house, for testing purposes; the size of the works enabling it to be done fairly satisfactorily. This, however, can only be arranged periodically, and coals are not continuously under test as I should prefer; while a further disadvantage is that the actual yield of residual products cannot be accurately ascertained. The most important particulars are, however, obtained; and from these, approximate comparative values of coals can be calculated. As the details of my valuation basis may be of interest to some of the members, I give the following particulars.

The duration of the test is usually 72 hours, excluding the time required for scouring the plant. Having ascertained the weight of coal carbonized, gas made corrected for temperature and barometric pressure, coke yield per ton averaged from a few weighed charges, illuminating power of the gas averaged from frequent tests made on the bar photometer night and day throughout the test period, ash in coke, ash in coal, and impurities in the gas, a money value for the coal under test is calculated relatively with the cost of a known or standard coal previously tested in the same series.

The contract or tendered price, as the case may be, of the standard coal is taken as a base, and the yield of gas per ton from the other coals is reduced to 14-candle power equivalent (corrected for temperature and barometric pressure). A unit value for the gas is then calculated by simple proportion from the cost price and 14-candle power calculated equivalent gas yield per ton of the standard coal. Thus, a standard coal costing 9s. 6d. per ton in the retort-house yields (say) 10,602 cubic feet (corrected) of 16'47-candle power gas per ton = 12,471 cubic feet calculated equivalent of 14-candle power. If another coal under test yields 10,208 cubic feet (corrected) of 15'3-candle power gas per ton, then its calculated equivalent of 14-candle power gas is 11,155 cubic feet, and the unit proportionate value of the gas ascribed to the coal under test is

12,471 : 11,155 :: 9s. 6d. : x and x = 8s. 5'97d.

Additions to, and deductions from, this unit gas value figure are then made for differences with the standard coal in actual yield of

gas (corrected) per ton, ash in coke, purification costs, and sulphate of ammonia calculated from ammonia in the crude gas only. The coke yielded for sale is ignored in this valuation, because if one coal yields less coke than another, it is safe to assume that it has given off a greater weight of gas and (or) tar, which are worth more than the difference in weight of coke.

A coal actually yielding 11,000 cubic feet of 14-candle power gas is more valuable to a gas company (other things being equal) than one yielding 10,000 cubic feet of 15.4-candle gas, when the prescribed illuminating power is 14 candles; and I allow 3d. per 1000 cubic feet excess or decrease in yield of gas per ton as against the standard coal yield for interest on capital, depreciation, and repairs of the carbonizing plant, on the grounds that more carbonizing plant is required for the lower gas-yielding coal. Carbonizing wages being more on the latter because stokers' wages are based on the work done, not on the gas yield, I allow for this item 2d. per 1000 cubic feet gas per ton difference with standard coal. For ash in coke, I allow 1d. for each 1 per cent. difference from the standard coal; whereby a coke containing 10 per cent. of ash is shown as worth 5d. per ton of coal less than another containing 5 per cent. The differences between sulphur impurities in gas from coal under test as against the standard coal are valued at purification costs. As the yield of tar and ammoniacal liquor cannot be ascertained, the quantity of ammonia in the crude gas at the outlet of the exhauster is converted into sulphate of ammonia equivalent, and the difference in yield as against the standard coal valued at the approximate selling price of sulphate, less cost of manufacture and bagging.

The result is an approximate comparative value of the coal under test delivered in the retort-house, as against the known cost of the standard coal, for the guidance of the engineer when making recommendations for purchase; and I suggest that truer values are obtained by this method than by taking the sperm value basis. Other items to which money values cannot very well be ascribed require, however, taking into consideration—including the behaviour of the coal in the retorts, effect on hydraulics and ascension-pipes, and character of the coke, all of which require noting during the test, and embodying in the engineer's final conclusions on the merits of the respective coals.

The accompanying statement shows the test figures and details of the comparative valuation of two hypothetical coals on the aforementioned basis, excluding the subsidiary items.

GAS MANUFACTURE.

Carbonizing plant, methods of working, and results obtained, have undergone a vast change in recent years; the objects being to reduce working costs and increase the yield. These objects have been attained to a certain extent; but we recognize that there is still room for improvement.

A few years ago, the laborious hand stoking predominated in all but the large gas-works. To-day it is substituted in all but the very small works by machine-worked horizontals or inclined retorts; and these are now being overlapped, particularly on the Continent, by verticals and carbonizing chambers, both of which systems may claim to have passed the experimental stage—being now launched on the market for practical work. Those of us who have had the opportunity of inspecting the vertical retorts in Germany (I have had the privilege of being sent there twice by my Directors), recognize the transformation that this system makes in the retort-house. Of vertical retort installations, the German system appears at the moment to be the most practical; and the results achieved under German gas-making practice (which differs from British in respect of illuminating power tests being ignored) are extremely fascinating.

We in the North of England will hope to be favoured in the near future with an opportunity of seeing this new type of carbonizing plant in operation at Sunderland, where, under the control of our friend Mr. Drury, we know that the best results possible will be obtained from it conforming with local requirements.

My dream for some time has been that we may have gas made on the lines of continuous carbonization (the German method is intermittent), and have it purified in closed vessels which only require opening (say) once a year. Also that the consumer may be able to light his gas by simply turning a tap, without requiring either matches or a bye-pass, and that gaseous fuel shall substitute coal in the heating of the greater proportion of domestic dwellings.

Respecting continuous carbonization, the thanks of the gas industry are due to Messrs. Woodall and Duckham for their indefatigable work thereon. The mechanical difficulties which have beset their particular system appear to have been overcome; and meanwhile others are working at the problem on a practical scale also.

Respecting purification, Dr. Feld's centrifugal washer, as also the recent invention of Professor Burstall, of Birmingham University, claim to deal with the wet purification of coal gas. Many purifiers already have internal fittings for holding the purifying material lightly, thereby abolishing the changing of purifiers for excessive back-pressure only. Reversing the working sequence of the purifiers intermittently, has already been adopted in some gas-works, resulting in a reduction of the purifier changes. These factors, combined with partial revivification *in situ*, point to the accomplishment of closed purification in the true sense of the word, by using the aforementioned wet process and having oxide purifiers as catch boxes only.

	Standard Coal.	Coal under Test.
Dates of working test . . . . .	..	..
Duration of test hours	72	72
Coal carbonized, tons	269	304
Gas made—		
Cubic feet, corrected to 60° Fahr. and 30 in. bar	2,852,000	3,103,500
Per ton, cubic feet, corrected	10,602	10,208
Average illuminating power on the bar photometer	16.47	15.3
Calculated equivalent to 14-candle gas, cubic feet per ton corrected	12,471	11,155
Ash in coke, per cent.	11.45	6.32
Ash in coal, "	7.50	4.21
CO ₂ at outlet of exhauster, per cent.	3.00	2.30
CO ₂ at station meter, "	Nil.	Nil.
H ₂ S per 100 cubic feet in crude gas at inlet of purifiers, grains.	1015	325
Sulphur compounds per 100 cubic feet at inlet of purifiers, grains.	65.15	26.64
Ammonia per 100 cubic feet at outlet of exhauster, grains	241	217
Calculated equivalent sulphate of ammonia, pounds per ton	14.17	12.27

Valuation.

	Standard Coal. s. d.	Coal under Test. s. d.
Unit value only for gas on 14-candle basis— 12,471 : 11,155 :: 9s. 6d. : x	—	8 5.97
Add or deduct for interest and depreciation, repairs, &c., on carbonizing plant, at 3d. per 1000 cubic feet on the difference in actual yield of gas per ton, corrected to 60° Fahr. and 30 in. bar.— 10,602 10,208	—	— 0 1.18
394 at 3d. per 1000 cubic feet	—	8 4.79
Add or deduct 2d. per 1000 cubic feet for carbonizing wages, calculated on the difference in actual yield of gas per ton, corrected to 60° Fahr. and 30 in. bar.— 10,602 10,208	—	— 0 0.78
394 at 2d. per 1000 cubic feet	—	8 4.01
Add or deduct for ash in coke 1d. for each 1 per cent. difference from coke of standard coal— 11.45 6.32	—	+ 0 5.13
5.13 at 1d.	—	8 9.14
Add or deduct for purification from H ₂ S, difference only, at 0.4d. per 1000 cubic feet— (10,602 at 1015 grains H ₂ S per 100 cubic feet) : (10,208 at 325 ditto) :: (10,602 cubic feet at 0.4d. per 1000 cubic feet) : x; and x — (10,602 cubic feet at 0.4d. per 1000) =	—	+ 0 2.94
9 0.08		
Add or deduct for sulphur compounds, difference only, at 0.5d. per 1000 cubic feet— (10,602 at 65.15 grains sulphur compounds per 100 cubic feet) : (10,208 at 26.64 grains ditto) :: (10,602 cubic feet at 0.5d. per 1000 cubic feet) : x; and x — (10,602 at 0.5d. per 1000 cubic feet) =	—	+ 0 3.22
9 3.30		
Add or deduct difference in sulphate of ammonia equivalent in crude gas at inlet to washer, at 0.86d. per pound— 14.17 12.27	—	— 0 1.63
1.90 at 0.86d. =	—	9 1.67
Net comparative values of coal to gas company, delivered to retort-house	9 6	9 1.67
Price tendered by colliery company, do..	9 6	9 6.00

The ignition of gas at the consumer's burner can be accomplished by sparks from an alloy already invented by Welsbach (of which I have personally had a small piece for some time); and the practical utility of this is only awaiting the application of a mechanical contrivance which the pressure of gas will operate on opening the gas-cock. This does not appear to be insuperable, having reference to those automatic lighters in public lamps already on the market which are operated by gas pressure.

The recent improvements embodied in gas-fire construction, whereby their efficiency has been considerably increased, should result in a considerably extended business being done in domestic heating, particularly if accompanied by differential prices for gas so used—this latter feature being worthy of careful consideration. Though these results have not, as yet, been collectively accomplished in practice, I feel justified in contending that they are all well past the laboratory stage, and that in the near future my dream will be realized by the assembling of them *in toto* in the same gas undertaking.

I am not in favour, however, of scrapping good workable existing carbonizing plant for the simple purpose of substituting any of the new carbonizing installations.

With machine-worked horizontal retorts, the innovation made by Mr. Charles Carpenter, and its application by Mr. S. Y. Shoubridge, Mr. Smith, of Stirling, and others, as to filling the retorts and allowing the requisite longer duration for burning-off the heavier charges, appears to easily beat everything previously accomplished in carbonizing results, conforming with British requirements. It is apparently a simple method of increasing the efficiency of existing plant at a minimum of cost, even if stoking machinery has to be installed to push out the coke; and my opinion is that it is the system to work on the general scale in preference to all others at the present time.

If extension or reconstruction of manufacturing plant is absolutely necessary, then the verticals and chamber retorts or ovens should, by all means, have full consideration, though as an alternative carburetted water gas plant can be installed at much less initial cost to stave off such extensions. The South Shields Company adopted the latter course, on my recommendation, instead of embarking on a reconstruction scheme at the Jarrow works; and with last year's depressed state of the coke market, and its immediate prospect little if any better, coupled with the unprecedented low prices of gas oil now ruling, I am more convinced than ever that, at any rate in my Company's case, the right thing has been done.

To the introduction of retort-house governors varied results have been attributed. My experience with a design of governor which I consider to be as good as, or better than, anything on the market, has only resulted in one advantage—viz., the maintaining of a constant and steady quality of the gas as made. But this, in itself, is sufficient to justify their adoption.

Coke-handling plant has always been a delicate question with me, by reason of the cost of upkeep and the vast amount of breeze usually perceptible in gas-works where coke conveyors and elevators are in use.

The Shields works have not hitherto had railway connection; but recently negotiations have been concluded for railway-trucks being hauled over adjoining private sidings from the Shields works to the North Eastern Railway.

Mechanical appliances are required for lifting the coke up on to the adjoining elevated railway sidings; and I recommended the adoption of the "Telpher" system for this purpose, and to extend it into the retort-house for handling hot coke. This type of plant, in my opinion, provides the most satisfactory method of handling coke, and involves a minimum of breeze being made. You will have an opportunity of inspecting this plant to-day, so far as it is completed. It is, I believe, the first case of adaptation to an inclined retort installation in this country.

Other matters that may be of interest to you at the Shields works are the arrangement for supplying breeze to the boiler-house, the grouping of the coal gas and carburetted water gas machinery in one room, the combined oil-storage tank and relief holder, the steel-framed block of buildings having only half-brick thickness walls, an office extension in artificial stone, luteless purifiers having overhead cover-lifting joists combined with a runway for handling the purifying material.

Before closing my remarks on manufacture, it may be mentioned that naphthalene troubles, formerly very prevalent at South Shields, have been reduced to a minimum by using special solvent oil in the Livesey washer situated immediately after the exhaustor, and coupled with the use of just a small quantity of "Gazine" at the outlet of the station meter.

During the year ending June 30, 1902, with 15,000 consumers, there were 1477 complaints due to choked services. In the year ending June 30, 1909, the number of such complaints was reduced to 410—that is, 72 per cent. decrease, though the consumers have increased in the meantime to 26,685, or 77 per cent. increase.

RESIDUALS.

The market value of coke has, unfortunately, fallen during the past twelve months—due primarily to trade depression; while the lesser quantities required by cement works, due to foreign-made cement competing, has also made a considerable difference in the coke sales of this district.

Every gas manager should endeavour to increase the local sale of coke by specially catering for the domestic household trade, by which I mean kitchen fires. During several winters now, rolleys with sacks of coke have been sent out in this town to travel the same streets on corresponding days each week. A large lettered board is fitted to the rolleys, with price painted thereon, and cash is paid on delivery; each rolleyman hawking coke in the district allotted to him. Printed handbills have also been periodically delivered from house to house, drawing attention to the advantages of coke. A breaking and screening plant, with sack-filling arrangement, is being erected at Shields works, which will facilitate the further development of this trade.

Tar has further fallen in value, due to over-production arising from the bye-product coke-ovens erected by collieries. Some improvement may be expected from the increasing popularity of tar-sprayed roads, in connection with the dust problem and with the Budget proposals as to roads for motor traffic.

Sulphate of ammonia has kept up wonderfully well, and the Sulphate of Ammonia Association are considering what steps should be taken to prevent over-production of this valuable fertilizer ruining the price, by extending the markets, as also by the

formation of a central selling agency. They are looking ahead to prevent disaster; and they ought to be financially supported by every works manufacturing sulphate of ammonia.

Respecting "Coalite," its claims are that of a smokeless fuel; but gaseous fuel is much simpler and more convenient to the user. If there is a market for "Coalite," then, inasmuch as it is a special class of coke, and gas is evolved in its manufacture, the ordinary gas-works is the place where it should be made. But the difficulty I foresee is that the gas is not of the quality now required for town supply, and that therefore the cost of "Coalite" as a fuel, excepting in very special cases, will most probably be prohibitive.

STRUCTURAL WORK.

The design, arrangement, and construction of gas-works plant and buildings necessarily varies according to the engineer's individual taste, the ground space available, and the locality in which the works are situate. Personally, I am averse to ornamentation in a gas-works, as it is unnecessary and increases the costs.

The Shields works provides a typical example, not to be emulated, of gas being made on a cramped site. While such a site lends plenty of scope for ingenuity in filling up every available corner and the grouping of plant compactly, it does not conduce to the cheapest working costs, nor does it by any means provide a show-place.

Steel-framed buildings, with half-brick panelling, are very suitable for gas-works; and apart from cost, they allow of plant being erected therein at the same time as the brickwork is being built. Reinforced concrete can also be utilized to very great advantage in gas-works structures; and I have adopted it in a variety of special cases for foundations, elevated floors, and walls. It could not, however, compete in point of cost with the half-brick panelling to the steel-framed building erected at the Shields works.

Artificial stone, as made by some processes, is obviously unsuitable for gas-works. I have adopted one particular make of it, however, in an extension of the offices; and though I abolished brickwork backing, the result is quite satisfactory—no trace of dampness being discernible. This extension comprised an additional storey and an area of 206 superficial yards of artificial stone, 9 inches thick throughout, with projecting imitation ashlar quoins and corbels, all to match the original building. The building is lined with plaster slabs, placed 1 inch clearance from the wall and secured with laths plugged to the wall. The cost of the artificial stone shell fixed complete, including plaster slabs, was £282, or 28s. 7d. per superficial yard; while in suitable local stone the cost, with the necessary brickwork backing and ordinary plaster, would have been about £380, or 38s. 9d. per superficial yard. The saving in this case was 25 per cent.

One feature in connection with structural, as also other work, that I do not believe in, is accepting in all cases the lowest tender. In most instances this can be done; but I am perfectly satisfied it is a mistaken policy often adopted. The competition that strains some contractors to tender at unremunerative prices; and when subsequently it is recognized that there are no extras to make the profit on, there is nothing but trouble and probably unsatisfactory work, even under the closest supervision.

DISTRIBUTION DEPARTMENT AND SELLING GAS.

The selling of gas—formerly neglected, so far as new business was concerned—is now our most important branch, owing to the keen competition that exists. Though we provide the cheapest and most efficient artificial light, this fact in itself is not sufficient; the public require telling so and telling often. Instead of reducing the price of gas to the lowest ebb, it is better to charge a little extra and spend more on educating the public as to the utility, advantages, and cheapness of gas for lighting, cooking, heating, and power; also on maintaining gas apparatus in the highest state of efficiency.

Continuous advertising, in one form or another, is of the utmost importance. Intelligent canvassers, meter inspectors, and gas-fitters can do a lot; but they require augmenting by the distribution of suitable printed matter, pithy notifications on accounts, demonstrations, show-rooms, maintenance of incandescent burners on consumers' premises, and prompt attention to consumers' complaints. These are the lines on which the South Shields Gas Company are endeavouring to run; and though we have had a show-room in South Shields for several years, and are continuing it, another permanent show-room coupled with a Branch Office for the payment of accounts, receiving orders and complaints, and showing gas apparatus, has just been opened at Jarrow for the convenience of the consumers in that part of the district of supply. Incandescent burner maintenance should be made a special feature—recognizing that a satisfied consumer is the very best advertisement. Free maintenance has been in operation here for two years now, with most satisfactory results.

While lighting is the mainstay of our business, the popularity of cooking by gas has extended enormously in recent years, even into the poorest houses, through the medium of slot installations. There is, however, a vast field, practically unworked as yet, in the heating of rooms; also in hot water circulating systems for dwelling houses. These are features that require specially catering for now. The recent application of more scientific principles in the construction of gas-fires has improved their efficiency considerably; and this should be demonstrated to the public.

Good pressures are essential for incandescent gas lighting,

cooking, and heating. It does not follow that higher pressures mean increased unaccounted-for gas, providing the distributing system is properly maintained and renewed when necessary. Though the initial pressures at our works have been increased so as to give 25-10ths on the outskirts of our district, as against 15-10ths nine years ago, the unaccounted-for gas has fallen during the same period from 12·4 to 5·17 per cent.

Instead of altering the mechanism of slot-meters (which could easily have been done by change wheels) when the price of gas was last reduced, I recommended that they be left unaltered, and that instead a rebate be given to the consumers each time the collector called. The system has given entire satisfaction, and is very popular with the consumers; the rebate corresponding with the dividend of the Co-operative Stores.

The changing of slots for ordinaries and *vice versa* is apt to become a costly and serious business; but enforcing a charge for fixing ordinary meters in such cases has had a beneficial effect here. One consumer was foolish enough to contest such a charge; but the magistrates ordered him to pay.

The multitude of incandescent gas-lamps, burners, fittings, and mantles now on the market has become somewhat bewildering; but, nevertheless, it is advisable to obtain samples of new patterns from time to time, and test them for higher efficiencies. It is necessary, however, to deprecate the cheaper outside enamelled steel-lamps, owing to their short life, which in some cases has not exceeded two years.

Most local authorities, even those who own electricity undertakings, now openly recognize that incandescent gas is much more satisfactory and cheaper than electricity for public lighting. In recent years I have succeeded in inducing five of the local authorities whom we serve, to scrap every flat-flame public lantern, and substitute, at their own cost, incandescent gas-burners with suitable new lanterns. The Gas Company undertake the upkeep and maintenance of the whole of these lamps, numbering 3122, at inclusive rates for gas, lighting, cleaning, repairs, and upkeep. The lamplighters attend to the mantle renewals, and a record is kept of mantles used per lamplighter and averages per lamp.

A large number of mantles have been experimented with both in the laboratory and in the street-lamps; and the best results are being obtained from a mantle having a metal top ring and a metal fork, which fuse together, thereby providing greater rigidity for the mantle on the upright burner. Twelve months experience with this type of mantle proves the saving of over 60 per cent. in the number of mantles used, as against those formerly employed—a well-known make and more expensive, but which far exceeded my estimate of the number required for maintenance.

Automatic pressure-wave lamp-lighting appears more suitable for some districts than others; and its extensive adoption depends to a great extent on the attitude taken up by lamplighters, who, if wise, will be satisfied with reasonable terms under present conditions.

The ventilation of inhabited rooms and buildings is a matter entitled to much more consideration than it receives. Building bye-laws and regulations ought to compel the fixing of ventilators in living rooms. Meanwhile, gas engineers should advise consumers on ventilation, and urge the distinct advantages which gas possesses over electric light for aiding it.

Electric light has always been more expensive than gas, is so to-day, and will continue so in the future, in my opinion; and electricians have no justification for assuming otherwise. The relative cost to small consumers of gas and electric light in this town works out at 3½ to 1 in favour of gas, *plus* a further saving in renewals, taking the low-pressure inverted incandescent gas-burner as against the most efficient electric lamp—*viz.*, the Osram. For cooking and heating, electricity is hopeless in point of cost comparatively with gas. For power, gas is also cheaper, except where electricity is supplied at special cut-prices as in some cases on Tyneside, where electrical competition is probably keener than any other part of the country.

COMMERCIAL SECTIONS.

In recent years, what have been termed Commercial Sections have been inaugurated by almost every District Gas Association other than our own. Personally, I consider the title rather a misnomer, having reference to the class of work and variety of matters dealt with. But having had an opportunity of perusing some of the annual reports, and discussing the matter generally with several who have experience in the matter, I am personally satisfied that the members of this Association and the undertakings we represent can be considerably benefited by starting such a section in the North of England. There are many questions which, even if there were time, it is not advisable to raise or discuss at the half-yearly meetings, but which could be freely dealt with at (say) monthly meetings of the section. I had intended dealing with the matter rather fully in this address, but time would not permit. It is, therefore, my intention to lay it before the Committee, with the object of having a report submitted to you for consideration and discussion at your next meeting.

I have now expressed my views on some of the matters foremost in my mind connected with the gas industry, and conclude with a word of apology. It is that while many of you are familiar with the subject-matters referred to, it is desirable that the outside public should learn something of gas men's views on the present

and future of the gas industry; and a presidential address seems to offer a suitable opportunity.

Mr. W. FORD (Stockton) expressed the opinion that, from the able and extensive address to which the members had listened, they could only think over it and say: "Well done, good and faithful servant, thou deservest our warmest commendation;" and to the President he must express his personal thankfulness that he was able to give them such information generally upon their great industry. He hoped it would benefit the young as well as the aged. He himself had received a great amount of information, which he should take home with him and digest in his leisure hours. In these simple words he proposed that the members should give a hearty vote of thanks to the President for his very elaborate and worthy address. He would ask Mr. Thomas Hardie to second the motion; and, in doing so, he might take the opportunity of congratulating him upon entering into the eminent position of Chief Engineer to the capital gas-works of the North of England. He hoped Mr. Hardie would be long spared to fill this position with the eminent abilities he possessed.

Mr. T. HARDIE (Newcastle) said that he had much pleasure in seconding the vote of thanks. Their President had a personality of his own. He thought that, in the closing paragraph of the address, he gave this feeling, in his own words. They had had an address which simply bristled with his individuality. He (Mr. Hardie) felt rather glad that the President had not given them more; but he was sorry he did not read the whole of his address. There was this advantage, perhaps, in this—that they would have to go back to the address and read it all for themselves. It would really be a necessity that they should do this, because so many of the views expressed by the President opened up matters which he was sure would require considerable time for digestion. Perhaps he might be permitted to thank the President and Mr. Ford for their kind references to himself; and also the members for the manner in which they had received them.

The motion was very cordially agreed to, and the PRESIDENT briefly returned thanks.

PRESENTATIONS TO MR. W. DOIG GIBB.

The PRESIDENT, addressing Mr. W. Doig Gibb, late Chief Engineer to the Newcastle and Gateshead Gas Company, said it was now his privilege and pleasure to present to him, on behalf of the North of England Gas Managers' Association, a solid silver tea and coffee service, on the occasion of his sphere of labour being removed from the North to the South of England. They asked him to accept these gifts as "a token of sincere esteem, and an appreciation of the services he had rendered to the Association during the eighteen years he had spent in the district." They knew he would not judge the gift by its intrinsic value, but that what would be far more gratifying to him would be the fact that practically every member of the Association had perfectly voluntarily subscribed to the presentation fund. They congratulated Mr. Gibb most heartily on the honour which had been conferred upon him in his appointment to the "plum" of the gas engineering profession. His ability as a gas engineer and as a gas expert was recognized throughout the country; but they in the North of England knew particularly that the choice of the South Metropolitan Gas Company had been a wise and a happy one, and that Mr. Gibb would be a credit both to them and to himself. The mention of the South Metropolitan Gas Company was always accompanied with one prominent matter, which was inseparably bound up with it—*viz.*, co-partnership. The two were synonymous terms. The cordial relations between Mr. Gibb and his workmen, and his consideration for their interests, combined with his uniform courtesy and general good-fellowship, had always been a special feature in his career. The promotion of a rifle club among the Newcastle Gas Company's workmen was an instance of the interest he had taken in their welfare. Such good feeling as this was the basis of co-partnership, as he understood it; and the South Metropolitan Gas Company's workmen would very soon recognize and appreciate the considerate Chief who was going among them. He would go further, and say that the Southern gas engineers would have a professional brother among them whom it would always be a pleasure to meet. He apologized for the inadequacy of his remarks, particularly when there were so many present who could have done much fuller justice to Mr. Gibb than he. But he would give one sentence which expressed the general view, and that was that they were exceedingly sorry to lose him. They were desirous that Mrs. Gibb should also have a *souvenir* of these proceedings; and he asked Mr. Gibb to accept the silver salver which was also on the table, on her behalf, as a memento. They wished him every success in his new surroundings; and they hoped he would be blessed with long life and happiness to enjoy the use of the gifts which he (the President) now formally handed over to him.

Mr. GIBB, in acknowledging the presentation, said there were some occasions when it was quite impossible to put into words what one felt. He thanked the members all very, very sincerely for their kindness in making him so handsome a present. It would be regarded as an heirloom in his family, and be handed down, he hoped, to his sons, and most probably to their sons. The President had been all too kind in what he had said about him. But there was one thing which, since it became generally known that he was going South, had been a source of very great gratification to him; and that was that the Newcastle workmen, the Newcastle officials, the North of England

Gas Managers' Association, and everyone with whom he had been connected, seemed to think that he had been, at all events, a real friend. This was very gratifying to him. The President had mentioned intrinsic value; but this was quite a secondary consideration. Though he had reason to know that the gift which he had received that day was of great intrinsic value, this, after all, was of secondary importance compared with its being such a tangible token of their regard for himself. And if anything could spur him on to do the very best he could in the South, it was the knowledge that his future career would be watched so carefully, and with so much love and esteem, by the hundreds of friends he was leaving behind him in the North. The President had referred to the co-partnership which existed in the South Metropolitan Gas Company; and he (Mr. Gibb) was going forward with eagerness—he might almost say with joy—to take part in this movement, because he so very thoroughly believed in it. It seemed to him that if such relations as had evidently existed between himself and the workmen of the Newcastle Company were sought for, there ought not to be very much difficulty in co-partnership being gradually established throughout the country, because it was quite certain that between himself and the workmen there had been very numerous expressions of kindness, which was—he was sure that in very many of their own cases also there was at least the preliminary stage, which must be there first—co-partnership of hearts. He could not say more beyond thanking the members, and he did so very sincerely, and trusted they would take it from him that it was sincere and from his heart. He also thanked them on behalf of his wife.

The gifts, as mentioned by the President, consisted of a silver tea and coffee service and a silver salver. On the service there was the following inscription:—

Presented to W. DOIG GIBB, Esq., M.Inst.C.E., by the North of England Gas Managers' Association, on his appointment as Chief Engineer to the South Metropolitan Gas Company, as a mark of esteem, and in appreciation of his services to the Association. 2nd October, 1909.

The inscription on the salver was to the same effect.

Mr. J. W. HELPS (Croydon), the President of the Institution of Gas Engineers, said he was particularly glad the President had asked him to make a few remarks, because he was one of those who came from the South, and who, in a short time, would be one of the gainers by what they in the North had lost. He did on this occasion most heartily welcome Mr. Gibb to the South. He felt sure that every engineer in that part of England would only be too glad that Mr. Gibb was coming to join their ranks. They had, of course, during past years, watched Mr. Gibb's career. They knew that in him the gas industry had one of its ablest supporters and one of its finest engineers; and they felt sure that the strength of their position in the South would be considerably added to by his advent among them. He (Mr. Helps) had had the pleasure personally of knowing Mr. Gibb for a very long time; and he recognized not only his great ability but his goodness of heart, and his generous, noble, and sportsmanlike character. He always laid a great deal of emphasis on the word "sportsman;" and he thought that if there was anyone who could claim to be a real sportsman, it was his friend Mr. Doig Gibb. He welcomed him to the South, not only because of his ability, but because he knew they would have a good and true man there, and one who would work ably and well with them. He (the speaker) was very glad indeed to have the opportunity of saying these few words; and he most heartily congratulated Mr. Gibb on the presentation which had been made to him that day, and on the tokens of satisfaction and affection which had been shown by every member of the Association to him that day.

Mr. ALEX. WILSON (Glasgow), having been called upon by the President, said he was very glad also to have the opportunity of congratulating Mr. Gibb on his new appointment. He was a very old friend of his. It was quite to be expected by anyone who knew the abilities and the capabilities which lay within him, that Newcastle would not hold him all his days. Mr. Helps had put the matter so nicely that really he could not say much more; but he was in this position, that they lost Mr. Gibb, first of all from Scotland, when he went south to Newcastle, and now he was going to London, where he hoped he would reach a higher pinnacle of success than he had ever had in the past. He wished him all success in his future career.

The PRESIDENT said he was quite sure that there were many more present who would like to say a word or two relative to Mr. Gibb's removal from the North of England. Unfortunately, however, they had a time-programme to work up to, and it would not permit of that.

This concluded the business of the meeting.

VISIT TO THE GAS-WORKS.

The members paid a hurried visit to the works in Oyston Street, a description of which is given later.

THE DINNER.

At two o'clock, a company of about 180 were entertained to dinner by the South Shields Gas Company in the King's Hall of the Golden Lion Hotel. Dr. J. F. ARMSTRONG, J.P., occupied the chair.

The toast of "The North of England Gas Managers' Association" was proposed by Mr. J. REDHEAD, the Vice-Chairman of the South Shields Gas Company.

The PRESIDENT, in responding, commented on the presence, as being unique at a meeting of a District Association, of the President and the two Vice-Presidents of the Institution of Gas Engineers.

Mr. T. BOWER (West Hartlepool) proposed "Kindred Associations;" and the toast was responded to by Mr. J. W. HELPS, the President, and Messrs. ALEX. WILSON and R. G. SHADBOLT (Grantham), the Vice-Presidents, of the Institution of Gas Engineers. Mr. Helps said that at present the Institution had, in the Parent Association and the District Associations, a duality; he wanted a trinity, by securing for the gas industry, through the Institution, the interest of directors and secretaries of gas companies and of members of corporations.

Mr. W. DOIG GIBB proposed "The Chairman and Directors of the South Shields Gas Company." In his remarks, he said that their worthy President went to South Shields in 1900, and, as a neighbour, he, as quickly as possible, went down to greet him, and to offer his help—at all events, his friendship. He was not revealing any secret, after the remarks of Mr. Redhead, when he said that he was absolutely appalled, in walking through the works, at the task Mr. Duxbury had in prospect. Between 1900 and 1909 there had been a complete revolution in the history of the Company. From 1899 to 1901 the profits of the Company were not sufficient to pay the full dividend; but from 1901 to the present time the full dividends had been earned, and a little over. In 1900, carbonizing costs were 5d. per 1000 cubic feet; in 1908, they were reduced to 2'06d. In the same time the gas sold per ton of coal had been increased by 1060 cubic feet. Leakage had been reduced from 12'40 to 5'07 per cent.; sulphate of ammonia had been increased by 6'30 lbs. per ton of coal; and 43 million cubic feet more gas had been sold per year, in spite of increased competition with electric lighting. All public lamps now had incandescent burners; and there were more slot-meters than there were ordinary. All this reflected enormous credit on the Engineer who had been in charge, and who, he felt, was worthy of their sincere congratulations for the way in which, in a comparatively short number of years, he had absolutely pulled the Company into a different place from what it was in before. But the Engineer could not have done what he had unless he had been absolutely backed up by the Chairman and Directors, whose health it was that he was proposing.

The CHAIRMAN acknowledged the toast.

The proceedings closed early, to allow the visitors to catch their homeward trains.

SOUTH SHIELDS GAS COMPANY & ITS WORKS.

History of the Company.



Engineer and Manager's Office—Showing Extension in Artificial Stone.

The South Shields Gas Company was formed in the year 1824 by a small private Company, for the purpose of supplying gas within the township of South Shields and Westoe. Subsequently, it was reconstructed; being registered under the Joint Stock Companies Act, 1856. In 1857, the reconstructed Company

applied for, and obtained, statutory powers, with £20,000 of original share capital and £20,000 of additional share capital—the dividend prescribed by the Act being 9 per cent. Power to borrow on mortgage a further sum of £9000 was also authorized. In the years 1867, 1879, 1886, and 1904, the Company obtained Special Acts authorizing the raising of additional capital, extensions of the area of supply, and further powers. The authorized capital of the Company is at present £441,500 in stock and £142,995 mortgage loans—a total of £584,495.

The Company's district of supply covers an area of about 25 square miles, comprising the county borough of South Shields, the borough of Jarrow, the parishes of Harton, Boldon, and Boldon Colliery, and portions of the urban district of Hebburn and the parish of Whitburn. The Company work, therefore, under the control of seven different Local Authorities so far as public lighting is concerned, and under four for street works.

The original gas-works were erected on part of the site occupied by the existing Shields works. In the year 1864, a small gas undertaking at Jarrow was purchased from a private Company, and, subsequently, it was reconstructed and considerably enlarged; thereby making the Jarrow works a larger manufacturing station than the then Shields works. The Company have continued to make gas at both the Shields and the Jarrow works; but in recent years the latter have only been used for gas manufacture during the midwinter season. An 18-inch trunk main connects the two works, which are situate 4 miles apart, and gas is sent through this main from either works to the other, as required, by the holder pressures, without the aid of any booster. By a simple arrangement of valves, this trunk main is utilized every evening as a distributing main; being connected to the station governors at each works.

In the year 1900, it was recognized that additional manufac-

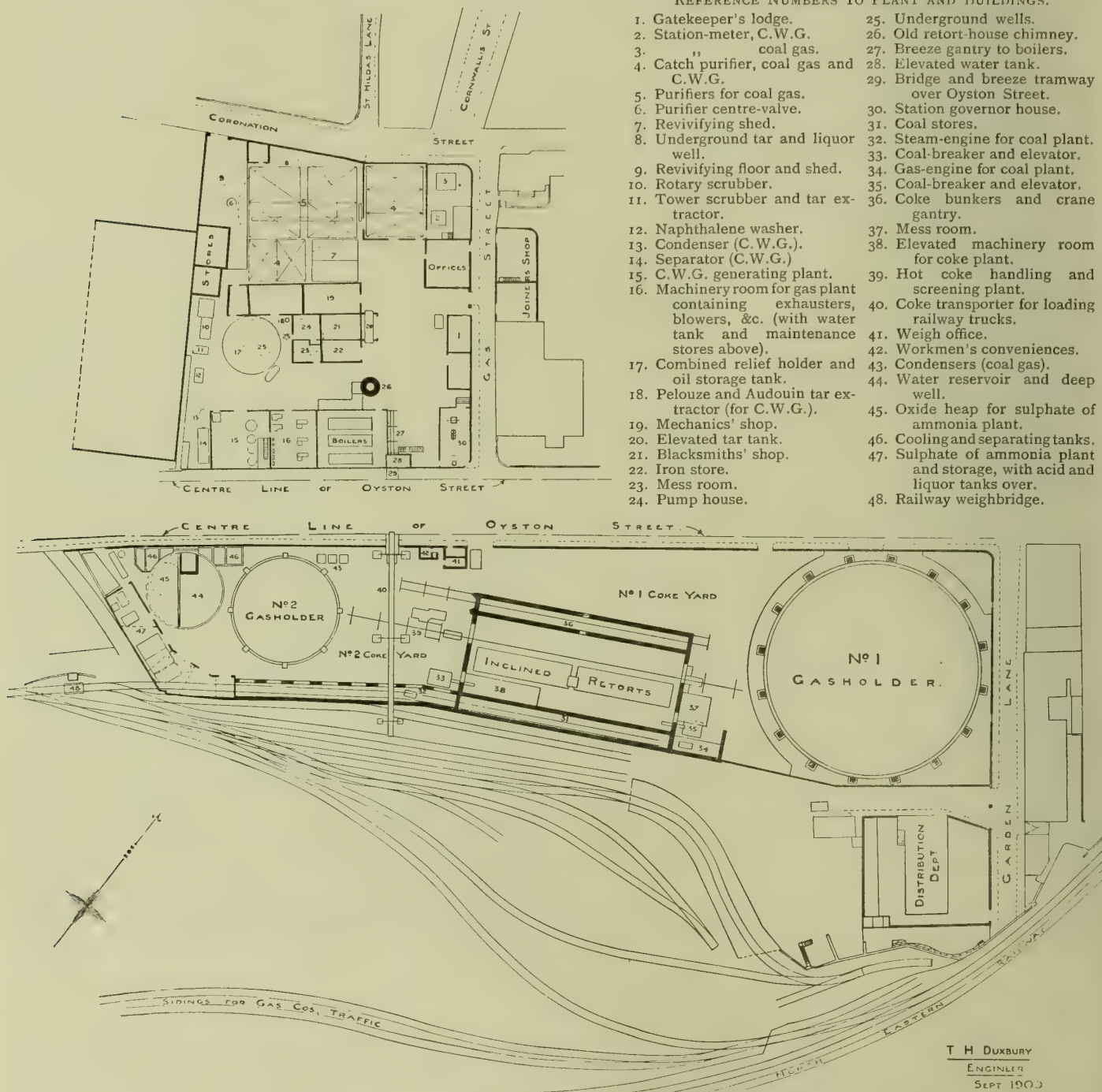
turing plant must be erected at either the Shields or the Jarrow works; and it was eventually decided to construct a new retort-house at the Shields works. This new retort-house was partially constructed (for horizontal retorts), and the order for the roof had already been placed, when Mr. T. H. Duxbury was appointed Engineer and Manager to the Company. No arrangements had been made for the reconstruction of any of the gas plant and apparatus outside the retort-house; but as the old plant was both too small and in most parts in a bad state of repair, a combined reconstruction and extension scheme had to be taken in hand. This has been carried out in stages from the year 1901 up to date, and will be completed this year. Of the plant in use at the Shields works in 1900, only one holder, a tower-scrubber, a station-meter, and station-governor are in operation to-day.

THE SHIELDS WORKS.

This account is not intended to deal with the innumerable and almost insurmountable difficulties that have arisen from time to time during the execution of the work, due to a section of the old plant having to be removed before new apparatus could be laid down. It is confined to a brief description of the Shields works as reconstructed and extended on the old works site, whereby the manufacturing capacity has been increased from 1 million to 2½ million cubic feet of gas per day. The site is, unfortunately, divided into two portions by a public street; the joint area of the two plots of land being 2 acres 3 roods 15 poles. A block plan of the proposed reconstructed works was originally prepared by Mr. Duxbury; and this has been rigidly adhered to throughout in subsequent execution of the work. The Shields works have not hitherto had any direct railway communication, and a portion of the coal is carted from the Company's coal-store at the railway station to the gas-works by the Company's horses, at a cost

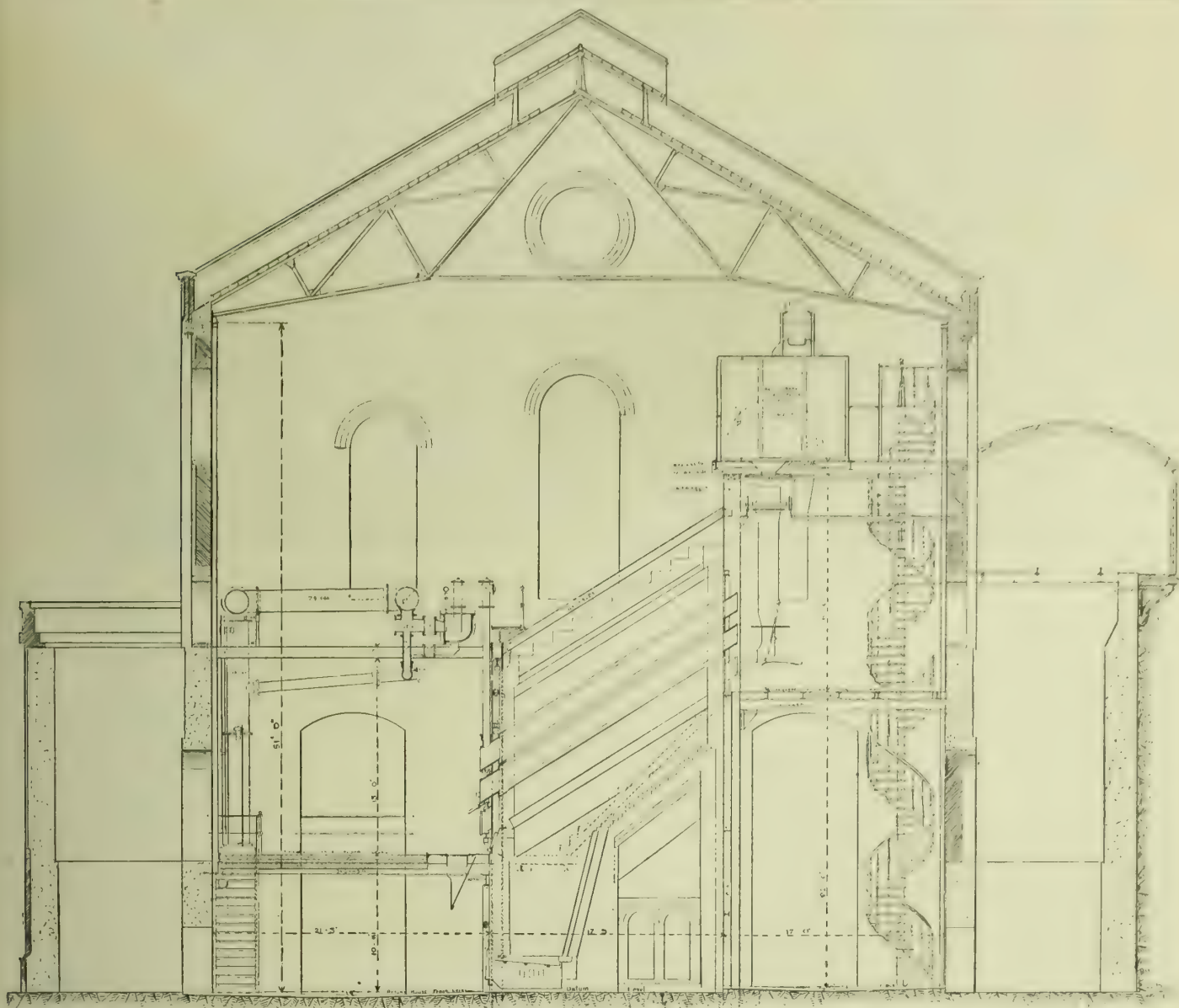
REFERENCE NUMBERS TO PLANT AND BUILDINGS.

- | | |
|--|---|
| 1. Gatekeeper's lodge. | 25. Underground wells. |
| 2. Station-meter, C.W.G. | 26. Old retort-house chimney. |
| 3. " coal gas. | 27. Breeze gantry to boilers. |
| 4. Catch purifier, coal gas and C.W.G. | 28. Elevated water tank. |
| 5. Purifiers for coal gas. | 29. Bridge and breeze tramway over Oyston Street. |
| 6. Purifier centre-valve. | 30. Station governor house. |
| 7. Revivifying shed. | 31. Coal stores. |
| 8. Underground tar and liquor well. | 32. Steam-engine for coal plant. |
| 9. Revivifying floor and shed. | 33. Coal-breaker and elevator. |
| 10. Rotary scrubber. | 34. Gas-engine for coal plant. |
| 11. Tower scrubber and tar extractor. | 35. Coal-breaker and elevator. |
| 12. Naphthalene washer. | 36. Coke bunkers and crane gantry. |
| 13. Condenser (C.W.G.). | 37. Mess room. |
| 14. Separator (C.W.G.). | 38. Elevated machinery room for coke plant. |
| 15. C.W.G. generating plant. | 39. Hot coke handling and screening plant. |
| 16. Machinery room for gas plant containing exhausters, blowers, &c. (with water tank and maintenance stores above). | 40. Coke transporter for loading railway trucks. |
| 17. Combined relief holder and oil storage tank. | 41. Weigh office. |
| 18. Pelouze and Audouin tar extractor (for C.W.G.). | 42. Workmen's conveniences. |
| 19. Mechanics' shop. | 43. Condensers (coal gas). |
| 20. Elevated tar tank. | 44. Water reservoir and deep well. |
| 21. Blacksmiths' shop. | 45. Oxide heap for sulphate of ammonia plant. |
| 22. Iron store. | 46. Cooling and separating tanks. |
| 23. Mess room. | 47. Sulphate of ammonia plant and storage, with acid and liquor tanks over. |
| 24. Pump house. | 48. Railway weighbridge. |



PART BLOCK PLAN OF SHIELDS GAS-WORKS.

T. H. DUXBURY
ENGINEER
SEPT 1903



Section of the Inclined Retort Installation at the Shields Works.

of 6d. per ton. The remainder is obtained from an adjoining colliery over a private siding, which runs into the coal-stores next to the retort-house.

Coal-Stores and Retort-House.—The capacities of the coal-stores are 1000 tons adjoining the retort-house, and 900 tons at the railway station; while the elevated bunkers inside the retort-house contain 240 tons—giving a total coal storage of 2140 tons. The retort-house is 150 ft. 6 in. long, 56 ft. wide, and 52 ft. high to the eaves, and is constructed of concrete walls to a height of 26 feet above the ground-level, as designed by the late Mr. W. J. Warner. The superstructure which was requisite for the accommodation of inclined retorts was designed by Mr. Duxbury, and built in plate bricks. A coal-store runs the full length of the retort-house on one side, and coke-bunkers are arranged on the other side; the latter having been adapted for this purpose because they were not required for coal.

The retort-house contains two benches of inclined retorts, each containing six beds of eights; the retorts being 20 ft. long and 24 in. by 16 in. Δ section, parallel throughout. The gas is taken off from the bottom mouthpiece by 7-inch diameter ascension pipes. Each bed of retorts has a separate hydraulic main. These are supported in front of the bench by cross girders extending from the bench bracing to the retort-house side walls. There are four tar-towers; one being used for three beds of retorts. There are two 12-inch retort-house governors on the foul main, situated directly in the centre of the retort-house. The producing capacity of the retort-house is 1,536,000 cubic feet per twenty-four hours, with six-hour charges.

Coal-Handling Plant.—Coal from the adjoining colliery is brought over the elevated railway siding in bottom-door waggons and dropped into a 100-ton capacity bunker which feeds the breaker; or the waggons can be taken further along and emptied into the coal-stores. Coal carted from the railway station is tipped from the carts direct into either of two breakers. The coal-handling plant comprises a unique arrangement of duplicate breakers and elevators, one at each gable end of the retort-house, with a reversible band conveyor running along the ground floor adjoining the coal-store, for feeding coal into either breaker. A push-plate conveyor extends the full length of the retort-house over the elevated steel-plate coal-hoppers, and receives coal from

either of the elevators. One of the elevators is driven by a gas-engine, and the other by a steam-engine; and a neat arrangement of gearing and clutches enables the coal-conveyors to be worked from either elevator.

Coke-Handling Plant.—A coke-handling plant is now nearing completion, comprising a low-level Telfer, which will take skips containing hot coke from the front of the retorts and deliver them outside at either end of the retort-house. Two quenching tanks are provided into which the skips will be slowly immersed, and drenching of the coke thereby prevented. At one end of the retort-house there is a breaking and screening plant for the preparation of domestic coke, into which the Telfer can deliver the newly-quenched coke, or it can take it forward and deposit it into the coke-yard at either end of the retort-house. The coke-breaker is of special design, fitted with adjustable rollers, and has been covered by letters patent.

At present, hot coke is dropped into barrows in the retort-house basement, quenched, and wheeled out to the yard, where it is tipped into skips and lifted and stacked by a locomotive steam crane. The crane travels on a track laid over concrete bunkers, and delivers coke therein for loading carts. With the new arrangement now being constructed, the existing locomotive crane gantry is being extended so as to allow of the crane being utilized for picking up coke-skips from the low-level Telfer at either end of the retort-house, and delivering it into the coke-yard beyond the range of the Telfer. The locomotive crane will also deliver either broken or unbroken coke into the existing and additional coke-bunkers, and breeze into a small hopper feeding a tipping buggy on the boiler-house gantry.

The extension of the crane gantry is by steel structures; and a hopper is constructed therein, fitted with a special arrangement for measuring and filling broken coke into sacks. Coke loaded on to rail has hitherto had to be carted to the railway station; but arrangements have now been made for trucks to be brought into the Shields works over the adjoining Colliery Company's private sidings. As these sidings are some 32 feet above the yard level, mechanical appliances are necessary for lifting the coke; and a high-level Telfer plant is now being erected to deal with it. The high-level Telfer runs at right angles to the low-level Telfer, and can take skips of quenched coke from it and deliver



Inclined Retort-House, with Roof over Coal-Stores, as seen from the Elevated Sidings.

it into railway trucks or into the coke-yard. It will also lift coke from stock and deliver it into railway trucks at the rate of 220 tons per working day. A special steel-framed carriage has been designed (and made locally) for hauling skips of coke from any part of the coke-yard to within range of the high-level Telfer.

The Telfer plants are electrically operated. Electricity for this purpose is generated on the works, with duplicate sets of Siemens dynamos, belt-driven by gas-engines. Each generating set is suitable for driving either of the Telfer plants.

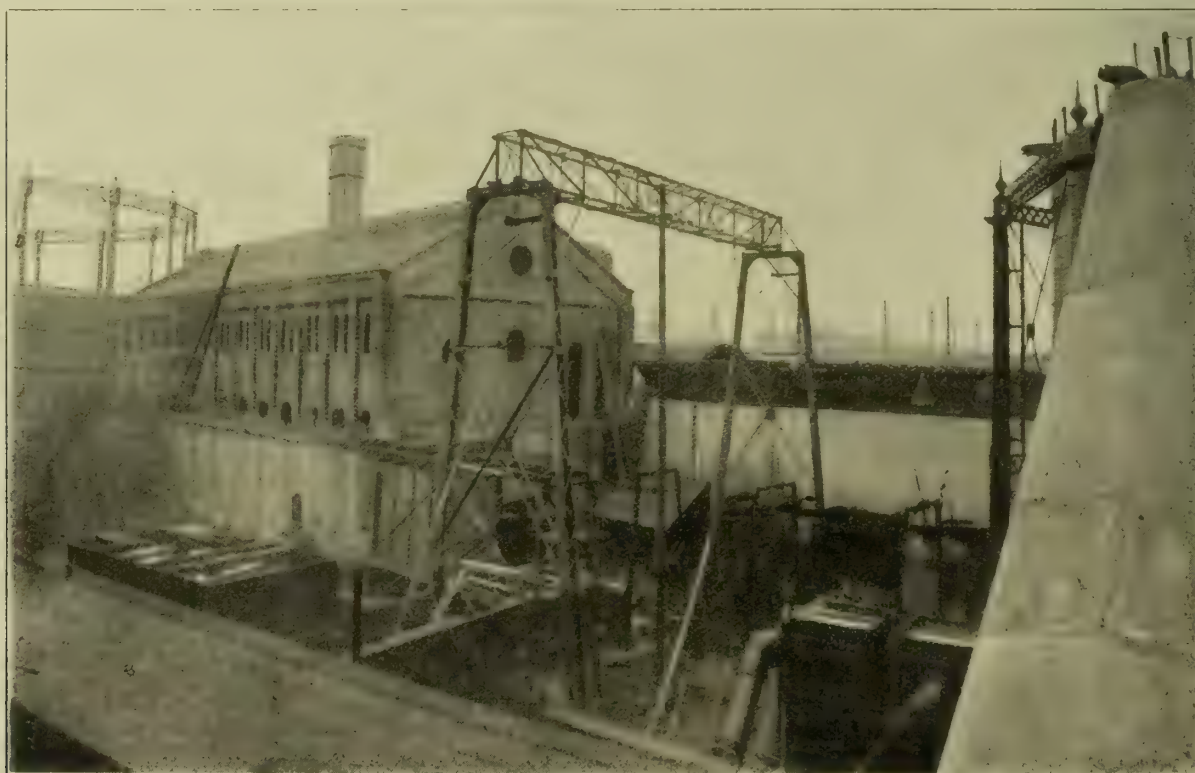
Condensers.—The condensers consist of a battery of three towers, water-tube type, and have a capacity of $1\frac{1}{2}$ million cubic feet of gas per twenty-four hours.

Exhausters.—These are fixed in a machinery room embodied in a range of buildings comprising carburetted water-gas generating house, machinery room, with incandescent maintenance stores and water-tank over, and boiler-house. The assembling in the one room of the exhausters with carburetted water-gas turbo-blowers and pumps enables one attendant to control the whole of this machinery. There are three sets of rotary exhausters, all direct driven; one being for coal gas, another for carburetted water gas, and the intermediate one is so connected that it can be used as a duplicate for either. No. 1 exhauster is of Waller's four-blade rotary type, of 70,000 cubic feet per hour capacity. No. 2 is of Gwynne's make, but converted by Messrs. Waller and Son into a four-blade, having a capacity of 80,000 cubic feet per hour. No. 3 is Gwynne's make, of 45,000 cubic feet per hour capacity, and used exclusively for carburetted water gas.

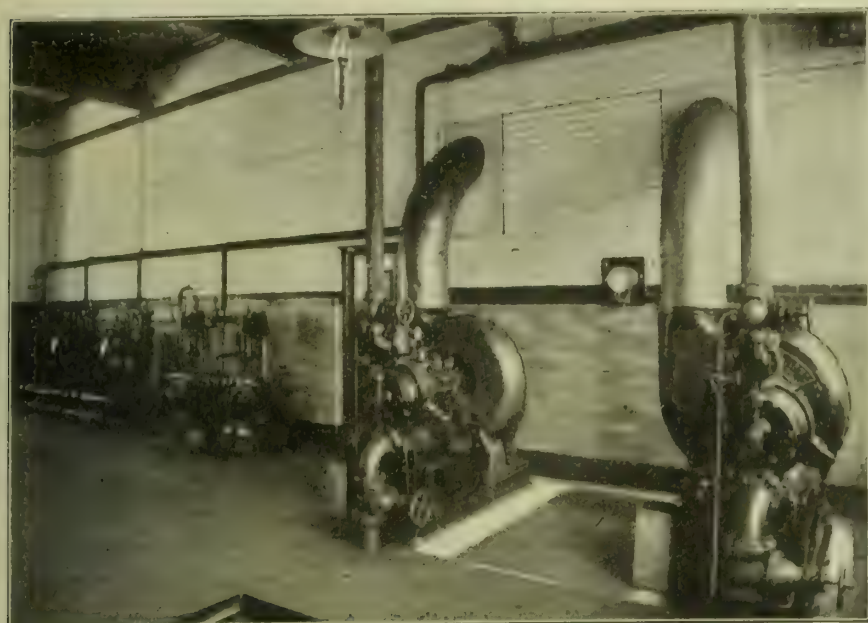
Boilers.—There is a battery of three Lancashire boilers, all fitted with forced draught; and practically the whole of the breeze made is used by the boilers on the works. They are 30 ft. long by 8 ft. diameter, and one is always off for cleaning. The old retort-house chimney is utilized for these boilers. Breeze is delivered to the front of the boiler-house by a tipping buggy running on a gantry, which connects the retort-house yard across a public street with the boiler-house yard.

Washers and Scrubbers.—The washing and scrubbing plant comprises a naphthalene extracting washer of the Livesey type (in which solvent oil is used), a tower-scrubber filled with thin boards and having a tar-extractor fitted in the base, and a rotary scrubber of the brush type. The tower-scrubber was used in the old works, but has been moved to a new position and refitted.

Purifiers.—There are nine purifiers in all; six being used for coal gas (four oxide and two catch boxes), and the remaining three for carburetted water gas. The purifiers are arranged in three batteries, with division plates subdividing them. All of them are of the luteless type, fitted with "New Century" covers and "Eclipse" joints. They are elevated on steel substructures, so as to provide oxide revivifying space underneath. The four oxide boxes are worked with a four-way dry-faced centre valve, the two carburetted water-gas boxes by separate slide-valves, and the three catch boxes having "Milbourne's" patent internal valves fitted. The sizes of the purifiers are as follows: Four of 35 ft. by 25 ft. by 5 ft. $8\frac{1}{2}$ in. deep; two of them being fitted with Spencer's hurdle grids, and the other two having gas entering



Part of the Framework of the High-Level Telfer during Erection.



Carburetted Water Gas Turbo-Blowers and Pumps in the Machinery Room.

in the centre between two layers of oxide on ordinary grids. The carburetted water-gas purifiers, for oxide only, are each 30 ft. by 20 ft. by 6 ft. deep. The catch-boxes are 40 ft. 6 in. by



Range of Steel-Framed Buildings—Walls Half-Brick Thick.

16 ft. 6 in. by 6 ft. 6 in., and are fitted with ordinary grids. Oxide revivification is carried out under the purifiers and in two revivifying sheds.

The purifying material is lifted by an elevator, which delivers either through a canvas shoot into two of the purifiers or on to a band conveyor for the others. The band conveyor delivers into the oxide purifiers or into skips travelling on a runway, which is utilized for lifting the covers of the two carburetted water-gas boxes.

Station Meters.—There are two station meters—one new one, of 80,000 cubic feet per hour capacity, for coal gas; the other being one of the original meters, of 20,000 cubic feet per hour capacity, and now used exclusively for carburetted water gas.

Gasholders.—There are two gasholders—No. 1 having two lifts, with guide framework, and 1,406,530 cubic feet capacity, and No. 2, having three lifts, of 287,610 cubic feet capacity. This holder has a top lift flying clear of the guide framework, and was designed to give sufficient pressure to operate automatic street-lamp lighters by pressure waves, without the aid of a booster. The total storage capacity at the Shields works is, therefore, 1,694,140 cubic feet, and, with the Jarrow holders, represents about 85 per cent. of the daily gas sent out by the Company in midwinter.

Station Governors.—There are three station governors; one that supplies South Shields

town, another the Jarrow distribution pressure main, and the third the shipyards and works along the riverside, on which a special pressure is carried for gas-power purposes. There is also a safety governor for preventing the district supply being shut off through the carelessness of a foreman in changing the holder valves. The governor-house is a detached building, and flanged branches are arranged on the pipe connections for the connecting of boosters whenever they may be required.

Tanks.—There are two overhead water-tanks of 9000 and 4210 gallons capacity respectively. No. 1 tank is employed for storing water pumped from a well and reservoir in the yard, and is used for coke quenching; No. 2 contains town's water, and acts as a storage boiler supply when (if ever) the town's water should be cut off temporarily.

A former gasholder tank has been converted into a tar and liquor storage well, having a capacity of 274,000 gallons. There is also a smaller well, having a capacity of 25,000 gallons, used for liquor. At present, tar is pumped into an elevated tank and carted to the railway station; but in future this cartage will be abolished, and the tar pumped into railway trucks on the elevated

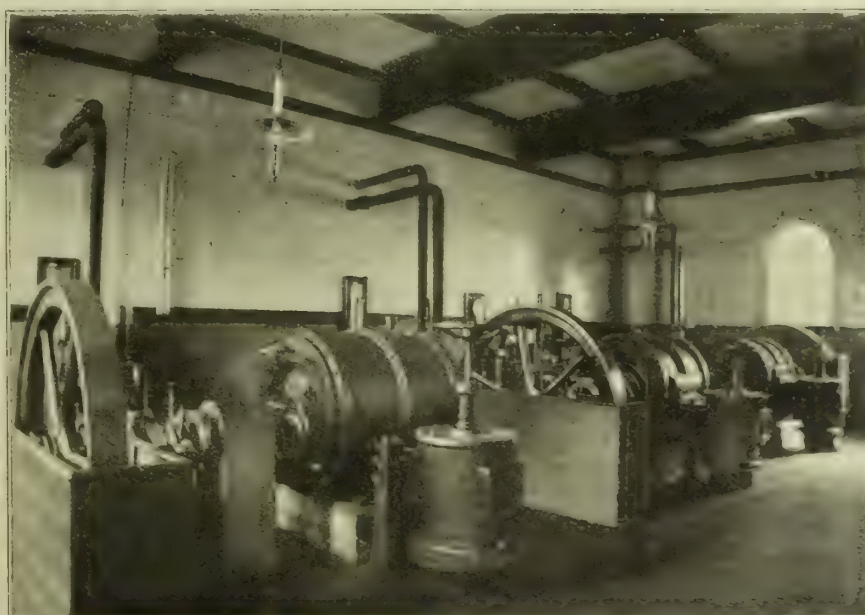
sidings. The tar and liquor pumps are assembled in the original pump-house.

Sulphate Plant.—Sulphate of ammonia is manufactured on the works with a plant having a solid plate lead saturator and a daily capacity of 3 tons of sulphate. In addition to an ordinary purifier, an oxide heap is used for this plant.

Carburetted Water-Gas Plant.—This plant comprises one 650,000 cubic feet per day set of Messrs. Humphreys and Glasgow's make. Owing to lack of ground space, oil storage is arranged inside the relief holder, which arrangement has been perfectly satisfactory since an internal crown was fitted to the oil-tank. The plant is of standard type, but embodies the latest improvements, including direct-coupled steam-turbines to the blowers and a specially constructed Pelouze type tar-extractor, which effectually prevents the oxide in the purifiers becoming clogged with tarry deposit. The generating house is arranged to accommodate a duplicate set at any future time.

The combined relief holder and oil-tank is erected on top of an old tar well, which is retained for water storage, but which necessitated a reinforced concrete table foundation being constructed on four reinforced concrete piers, which were extended down to the rock at a depth of 18 feet below ground level. The concrete table itself is 18 inches in diameter, with reinforced concrete girders formed therein; the whole constituting a complete monolithic mass. Indented steel bars were used for reinforcement. The carburetted water-gas plant is only used intermittently, and is shut down entirely during the summer.

Workshops and Buildings.—The workshops comprise a joiner's shop, where carts and trolleys are repaired; a blacksmith's shop, fitted with two hearths and iron store adjoining; and a mechanics' shop, fitted with tools for executing all necessary repairs on the works. The workshops are houses in the old works buildings, which have been adapted to suit the respective requirements. The range of buildings containing machinery and carburetted water-gas plant is of steel-framed construction with half-brick thickness walls filled in. Half-brick pilasters are built in front of



Coal Gas and Carburetted Water Gas Exhausters in the Machinery Room.

the stanchions in the yard, whereby no steel work is visible from the outside.

The purifiers stand in the open without any buildings over them; in fact, the roof of the old purifier-house was removed before the new purifier was erected.

The offices at the works are occupied by the Engineer and his staff only—the Secretary's offices being situate in the centre of the town. They have recently been enlarged by the addition of another storey; this extension being carried out in artificial stone to match the original building. They provide accommodation as follows: Ground floor, Assistant-Manager, Distribution Superintendent, and clerks; first floor, Engineer and Manager's office and typing office; second floor, drawing office and laboratory.

The gatekeeper's lodge and weigh-office constitute separate buildings at the entrances of the works.

Stables, accommodating 23 horses, as also distribution department stores and workshops, are erected on separate sites.

The Contractors who have been engaged on the reconstruction work are as follows:—

Messrs. Drakes Limited: Inclined-retort installation and part of coal-handling plant.

Messrs. Graham, Morton, and Co.: Part of coal-handling plant.

Messrs. Strachan and Henshaw, with Messrs. Robert Dempster and Sons as Sub-Contractors: Coke-handling plant.

Messrs. Clapham Bros.: Condensers and five purifiers.

Messrs. Waller and Son: Exhausting plant.

Messrs. R. & J. Dempster: Livesey washer.

Messrs. W. C. Holmes and Co.: Rotary scrubber, also Western type double-faced gas-valves throughout the works.

Messrs. Ashmore, Benson, Pease, and Co.: Purifiers, steel framework for buildings, and combined oil-tank and relief holder.

Messrs. J. & J. Braddock: Station meter and governors, and retort-house governors.

Messrs. Humphreys and Glasgow: Carburetted water-gas plant.

Messrs. H. Greene and Sons: Schwab's sulphate of ammonia plant.

Messrs. Joseph Taylor and Co.: Solid plate lead saturator.

Messrs. Clayton, Son, and Co.: Three-lift gasholder.

Buildings: Local firms.

HANDLING GAS-COKE AT LIVERPOOL.

A Fixed Inclined Temperley Transporter at the Wavertree Gas-Works.



Coke Handling Plant at the Wavertree Gas-Works, Liverpool.

WE give a reproduction of a photograph showing an important installation of a "Temperley Transporter," supplied by Messrs. Applebys Limited, at the Wavertree Works of the Liverpool United Gaslight Company. It constitutes a rapid and satisfactory method of handling hot gas coke.

The transporter is employed to convey quenched coke from the retort-house to the hoppers, from which it is delivered into railway waggons or carts. The transporter beam is of sufficient length to give a total transporting distance of about 282 feet; and it rises in this length about 22 feet. On this beam runs a Temperley patent double-purchase link-action traveller, which operates a Temperley patent automatic dumping fall-block. The coke is carried in automatic dumping coke-skips of special design. The transporter is driven by an electric winch designed for lifting a skip containing 5 cwt. of coke at a speed of about 200 feet per minute, and for transporting the load along the beam at a speed of about 500 feet per minute. The transporter

is operated entirely by one driver, who from his cabin has perfect control over the various motions of lifting, transporting, lowering, and automatically tipping the skips and discharging the coke, and returning the empty skips and lowering them. The driver's cabin is so situated that he has a good view of his work at all stages; and an indicator is fitted in the cabin, within view of the driver, to show the position of the traveller on the beam at any time. The transporter, it is claimed, constitutes a most economical, rapid, and satisfactory method of handling hot coke in gas-works, &c.

For the purpose of calculations, the dead-weight of ferro-concrete structures is computed on the basis of actual volume including the reinforcement. As the quantity of metal rarely exceeds 3 to 4 per cent., the Hennebique practice, which has been approved by all engineers and constructors, is to take the weight of ferro-concrete at 150 lbs. per cubic foot.

An Epoch in Gas Manufacture.

DESSAU VERTICAL RETORTS

4022 already Ordered.

THE VERTICAL GAS-RETORT SYNDICATE, LIMITED,

are the Sole Licensees for the Erection of Installations on this System
in the United Kingdom and the Colonies.

*LETTERS PATENT No. 1393 of 1904 confer Exclusive Rights
as follows:*

"The Manufacture of Gas by subjecting Coal to distillation in a Vertical Retort heated to a higher temperature than is usually employed in Gas Manufacture so that Coke is formed from the internal walls of the Retort inwards and the Gas generated passes inwards and upwards through the central portion of the charge the Retort being charged with Coal up to the same level as that up to which the external heat is applied so that no space is left in which the Tar can quickly separate it being compelled to pass upward through the uncoked internal portion of the charge before leaving the Retorts substantially as, and for the purposes, hereinbefore described."

THESE RIGHTS HAVE BEEN UPHELD BY THE HIGHEST COURT OF LAW IN GERMANY

(See "JOURNAL OF GAS LIGHTING," July 13, 1909, p. 96.)

The first Installation in England has been erected at the SUNDERLAND
GAS=WORKS, and will shortly be in Operation.

THE SYSTEM HAS NOW BEEN ARRANGED FOR ADAPTATION TO MODERATE SIZED WORKS.

Consulting Engineer: Mr. CHAS. HUNT, M.Inst.C.E.

Joint Sole Contractors { SAMUEL CUTLER & SONS, Millwall and Westminster.
GRAHAM, MORTON, & CO., Leeds.

For further Particulars, apply to the Secretary,

C. HOLMES HUNT,

17, VICTORIA STREET, WESTMINSTER, S.W.

NEW PATTERNS FIRES 1909-10



The "MADEIRA."

**MOST ARTISTIC AND GRACEFUL IN
DESIGN.**

Fitted with Patent Non-Lighting
Back Burner.

Supplied with double Fuel and Ordinary
Grid Pattern Fire Bar as shown, or with Patent
Single Row Fuel and Single Fire Bar as illus-
tration of "Aden" below, as desired.

For Rooms up to 18 feet square.

Fire opening 12 in. wide.

Sizes over all:

22 in. Wide, 30 in. High, 9 in. Deep.

The "ADEN."

**DESIGNED ON BOLD AND ARTISTIC
LINES.**

Fitted with Patent Non-Lighting
Back Burner.

Supplied with Patent Single Row Fuel and
Single Fire Bar as shown, or with double Fuel
and Ordinary Grid Pattern Fire Bar, as illus-
tration of "Madeira" above, as desired.

For Rooms up to 18 feet square.

Fire opening 12 in. wide.

Sizes over all:

22 in. Wide, 30 in. High, 9 in. Deep.



FLETCHER, RUSSELL, & Co., LTD.,

Palatine Works, **WARRINGTON.**

Show-Rooms:—134, Queen Victoria Street, LONDON, E.C., 130, Deansgate, MANCHESTER.

AN AMERICAN VERTICAL-RETORT BENCH.

The Daniel R. Russell Patent.

Under date of Aug. 9 (No. 930,494), the American Patent Office has issued the specification of a patent granted to Mr. Daniel R. Russell, of St. Louis, Mi., for "new and useful designs in connection with vertical-retort benches." The "American Gaslight Journal" of the 20th ult. reproduced the text of the specification (with the drawings); and the following particulars were obtained from the columns of our contemporary.

The patentee's object is to provide means by which the heating of the various parts of the retorts can be independently regulated, so that the highest temperature may be had at the centre or at either end of the retort.

The furnace A has communicating with it a flue B, for conduct-

ing the heating gases to the various combustion chambers C by means of the passages D. The heating chambers (six in number) are formed in pairs, by means of passages E. Each pair of chambers thus constitutes a set connected together, but entirely independent of the other sets. Passing through the various chambers are vertical retorts F, which, in the furnace shown, are four in number.

In order to insure the circulation of the heated gases around the retorts, each of the chambers C is provided with a pair of short baffle-walls connecting the front pair of retorts with the front portion of the furnace; another pair of baffle-walls connecting the front and rear retorts. These latter are provided with passages G, and also with a pair of inwardly projecting baffle-walls H. While each set of combustion chambers is thus provided with two gas inlets, a single outlet only is provided for the gases from the two chambers constituting a set. This outlet I communicates with a set of recuperator flues J. The sets of these

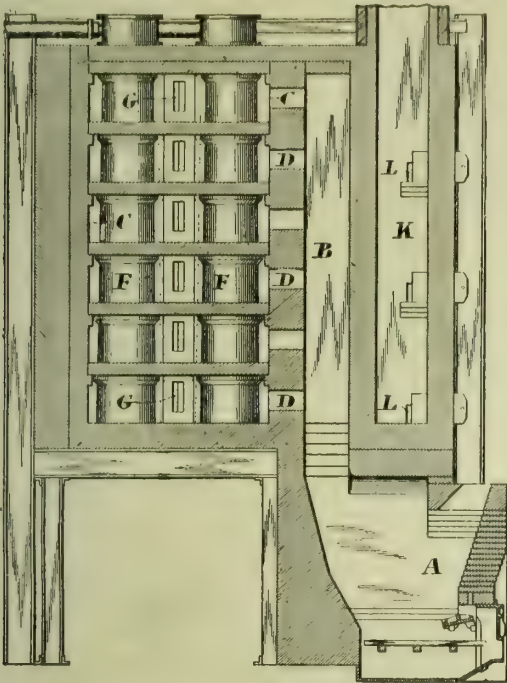


Fig. 1.—Vertical Central Section.

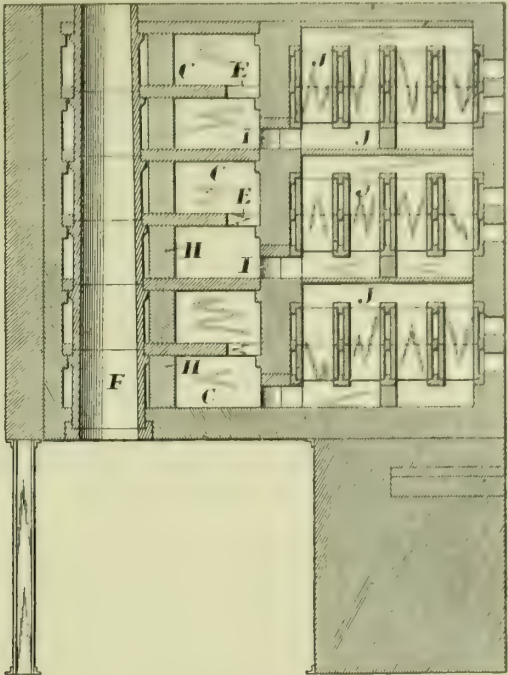


Fig. 2.—Vertical Section on Line 2 of Fig. 3.

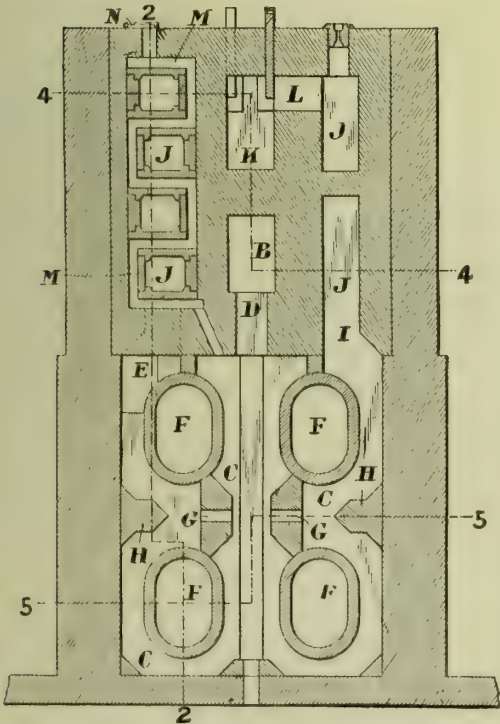
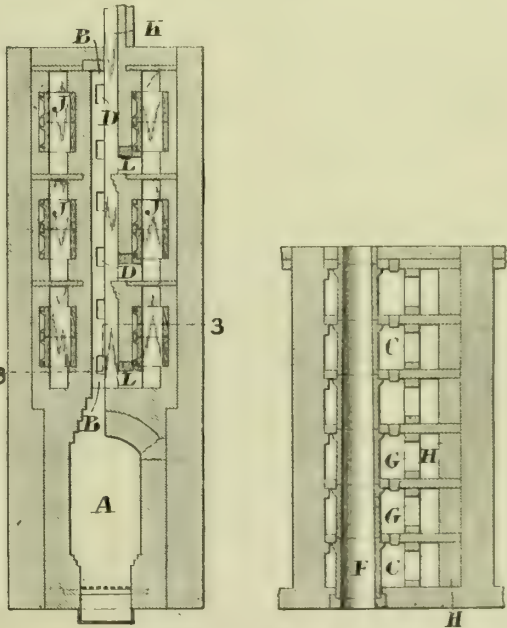


Fig. 3.—Horizontal Section on Line 3 of Fig. 4.

recuperator flues are three in number—one for each set of heating chambers. The gases, after passing through the flues, enter the chimney K through a passage L. Each of these passages is provided with a valve or damper, by means of which the passage of gases to the chimney is regulated—thus indirectly regulating the passage of gases from the flue B to the two corresponding heating chambers. The recuperator flues are provided with stoppers for giving access to them.

In order to supply heated secondary air to the various combustion chambers, each set of recuperator flues J is provided with a pair of sinuous passages M, communicating at one end with one



Figs. 4 and 5.—Vertical Cross Sections on Lines 4 and 5 of Fig. 3.

of the combustion chambers and at the other with the atmosphere. The latter passage is controlled by a damper N, so that the supply of secondary air can be regulated to correspond with the amount of gases entering the heating chamber.

In the operation of the bench, the heated gases from the furnace pass into the various heating chambers C. The quantity of gases entering each set of heating chambers, however, can be independently regulated by the valves or chambers provided, as the gases will not enter the combustion chambers unless a corresponding amount of the products of combustion escape through the openings into the chimney K. At the same time a supply of secondary air to each of the combustion chambers can be independently regulated by the dampers N. In this way "perfect control is obtained by the heating of the retorts throughout their entire length, and at the same time the construction is simple and not liable to get out of order."

GLOVER-WEST VERTICALS AT ST. HELENS.

Additional Tests by Dr. Colman.

In the issues of the "JOURNAL" for June 8 and July 20, results were given of tests made by Dr. Harold G. Colman of the Glover-West vertical retorts at St. Helens, when carbonizing washed Orrell nuts and Thornley unscreened coal. We are now able to supplement the figures already published by others relating to further tests carried out by Dr. Colman with Yorkshire Silkstone coal from the Barrow Colliery and Wigan Arley Mine coal.

TEST WITH YORKSHIRE SILKSTONE COAL.

Coal Carbonized.—The total quantity of coal carbonized was 57'05 tons; an average sample, taken from the trucks as unloaded, giving the following figures on analysis:—

Moisture	1'64 per cent.
Ash	5'95 "

Gas Made.—The total quantity of gas produced from the above quantity of coal was 709,400 cubic feet, corrected to 60° Fahr. and 30 in. barometer. Therefore the yield of gas was—

12,435 cubic feet per ton.	
237,500 " per diem.	
29,687 " per retort per diem.	
1,484 " per foot of retort per diem.	

Quality of Gas.—Average samples of gas were collected in a holder of about 1000 cubic feet capacity; the period of collecting being mostly from ten to eleven hours. These were tested for illuminating power and calorific power with the following average results:—

Illuminating power . . .	16'19 candles, No. 2 Met. burner
Calorific power (gross) . .	584'9 B.Th.U.
" " (net)	522'0 "

Composition of Gas.—Samples were subjected to the complete analysis, and gave the following average results:—

	Per Cent.
Carbonic acid	1'10
Unsaturated hydrocarbons	2'70
Oxygen	0'20
Carbonic oxide	7'30
Methane	32'30
Hydrogen	53'75
Nitrogen	2'40
	99'75

Production of Coke.—The total yield of coke, weighed moist a short time after discharging, was 43'475 tons, an average sample of which contained—

	Per Cent.
Moisture	12'5
Ash	9'1

The yield of coke is therefore—

15'3 cwt. per ton moist as weighed,
or 13'3 " " dry "

Generator Fuel.—The total weight of coke (containing 7 per cent. of moisture) used in the generator during the test was 8'25 tons, or equal to

14'4 per cent. of moist coke.
13'4 " " dry coke.

Yield of Tar.—The total production of tar, free from liquor, amounted to 708 gallons, or equal to

12'4 gallons per ton.

Quality of Tar.—The tar was much thinner than that obtained from the same coal in horizontal or inclined retorts, and gave the following figures on analysis:—

Specific gravity, at 60° Fahr., 1'084.

Composition by Distillation, &c.

	Per Cent. by Volume.	Per Cent. by Weight.
Light oils up to 170° C.	8'5	6'7
Middle oils, 170° to 270° C.	25'2	21'7
Heavy oils, 270° to 350° C.	24'1	22'5
Pitch above 350° C.	—	48'5
Naphthalene	—	6'9
Free carbon	—	3'6

Yield of Ammonia.—The total yield of ammonia, calculated as 10-oz. liquor, amounted to 1364 gallons, or equal to

23'9 gallons of 10 oz. liquor per ton,
20'1 lbs. of sulphate of ammonia per ton.

Yield of Cyanide.—A test of the gas at the inlet to the washer showed the following:—

Cryst. sod. ferrocyanide
(Na₄FeCy₆.10H₂O) = 4'56 lbs. per 10,000 cubic feet,
= 5'67 lbs. per ton.

Total Sulphur in gas purified with oxide only—
27 grains per 100 cubic feet.

Naphthalene in purified gas—
3'3 grains per 100 cubic feet.

TEST WITH WIGAN ARLEY MINE COAL.

Coal Carbonized.—The total quantity of coal carbonized was 81'82 tons; an average sample, taken from the trucks as unloaded, giving the following figures on analysis:—

Moisture	1'39 per cent.
Ash	3'58 "

Gas Made.—The total quantity of gas produced from the above amount of coal was 993,712 cubic feet, corrected to 60° Fahr. and 30 in. barometer. Therefore the yield of gas was—

12,145 cubic feet per ton.	
249,050 " per diem.	
31,131 " per retort per diem.	
1,557 " per foot of retort per diem.	

Quality of Gas.—Average samples of the gas were collected in a holder of about 1000 cubic feet capacity; the period of collection being mostly from ten to eleven hours. These were tested for illuminating power and calorific power, with the following average results:—

Illuminating power . . .	15'22 candles, No. 2 Met. burner
Calorific power (gross) . .	576'2 B.Th.U.
" " (net)	516'3 "

Composition of Gas.—Samples were subjected to complete analysis, and gave the following average results:—

	Per Cent.
Carbonic acid	1'15
Unsaturated hydrocarbons	2'45
Oxygen	0'15
Carbonic oxide	7'30
Methane	33'90
Hydrogen	51'65
Nitrogen	3'25
	99'85

Production of Coke.—The total yield of coke, from a quantity of 41'22 tons of coal, was 32'55 tons, weighed moist a short time after discharging. An average sample contained—

Moisture	12'05 per cent.
Ash	5'87 "

The yield of coke was therefore—

15'8 cwt. per ton moist as weighed,
or 13'9 " " dry.

Generator Fuel.—The total weight of coke (containing 7 per cent. of moisture) used in the generator during the test was 10'68 tons, or equal to

13'1 per cent. of moist coke.
12'2 " " dry coke.

Yield of Tar.—The total production of tar free from liquor amounted to 883 gallons, or equal to

10'74 gallons per ton.

Quality of Tar.—The tar was comparatively thin, and gave the following figures on analysis:—

Specific gravity, at 60° Fahr., 1'075.

Composition by Distillation, &c.

	Per Cent. by Volume.	Per Cent. by Weight.
Light oils up to 170° C.	7'4	5'8
Middle oils, 170° to 270° C.	26'6	23'1
Heavy oils, 270° to 350° C.	29'5	27'8
Pitch above 350° C.	—	42'7
Naphthalene	—	6'7
Free carbon	—	3'8

Yield of Ammonia.—The total yield of ammonia, calculated as 10-oz. liquor, amounted to 2338 gallons, or equal to

28'6 gallons of 10-oz. liquor per ton,
24'2 lbs. of sulphate of ammonia per ton.

Yield of Cyanide.—A test of the gas at the inlet to the washer gave—

Cryst. sod. ferrocyanide
(Na₄FeCy₆.10H₂O) = 4'65 lbs. per 10,000 cubic feet,
= 5'64 lbs. per ton.

Total Sulphur in gas purified with oxide only—
30'2 grains per 100 cubic feet.

Naphthalene in purified gas—
3'3 grains per 100 cubic feet.

In the last number of the "JOURNAL," we expressed to M. Payet, who has relinquished the secretaryship of the Société Technique du Gaz en France, our best wishes for his success in the position he will in future occupy in connection with the French "National" Gas-Engine Company. To-day we have to offer him our hearty congratulations on his approaching marriage with Mlle. Irène Gallo, daughter of M. Gallo, Manager of the gas-works at Arles, in which town the ceremony will take place next Saturday.

At the meeting of the Exeter City Council last Wednesday, the Town Clerk reported the receipt of a letter from Mr. F. T. Depree, resigning his seat as a member for St. Leonard's Ward, and enclosing the fine of £5. According to the "Western Morning News," Mr. Depree has taken this step in order to become the Conservative candidate in St. Thomas's Ward (the representative of which is retiring). The works of Messrs. Willey and Co., of which Company Mr. Depree is Chairman, are situated in this ward, and a large number of the employees live in it.

WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.

Half-Yearly Meeting at Tenby.

TENBY, the delightful home of the Incoming President, Mr. A. H. Brookman, which was the place chosen for last week's meeting of the Institution, was, of course, certainly off the "beaten track," and somewhat difficult of access for many of the members. But those who were able to attend were well rewarded for any journey they might have had to undertake, for the gathering proved to be in every way a successful one. After the deluge of Tuesday, which wrought such sad havoc in the valleys of South Wales, Wednesday morning was beautifully fine; and those who were early on the spot found it somewhat difficult to turn their minds to business among such charming surroundings. Towards noon, however, other members began to arrive; and punctually at the appointed hour a move was made to the Assembly Rooms, where the business meeting, extending over a couple of hours, was held. Among the visitors were the President of the Institution of Gas Engineers (Mr. James W. Helps, of Croydon) and Mr. Norton H. Humphrys, of Salisbury; and both these gentlemen, on the invitation of Mr. Brookman, took part in the proceedings, which were also attended by Directors of the Gas Company. It is always a pleasure to see the useful services of a Gas Manager acknowledged; and the kindly references made by Alderman John Leach, J.P. (who acted as spokesman for the Directors), to Mr. Brookman's work, were cordially appreciated by the members. Mr. Brookman has been at Tenby for upwards of thirty years, and has seen the yearly output rise from about 7 million cubic feet to something like 27 millions. The output of gas is at least as great in August as in mid-winter—which is a pleasant state

of affairs. But Mr. Brookman enjoys also other advantages. In such a lovely little place as Tenby, the gas-works could hardly fail to be attractively situated. But even so, their position proves to be a surprise for the visitor. Placed in a little hollow, the surrounding trees almost completely hide them from the view of prying eyes; and were it not for the tell-tale gasholder, one would search the landscape in vain for any sight of them. Surely, some of his fellow-managers must have envied Mr. Brookman, when they found their way into his works, and saw themselves standing on the greenest of grass, and with fruit trees and flowers of all kinds within reach of their hands! For a full description of the works, readers may be referred to the interesting paper by the President, which we shall reproduce next week. It will be seen that the Tenby gas undertaking occupies a peculiar position, in that the Company work under a lease from the Corporation, who receive a rent; while the charge for gas is regulated by a sliding-scale, dependent upon the price of coal delivered at the works. A capital luncheon, the hosts at which were the Chairman and Directors of the Gas Company (though the Chairman himself, Mr. H. Travers Smyth, was unfortunately prevented from being present), formed an agreeable portion of the day's proceedings; while Alderman Leach's description of the historical and other associations of the town was also greatly enjoyed. The technical fare, too, was of an interesting character; and altogether it is safe to assume that the members left Tenby with regret, and carried away with them the pleasantest recollections of the meeting and of the warmth of the welcome extended to them.

The Meeting.

The Directors of the Tenby Gas Company had kindly provided a room for the business meeting in the Royal Gate House Hotel Assembly Rooms; and here the members gathered at noon last Wednesday. At the opening of the proceedings, the chair was occupied by Mr. THOMAS ACLAND, of Llanelly, the Retiring President, who subsequently gave place to Mr. A. H. BROOKMAN, the new President.

A WELCOME.

Before the business was entered upon, Mr. C. W. R. STOKES, the Secretary of the Gas Company, introduced his Directors, and said they had pleasure in being present at the meeting. The Chairman (Mr. Henry Travers Smyth), he was sorry to say, was unavoidably absent; but his place would be taken by Alderman John Leach, J.P.

Mr. ACLAND said the members were very glad indeed to have the Directors of the Company with them.

Alderman JOHN LEACH then addressed the meeting, and, after apologizing for the absence of the Chairman of the Company, welcomed the members to Tenby. They were pleased, he said, both as individuals and as a Company, that the Institution had selected Tenby as their place of meeting. He believed it was the first time they had come so far west; but having done so, they had found a very pretty and pleasant little place for the meeting. The Company felt very proud that the members had chosen Mr. Brookman as their President for the coming year. They had known his capabilities for a long time. He had done good service for the Company; and he (the speaker) was sure that this good service he would endeavour to extend to the Institution and other bodies with which he might become connected. They were aware, probably, that Tenby was by no means a new place. In fact, it was a very old town, and had considerable archaeological and other associations. [These he proceeded to indicate at some length to the members.] In the year 1835 the first election of a Town Council took place; and improvements were then undertaken, one of which was the establishment of a gas-works. It was an interesting fact that it was only in 1810 that a big London Gas Company was incorporated, and three years afterwards that Westminster Bridge was illuminated by gas; and about twenty years later Tenby was talking about the establishment of a gas-works. It was worth noticing that Tenby, even at that time, possessed a progressive spirit, though it was in want of money. During the period since 1836, under the Corporation's Act, they had spent on water supply, drainage, improvement of roads, laying out of open spaces, and other matters, a sum of from £70,000 to £75,000—not a small amount for a small town, that, at its best, had not a population of more than 4500. He had now only to express the hope that their stay, short as it was, would be a happy one, and that they would take home with them pleasant recollections of the place.

Mr. ACLAND, on behalf of the Institution, thanked Alderman Leach for acting on the part of the Directors, and for the in-

teresting statement he had made of the incidents connected with the ancient and historical town in which they were meeting.

MINUTES OF THE LAST MEETING.

The HON. SECRETARY (Mr. Octavius Thomas, of Pentre) read the minutes of the meeting held last May at Barry; and they were confirmed.

THE LATE MR. THORNTON ANDREWS.

The HON. SECRETARY then read the following letter from Mr. George Andrews, dated June 8, 1909: "I beg to acknowledge the receipt of your letter of the 4th inst., forwarding a copy of the resolution passed by the members of the Wales and Monmouthshire Institution of Gas Engineers at their meeting held on the 19th ult. Will you please convey to the members of the Institution our thanks for the kind vote of condolence with us on the death of our father."

AFFILIATION WITH THE PARENT INSTITUTION.

The HON. SECRETARY read a letter from Mr. W. T. Dunn, the Secretary of the Institution of Gas Engineers, stating that the application for the affiliation of the Wales and Monmouthshire District Institution of Gas Engineers and Managers with the Institution of Gas Engineers had been duly laid before the Council of the latter body, when it was unanimously resolved that it should be acceded to.

APOLOGIES FOR ABSENCE.

The HON. SECRETARY said he had received letters of apology for absence from the Presidents of several of the District Associations. Alderman Thomas Canning had written saying that he regretted very much that he could not, after trying hard, see his way clear to get to Tenby for the meeting. After a very arduous season's work, he was taking a short rest, and could not much prolong it; and so reluctantly he had to forego the Tenby meeting, to which he had looked forward with much interest.

DEATH OF MR. DAVID JONES.

Mr. ACLAND said he had now a rather sad duty to perform; and that was to propose a vote of condolence with Mrs. David Jones and family in the loss they had sustained by the death of Mr. Jones, who was a member of the Council of the Institution, and Manager of the Dowlais Gas-Works.

The HON. SECRETARY seconded the vote, which was passed by the members rising silently in their places.

NEW MEMBERS.

On the proposition of the HON. SECRETARY, seconded by Mr. R. A. BROWNING (Neath), the following new members were unanimously elected: Mr. James Black, Gas Manager, Sharpness Docks; Mr. Robert John Calderwood, Gas and Water Manager, Milford Haven; Mr. J. Gibbon, Gas Manager, Haverfordwest; and Mr. William Valon Watson, Gas Manager, Ebbw Vale.

THE NEW PRESIDENT.

Mr. ACLAND said he now had the pleasant duty of introducing the President Elect, Mr. A. H. Brookman—pleasant it really was, because he knew that in his hands the affairs of the Institution would be in good and safe keeping. He was sure that Mr. Brookman, assisted by their able Hon. Secretary, would uphold the dignity and credit of the Institution; and he hoped his year of office would be as happy as his own had been.

Mr. BROOKMAN then took the chair, amid applause. He said he felt that, though the Institution had not been a long time in existence, he had to follow men who had distinguished themselves in the profession. He had an arduous task to perform in any way arrive at their standard; but he hoped, with the assistance of the members and of the Hon. Secretary, to satisfactorily discharge the duties of the position and help on the work of the Institution. He thanked them all for the honour done him.

THANKS TO THE RETIRING PRESIDENT.

The PRESIDENT said his first duty was to propose a vote of thanks to Mr. Acland, the Retiring President. Those who knew Mr. Acland were aware that anything he undertook would be well done; and the members of the Institution had had ample evidence of his ability. He had conducted the meetings in an excellent manner, and ably carried out all the work. He therefore had great pleasure in proposing a hearty vote of thanks to him.

Mr. BROWNING seconded the proposition, which was cordially agreed to; and Mr. ACLAND briefly returned thanks.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—My first duty is to thank you for the honour you have conferred upon me by electing me President for the ensuing year, and for the additional compliment you have bestowed upon me in selecting Tenby as the place of your fifth annual meeting. I can assure you this is as much appreciated by my Board of Directors as by myself.

Before proceeding to refer to gas matters in general, I should like to say a word or two about the Wales and Monmouthshire Institution, and to congratulate you on the progress it has made, and on the prosperous position it has attained in so short a time. It is just four years this month since we held our first meeting, under the presidency of Mr. Thomas Canning; and when we look back over those four years, and review the useful work accomplished, I think you will agree with me that we have much reason to be gratified with the success that has attended the establishment of this the youngest District Association of Gas Engineers. We recognize that our heartiest thanks are due to those gentlemen who initiated the idea and brought it to fruition.

Two meetings have been held each year, for business and the discussion of papers; and the following towns have been visited: Cardiff, Newport, Swansea, Neath, Shrewsbury, Llanelli, and now Tenby. Papers have been read on a variety of subjects, all of which have been the means of imparting useful and valuable information to the members. Indeed, in this respect, I am of the opinion that District Associations, owing to the peculiar position they occupy, serve a more useful purpose than the parent Institution. I have noticed, from my own observation, that at meetings of the smaller bodies, members are more inclined to express their thoughts and opinions freely than they do in the larger assembly, composed, as it usually is, of experts on gas matters, gathered together from all parts of the world. I think the chief aim of a District Association should be to afford opportunity to its members to meet for free discussion and interchange of views on current topics connected with the gas industry. Instead of following the beaten track of listening only to prepared papers, I would suggest that we should encourage informal discussions similar to that on the question of the calorific power standard which was so ably introduced by our ex-President (Mr. Acland) at the Barry meeting in May last. We might also invite gentlemen who are not members of the Association to attend the meetings and add to our stock of information, by speaking on questions which directly affect the gas industry. In some districts, Commercial Sections and Investigation Committees have been formed; and the advisability of following this example is a point worthy of consideration on our part.

Another point in favour of the District Associations is that they can hold their meetings in towns, such as Tenby, which are not likely to be visited by the Institution of Gas Engineers. Thus the smaller undertakings are brought into touch with the leaders of our profession, and derive advantages similar to those enjoyed by larger towns. In remote districts visits from brother managers are extremely rare; and the result is that we are perhaps liable to get a little rusty and antiquated in our views of things. It should, therefore, be of immense advantage to managers of such works as I speak of to have a District Association to visit them; for the more opportunities we have of meeting together in friendly conference, and of assisting each other to solve the many knotty problems that confront us, the better it will be for the gas industry in general, and for the works we have under our control in particular. We may at times get a rude awakening from some of our cherished and crusted notions; but we shall be all the better for the shaking up.

In passing, I may refer to the decision of this Association to affiliate with the Institution of Gas Engineers, which was reached at our last meeting. This is a step which should add to the use-

fulness and the influence of our Association. We have now the power of nominating a representative on the Council of the Institution; and those members who have not yet joined the Institution have the privilege of doing so without payment of the entrance fee—an advantage of which I hope they will very largely avail themselves.

I take this opportunity to congratulate the Livesey Memorial Committee on the success of their efforts. They have been able to establish a Chair for Fuel and Gas Engineering at Leeds University. It is a worthy commemoration of one who was, in the broadest sense of the word, a benefactor to his race. I take it that those who teach or give to others the means of improving themselves, work on a higher platform, and do more lasting good, than those who merely administer charity. It is a good and glorious thing to relieve suffering, and I would be the last to disparage charitable effort; but is it not better to destroy the root of the evil than to administer a palliative? The man has gone, but his work remains. We were glad to join with other District Associations in supporting such a deserving movement, and that not only from the commemorative aspect, but also because of the crying need in our profession for the best obtainable scientific and chemical training. Many have essayed in the past to enter upon this department, but have found it a difficult and a toilsome matter. The present effort will tend to smooth the way.

I am sorry that the first scholar has not entered the gas profession. But he is not altogether lost to us; on the contrary, he is now in a position to do useful work for the industry. Yet why did not one of our leading gas undertakings secure the honour of employing the first Leeds scholar? And here I venture to tread on somewhat delicate ground. There is room for more practical appreciation of the trained scientist. Young men are being continually urged, in season and out of season, to educate and improve themselves. Yet there are widespread complaints among medal winners, holders of scholarships, and other distinctions, as to the difficulty of getting employment. When we read advertisements like this: "Wanted, for a gas-works laboratory, thoroughly qualified man, salary 30s. a week," we wonder whether the time and money spent on technical training are considered to have had a practical end in view. Is it undertaken for amusement or for business purposes? Is the student to practically give away the results of his labours for the direct benefit of one gas undertaking and the indirect benefit of all? Is he expected to take up scientific work as a pleasant recreation for leisure hours? Or is he to regard it as a means of earning a respectable living? Of necessity, it means the last-named to ninety-nine out of a hundred. Until a reasonable financial inducement is much more in evidence than it is at present, the best abilities will not be attracted to the gas industry. Parents and guardians do not fail to appreciate the signs of the times, and the promising young scientist will be advised to direct his attention elsewhere.

The Council of the Institution of Gas Engineers, having drawn attention to the proposed "Regulations for Financial Organization and Administration" suggested by the Institute of Municipal Treasurers and Accountants, it will be of interest to those members working under local authorities to consider the matter. The recommendations proposed are as follows:

That it should be made compulsory for every local authority of sufficient size to appoint a Finance Committee, with general powers of control and supervision of all matters of finance.

The term "Financial Officer" is defined as meaning "the treasurer, accountant, or comptroller acting as the chief financial officer of the Council."

Separate annual estimates of capital and revenue accounts shall be submitted to the Finance Committee of the Council in such form, and under separate headings, as the Finance Committee prescribe. The preparation of the estimates shall be by the various heads of departments, in consultation with the financial officer.

"He" (presumably the financial officer) shall present the draft estimates to the various Committees for approval, and at the same time furnish the Finance Committee with a copy thereof.

The financial officer shall bring up to the Finance Committee the annual estimates approved by the various Committees.

In considering the capital estimates, the Finance Committee shall have regard to the maximum amount which, in their opinion, the Council should seek to borrow in the year.

No liability exceeding £50 shall be incurred (by any Committee) without the express sanction of the Council, except in the case of Committees acting in pursuance of statutory or specially delegated powers of expenditure.

It shall not be in order to submit estimates to the Council through any Committee other than the Finance Committee, except in cases of urgency, or where the Council is under statutory obligation to proceed.

No recommendation or proposal involving expenditure on capital account shall be submitted by the Finance Committee to the Council.

The heads of departments shall submit to the financial officer the contractors' detailed accounts and measure bill, for his examination and comparison with the contract, specifications, and bills of quantities, also a statement showing the additions and deductions on the contract (if any); and the final certificate of the heads of departments is not to be issued until this has been done.

The heads of departments shall furnish the financial officer with particulars of all estimates and tenders.

In connection with this matter, a Departmental Committee was appointed in 1906, by the President of the Local Government Board, to inquire into, and report upon:

1—The system on which the accounts of local authorities in England and Wales are at present kept.

- 2—Generally as to the system, and in particular whether such accounts should be prepared on a system requiring the entries of receipts of money or not.

- 3—The regulations which should be made on the subject.

Their report was issued in July, 1907. Twenty-eight witnesses were called before the Committee, of whom six were district auditors and fourteen were nominated by various associations. The Institute of Municipal Treasurers and Accountants were represented; but the Institution of Gas Engineers or any of the other professional institutions were not. The system of accounts recommended is what is termed the "Income and Expenditure System," which is the one already in use in connection with nearly all trading concerns belonging to local authorities, instead of the "Receipts and Payments" system, usually adopted in connection with the collection of rates. The Committee also recommend the appointment of an officer to control the accounts, independently of the official in charge of trading or other departments. You see, then, that the Institute of Municipal Treasurers and Accountants have taken advantage of the report, and are trying to push the matter forward. It is interesting to note that the system recommended, with the exception of small additional details, is precisely what the managers of the various gas undertakings are already using, though no credit is given them for it. As it is important that every chief officer of a department should retain his authority, it behoves all to do their utmost to oppose the movement suggested by the Institute of Municipal Treasurers and Accountants.

With regard to technical matters, I think that we are extremely fortunate in having many high-class journals to represent the gas industry. Every week their pages are full of well-written articles, scientific and technical. In fact, no subject or question relating to gas matters seems to escape their attention; and I have no hesitation in saying that the forward movement and new spirit of energy which have characterized the gas industry of late years is largely due to the stimulating encouragement of the Technical Press, of which, no doubt, you are all diligent readers. I therefore feel that it would only be a waste of time if I attempted to make a long address on technical matters. There are, however, some aspects of the present position of the industry that I would like to touch upon. The majority of the members of this Association are (like myself) managers of small or medium-sized works. My remarks, therefore, must be understood to apply more particularly to those who occupy such a position than to managers of large undertakings. You are well aware that the multifarious duties and the daily routine work attached to the position of a gas manager are sufficient to keep him fully occupied; leaving him little time to wander through the attractive fields of experiment and research.

I have been connected with the gas industry long enough to have seen many changes brought about, and new conditions arise, both in the manufacture and the supply of gas; and while some of these have relieved the manager of many worries and anxieties, others have added greatly to his responsibilities. There was a time when a gas-works could shut down for a day or so in the summer months for the purpose of effecting alteration or repairs. Now it is difficult to do so even for a few hours; for directly the requirements of the lighting season begin to slacken off, the demand for cooking and other purposes increases. In fact, the tendency towards an equal load, day and night, summer and winter, is rapidly growing, and affords evidence of the extended use of gas for industrial and domestic purposes. To cope with these new conditions, our works need to be equipped with the very best plant, which should always be kept up to the highest standard of efficiency—indeed, it is absolutely necessary to duplicate many parts of our works as a safeguard against unforeseen contingencies. Another feature of this changed condition of things is that we cannot follow Mr. Newbigging's advice and keep down the pressure in the mains. On the contrary, it is necessary to keep up a uniform pressure day and night. From this, and with the increasing use of the steam-roller and the growth of heavy traffic on the roads and streets, it follows that the problem of reducing the leakage account to reasonable limits is rendered more and more difficult.

Another difficulty with us at Tenby—and I daresay many of you have met with the same experience—is the disposal of coke. The production of coke at a time of the year when there is very little demand for it is forced upon us by this growing consumption of gas. A remedy would, of course, be found in the adoption of one or other of the carburetted water-gas plants; and this is a step we are seriously contemplating at Tenby.

Perhaps of the many problems confronting the gas manager at the present day, none is more perplexing than that of deciding upon the particular type of plant or machinery that will be most suitable for the works under his charge, and is likely to prove the best investment in the long run. There is a growing tendency to adopt labour-saving appliances for every purpose for which it is thought they can be profitably employed. But while the manager does well to take advantage of the numerous inventions available for reducing the cost of gas production and displacing the heavy manual work of the retort-house, he requires to exercise great care and caution before committing his proprietors to capital expenditure which may take years of saving to overtake. Machinery, looked at from one point of view, may appear economical; but when interest on outlay is considered, and proper allowance made for depreciation, the case may wear a different complexion.

An illustration of this may be found in the rapid evolution of

methods of carbonization. A short time ago the struggle lay between horizontal and inclined retorts, but to-day it is the continuously fed vertical retort that holds the field. This is a modern adaptation of an old idea which has been the subject of much experiment by gas engineers. It may interest you to learn that one of the earliest types of a continuously fed vertical retort was experimented with at Tenby as far back as the early seventies of the last century, by the late Mr. George Wilson Stevenson, who was then lessee of the works. This differed somewhat from the latest type, inasmuch as it was fitted with a central shaft with short lengths of worm or screws, keyed on at intervals of every 6 inches of its length. The idea was to work the coal down by means of the worm, and so obtain continuous feed and discharge. The shaft was the chief cause of failure, as no iron could be found capable of standing the intense heat of the interior of a retort. Whether the modern adaptation of the system is the last word in retort construction, it is impossible to say. He would be a rash man who ventured to say what the next step will be. My own impression is that future developments in the manufacture of illuminating gas must be looked for in another direction. If we glance over the pages of the "Power Gas" number of "Cassier's Magazine," and note the wonderful progress and great strides that have been made in the construction of producer and suction-gas plant within the last few years, it will occur to us that future progress must be on similar lines, as, after all, our chief business is to make gas.

From the consideration of the manufacture of gas, our thoughts naturally turn to distribution. Here, also, we find the same extraordinary progress and changed conditions. Some of us can, I daresay, recall the time when the use of gas was practically confined to lighting; and the principal means of using it for this purpose were batwing and fishtail burners. The past fifty years has been marked by great advances in all the industries of the world; and that which concerns us most (the gas industry), we have seen developing at a remarkable rate and holding its own against all competitors. Although gas no longer holds the monopoly of artificial lighting, the improvement in the means of using it for other purposes has placed it in a much stronger position than it ever held before, and, by means of the great invention of Dr. Auer von Welsbach, it has beaten all competitors in the beauty and cheapness of its light.

When the President resumed his seat,

Mr. ACLAND remarked that a time-honoured custom prevented them from criticizing the Presidential Address. Mr. Brookman had dealt with matters in an able and instructive manner; and he proposed a vote of thanks to him.

This was seconded by Mr. BROWNING, and met with a hearty response at the hands of the members.

THE PRESIDENT briefly acknowledged the compliment.

SOME POINTS OF GAS-WORKS ECONOMY.

THE PRESIDENT said that, in the absence of Mr. J. H. Canning (Newport), who was down on the agenda to open a discussion on "Some Points of Gas-Works Economy," he would ask the Hon. Secretary to read the notes he had prepared and forwarded.

THE HON. SECRETARY said Mr. Canning, in a letter, stated that he had delayed writing until the last moment, hoping that there might be some possibility of him attending the meeting; but he regretted to find it was absolutely out of the question. They were carrying out considerable alterations, including an installation of a Fiddes-Aldridge stoking machine, at the Crindau works; and in consequence his father and he had been obliged to postpone their holidays. His father had just gone away; and so it was quite impossible for him to be absent too.

The notes were then read by the Secretary; and they will be found, together with a report of the discussion to which they gave rise, on p. 47 of this issue.

THE WORK OF THE INSTITUTION OF GAS ENGINEERS.

THE PRESIDENT then introduced to the members the President of the Institution of Gas Engineers (Mr. J. W. Helps, of Croydon). They offered Mr. Helps, he said, a most hearty welcome, and congratulated him on the honour of the great position which he held. He hoped Mr. Helps would make some remarks.

Mr. J. W. HELPS (Croydon) thanked the President very much for his welcome, and for giving him the opportunity of making a few remarks. He said he wanted first of all, before referring to Mr. Canning's notes on "Some Points of Gas-Works Economy," just to allude to one or two matters in connection with the Institution of Gas Engineers and the District Associations. He had very great pleasure in being present at this meeting for two reasons. The first was a personal reason, and the second an official one. With regard to the personal reason, he could lay claim, he thought, to having known their President longer than anyone else had done who was connected with the Association. Mr. Brookman and he (Mr. Helps) were together at the Bath Gas-Works more years ago than he liked to think of; and he felt he could safely say that the first rudiments of work in connection with the distribution department he learnt at the same time that Mr. Brookman learnt his work. He had to thank Mr. Brookman for a good many hints, as a somewhat younger man, in connection with what he did there. To come to his second reason, he wanted to thank the Association, as President of the Institution of Gas Engineers, for their invitation, and to tell them how much he appreciated the honour of that invitation. In the course

of his address, the President had remarked that, owing to the peculiar position they occupied, he was of opinion that the District Associations served a more useful purpose than the parent Institution in the imparting of useful and valuable information to the members. There was a great deal in this; and he thought it was on the principle, which they all knew to be a true one, that committees really did the main work in all associations. They could not in the parent Institution be cognizant of all the conditions which existed in every district throughout the country; and he thought that the good of the amalgamated Societies, as they now had them, arose from the fact that they were able in London to "bottle up" and get in a concentrated form the requirements and needs of the gas managers spread all over the country. In this way, they were in a better position to deal with them than they would have been without affiliation. He congratulated the Wales Association on having affiliated with the parent Institution. It was going to have mutual advantages. The parent Institution were going to derive good from learning the views that would thus be put before them; and he felt sure the Wales Association themselves would benefit from being able to send up to the Institution their own ideas and their own needs through the accredited representative who would sit at the Council meetings from time to time. It seemed to him that in their great industry—the gas industry—the truth of the good old saying "Unity is strength," was very strongly shown. They had proved by these amalgamations that they had unity on the professional side; but he thought this unity wanted to be carried a little farther. It was no good to expect that the amount of work that ought to be done could be accomplished with the finances that were at their disposal. These were derived simply from the subscriptions of 800 or 900 members, which formed the revenue of the year. They ought to be able to look with confidence for a little more assistance from directors and shareholders of gas companies. It was rather hard to say so at this meeting, because he was now speaking in the presence of some directors who had shown their interest in the Wales Association and its work by attending during the transaction of the technical business, and by the way in which they had backed up Mr. Brookman's efforts in connection with the organization. But he did feel that they had a right to expect from directors and shareholders a little bit more assistance from a financial point of view. He had, he believed, the reputation of being one of the most arrant beggars in the gas industry. He had done a great deal in the way of sending out circulars, &c., asking for help; and in reply he was often asked the question—in connection, for instance, with a gas exhibition to be held in London—"What is the good to us of an exhibition in London? If it were to be in our own district, we should be pleased to support you." This, however, was a very narrow-minded method of looking at things. Anything that was done for the good of the industry in any part of the country, must eventually be reflected in one's own particular district. He hoped these few remarks in regard to the matter would filter through to other directors, and that they would see it was their duty to provide the Institution with the means to carry on the research and different work which they had not so far been able to undertake. This was a matter that received great attention on the Continent; and it was due to this fact that certain countries had gone so much ahead. It was not a very long time ago that one would have been struck by the backwardness of both France and Germany—and especially of the former; but now they were well up with this country, and it was from them that, of late years, Englishmen had obtained many notions and much knowledge, which had enabled them to bring about improvements in their own works. He did want to impress upon those present that it was of the utmost importance that they should do all they possibly could to educate their directors up to the advisability of replying a little more favourably when the question of helping the Institution with funds came before them. The President had referred to the Chair of Gas Engineering at the Leeds University. Now, he (Mr. Helps) had had the pleasure of going over the University, and talking with those responsible for what was being done; and he thought he could assure the members that a very great work had been started there, and one which would not only have a highly beneficial effect on the industry from the point of view of the education of young men, but would, by the researches carried out, put an end to many difficulties and set at rest many doubts the solving of which would be of great assistance to them in the conduct of their work. He appreciated the honour of the invitation that had been extended to him, and thanked the members very heartily indeed, on behalf of the Institution of Gas Engineers and himself, for their kindly welcome, and also the Directors of the Tenby Gas Company for their appreciation of the meeting and the hospitality they were shortly going to extend to those present. Mr. Helps then made some remarks on the subject of Mr. Canning's notes; and these will be found reported elsewhere, along with the remainder of the discussion.

The President said he must thank Mr. Helps for his remarks and the old associations he revived in connection with, he was going to say, their boyhood. Certainly, it was going back almost more years than one cared to remember; but those were happy days, so far as he was concerned. It was very good of Mr. Helps to undertake so long a journey in order to attend the meeting.

THE TENBY GAS-WORKS.

The President had prepared, and distributed copies of, a paper on the Tenby Gas-Works; but owing to pressure of time,

it was agreed that this should be taken as read. The description will appear next week. It is crowded out of the present issue of the "JOURNAL."

VOTES OF THANKS TO AUTHORS.

Mr. BROWNING, in proposing a vote of thanks to Mr. Canning and the President for their contributions, expressed regret at Mr. Canning's absence. They were, he said, always pleased to have his notes and papers, because they were so practical.

Mr. A. W. BRANSON (Caerphilly), in seconding, remarked that a good deal of Mr. Canning's paper was perhaps above the heads of those among them who were connected with small works; but the references to the retort-house they could all take to heart.

The President acknowledged the vote.

APPOINTMENT OF A REPRESENTATIVE ON THE COUNCIL OF THE INSTITUTION OF GAS ENGINEERS.

The Hon. SECRETARY said the first member to be selected to represent the Wales and Monmouthshire Institution on the Council of the Institution of Gas Engineers was their first President, Alderman Thomas Canning. Their next President was Mr. R. A. Browning; and he had pleasure in proposing that this gentleman be now elected as their representative.

Mr. ACLAND seconded this, and it was unanimously agreed to.

PLACE OF NEXT MEETING.

The President said that several places had been suggested for the next meeting; and he proposed that the Council should be left to deal with the matter.

This was agreed to.

TENBY GAS COMPANY THANKED.

Mr. ACLAND proposed, and the Hon. SECRETARY seconded, a hearty vote of thanks to the Chairman and Directors of the Tenby Gas Company for their kindness in providing a room for the meeting, and for the hospitality of which they were about to partake.

The members signified their agreement with this by a round of applause.

THE LUNCHEON.

After having been photographed in a group, the party proceeded to the Royal Gate House Hotel, where they were entertained at luncheon by the Chairman and Directors of the Tenby Gas Company. Over thirty sat down to a most enjoyable repast, at the conclusion of which a short toast-list was gone through. Alderman Leach presided.

Alderman LEACH, after the "Loyal Toast" had been duly honoured, proposed "Success to the Wales and Monmouthshire District Institution of Gas Engineers and Managers." He said they lived in an age of combination. The order of the day seemed to be "Combine;" and he quite appreciated the efforts made to this end on behalf of the Institution, because he believed they must result in good both to the members and to their undertakings.

The President, in responding, thanked Alderman Leach and his brother Directors on behalf of the Institution for their hospitality and the reception they had given the members. The Institution, like others of its kind, existed for the purpose of enabling the members to help each other over difficulties; and in this way they benefited the undertakings they had charge of. It would be impossible to over-estimate the value of these meetings to the gas industry; and he thought he was quite justified in saying that, where advantage had been taken of the hints and suggestions thrown out at the meetings for improving the works and securing economies, it had been the means of adding largely to the profits of the undertakings. Therefore it was gratifying to him to find that his Directors, and other Directors, were learning more and more to appreciate the good that was being done by gatherings of this kind. They thus recognized the value of the work performed; and managers were encouraged to improve the industry, and to strive to bring about further progress.

Mr. ACLAND proposed "The Tenby Gas Consumers' Company," also remarking that it was not only gratifying but very encouraging that they, as members of the Institution, should find that the Directors of the respective gas-works took an interest in the meetings, and assisted them in the kind manner that the Tenby Directors had done on the present occasion. He ventured to hope it would not be the last time they would visit Tenby.

Mr. WILLIAM LEWIS, a Director, returned thanks, and said it had given them great pleasure to entertain the members of the Institution, as they believed such meetings were the means of doing a great deal to advance the interests of the gas industry. They could truly say that since the formation of the Company the aim of the Directors had been to supply the public with a good article at a reasonable cost; and to do this, they had spared no effort to improve the works and to obtain the best results. It was only fair he should acknowledge that a great deal of the success of the Company's operations had been due to their excellent Manager, who, he was pleased to see, had been elected President of the Institution.

The President, in proposing "The Mayor and Corporation of Tenby," said that Alderman Farley, the Mayor, took a great interest in the affairs of the town; and his presence there that day indicated, he thought, the pleasant business relations that always existed between the Corporation and the Gas Company. The interests of the two bodies were identical. They were both specially and peculiarly concerned in the supply of gas—a commodity upon which the welfare and prosperity of a town like Tenby largely depended; and he was glad to see this recognized both by the Company and the Corporation. The result was there was none of that friction between the parties which was generally detrimental to the community and bad for everyone all round.

The Mayor, in reply, remarked that he had been a member of the

Corporation for quite twenty years; and during this period the relations between the Company and the Corporation had always been pleasant. Some nine or ten years ago, perhaps, things were rather strained. A new Company was almost formed; but they found they could not go on with it. The Company had a great deal for which to thank their Manager. Mr. Brookman had plenty of grit.

Mr. D. REES EDMUNDS, Solicitor, Llanelly, on being called upon, said it had afforded him much pleasure to be present, and especially to listen to Mr. Helps's speech, although he must not forget that Mr. Humphrys came in a good second, nor must he omit what the President himself said. He was not connected with any gas undertaking, except as a small shareholder; but he had been concerned, in a way that he thought was not altogether unknown in some parts of the country, within the last two or three years, in bringing about the end of that "bucket-shop" gang who had been a disgrace to the gas-making world, during the last three or four years in particular. He was sure they would forgive him the little conceit he was guilty of in saying this. They had heard that a name had been painted off from a door of a particular office in the City of London. Well, perhaps he (the speaker) was responsible more than anyone else for bringing about this state of things; and he was sure the gas profession and *bond fide* investors in the gas undertakings of this country generally would be the better and healthier for it. He ought to say that both the "JOURNAL OF GAS LIGHTING" and "Gas World" had rendered excellent and unselfish service in bringing the matter about.

Mr. HELPS proposed "The Health of the Chairman," who he said was connected with the Gas Company, and was also a prominent member of the Corporation. He hoped that the relations between the two bodies would be as pleasant in the future as in the past. So long as corporations avoided association to any extent with municipal trading, there was no difficulty whatever in maintaining pleasant relations between them and companies; but it seemed to him that when they got hold of undertakings and ran them contrary to the interests of local trade in the town, friction must at times arise. He had experienced this himself. That such an occurrence had not taken place in Tenby, he thought the ratepayers had much to thank themselves for.

Alderman LEACH, in response, said that if the Chairman of the Company had been able to be present, it would have afforded him as much pleasure to preside as it had himself. A good deal of the success of the Company had been due to the Secretary, Mr. C. W. R. Stokes, a gentleman who, like himself, had been connected with the Corporation for a great number of years. He became Town Clerk; and he was in the forefront of every good thing that took place in Tenby. He proposed "The Health of the Secretary."

Mr. STOKES, in acknowledgment, said he had been connected with the Company since 1876; and from that time to this, his office had always been a most pleasant one. The Directors had always seen eye to eye with the Manager and himself. With Mr. Brookman, they had never had a sign of friction. Mr. Brookman's ambition and his had been first to serve the Company and secondly the consumers. They argued that if they supplied a good article, the consumer would come and take it; and they did everything they could to encourage the people to use gas. The shareholders' interest was the interest of the Company; and they—the Secretary, the Manager, and the Directors—always considered what was best for the benefit of the shareholders, because they had invested their money in the concern and expected to receive good interest. The Company had generally paid $7\frac{1}{2}$ per cent.; and now it was 10 per cent.—a very creditable dividend, which they hoped to continue for years to come. The Corporation had a little difficulty with regard to the renewal of the lease in 1896; but wiser counsels prevailed, and they fell in with the idea that the old Company was the Company for Tenby. He hoped it would continue to be the Company for Tenby as long as he lived.

On rising, the members separated themselves into groups, to visit the gas-works and see as much of the attractions of the town as was possible in the time at their disposal.

SOME POINTS OF GAS-WORKS ECONOMY.

[A Discussion at the Meeting of the Wales and Monmouthshire Institution. Sept. 29.]

Mr. J. H. CANNING (Newport) forwarded the following notes to open a discussion on this subject. These were, in Mr. Canning's absence, read by the Hon. Secretary (Mr. Octavius Thomas).

I fear that in accepting the invitation of the President and Council to open this discussion, I have been actuated more by the certainty of myself acquiring valuable information than by the hope of being able to lay before you anything novel upon so well-worn a subject.

In the first place, it may be advisable to refer briefly to a difficulty which faces us at the very outset, and which, though a matter of common every-day experience to all of us assembled here, is not, however, always fully realized by those possessing a less intimate, practical experience of the daily working of a gas undertaking. This difficulty may be briefly expressed in the statement that it is impossible to lay down a general scheme of effecting economies which shall be beneficially applicable to any and every gas-works. There can nowhere be found a more striking illustration of the proverbial fact that "one man's meat is another man's poison;" for that which constitutes a most laudable and striking economy in one works, would be absolutely prejudicial and ruinous if introduced elsewhere. Speaking generally, economies may be compared with those forms of vegetation which do not usually survive transplantation, but must be sown in the spot where they are to grow. Gas-works throughout the country are mutually indebted to each other for innumerable general ideas of methods whereby saving may be effected; but in almost every case, owing to the varying conditions of site, cost of materials,

market for residuals, and a host of other considerations, the original idea must be modified—sometimes beyond recognition. It is therefore necessary to qualify any remarks upon this most important subject by stating beforehand that it is tacitly understood that any economy referred to is justified by the prevailing conditions.

Economy in capital expenditure, though so important—its presence or absence leaving indelible traces perennially upon the balance-sheet—hardly falls within the scope of to-day's discussion, which is rather confined to working economies, the most striking and most effective of which must from the nature of things be effected in and about the retort-house. This is manifest from the fact that carbonization is, to all intents and purposes, a final and decisive operation. The distillation of the coal once effected, then, whether for good or for ill, the quantity, quality, and composition of the coal gas and the accompanying residuals are practically unalterable. Good carbonizing may be roughly described as the provision of the adequate heat and the moving of the coal and its products respectively into and out of its influence, with the most satisfactory financial results possible under the local conditions. Hence the economies possible divide themselves roughly into those relating (a) to the heating of the retort-settings, and (b) to the mechanical handling of the coal and coke.

At the present time, little that is new can be said as to the working of regenerative furnaces. They are now of practically universal adoption; and their fuel consumption, as well as the uniformity and regularity of the heat furnished by them, leaves in almost every instance little to be desired. It is usual to regulate their working in accordance with the indications yielded by one of the various types of gas analysis apparatus now on the market; and in this connection it must be remembered that, useful as these appliances are, totally erroneous conclusions may be drawn from their indications if they be employed either shortly before or after firing-up or cleaning the fire. In other respects, the chief points requiring attention are the maintenance of a good depth of fuel, rapid firing-up with hot, clean coke, and the keeping clean of the fires and waste-gas flues. As to the actual process of carbonization, the immense developments now taking place in this department of gas manufacture place us all in the position of earnest and observant students. In general, however, it would appear that what may be termed "balance" is being sought, and to some extent attained, in this matter. In other words, such a relative proportion is being observed between the heat of the retort and the weight of charge as, not merely to secure the highest possible make per ton, but to secure that maximum make per ton concomitantly with high calorific value and good yield of residuals, while all such difficulties as stopped pipes and the innumerable troubles attendant on carbonization shall be at a minimum.

In approaching the mechanical handling of coal and coke (in which term mechanical and gravity types of stoking are included), one is immediately struck, both by the immense variety of systems in vogue and also by the considerable amount of success attained by each in its proper sphere. On comparing, for instance, the almost endless procession of coolies, each carrying a few pounds of coal, unloading a cargo for a gas-works in the Far East, with the modern labour-saving equipment of one of the Metropolitan or large Provincial works, one is struck by the apparently immense contrast of method; and yet each undertaking successfully makes use of the most economical means available under its own special conditions—which is, after all, the entire spirit and object of true engineering.

Two points may here be profitably dealt with; and the first is the employment of electricity in gas-works. One of the chief obstacles hitherto to the application of this agent to the purposes of our industry has been a more or less sentimental aversion to the employment of a commercial competitor. This objection would carry more weight were the required energy purchased from a rival concern. But when, as is almost universally the case, gas undertakings generate their own current by means of gas-engines far more cheaply than it can be purchased, it is evident that the grievance (if any) should be felt by the local electrical undertaking. After all, the power is really derived from the gas; electricity forming no more than a convenient intermediary for its distribution, and playing merely the part of the air or water in a compressed air or hydraulic installation respectively.

The use of electricity as an agent for power distribution certainly conduces to economical working in so far as it enables the whole of the power generating plant to be centralized. It must, however, be used with judgment and a certain amount of knowledge; while, if it is to be successful, all motors and their adjuncts must be of full power for the work they are to carry out, as an electric motor does not possess that elasticity and staying power which enable a gas-engine to carry an overload for long periods with ease and security. Were it possible to drive the whole of a gas-works plant direct from one motor, then the gas-engine would be at once the most economical and efficient source of power; but when, as is the actual case, power is required at numerous points, electricity really furnishes a convenient intermediary. The whole of the coal and coke handling plant in use at the Crindau works of the Newport (Mon.) Gas Company is electrically driven, and includes capstans and movable truck tipping-crane on the sidings, coal-breakers, elevator, and push-plate conveyor delivering coal into continuous overhead hoppers, whence, by means of the Aldridge-Gibson patent doors, the coal is automatically supplied to a Fiddes-Aldridge stoking machine, the coke discharged by which is handled by means of an electric telfer.

The telpher is one of those types of plant now coming into use upon gas-works which may be more readily and efficiently driven electrically than by any other means at present available; and the use and capabilities of this machine are the subject of the second point referred to above. One of these plants has now been in use at Newport for three years. Under the conditions existing at these works, a telpher fulfils all requirements most satisfactorily and economically; for it not only removes, extinguishes, and stacks the hot coke, but also loads coke into waggons on the high-level siding and unloads bricks, fire-clay goods, castings, and the numerous and varied materials delivered to a gas-works by rail. But the real and substantial benefit of the telpher is that it handles its load without injury either to the coke or to the plant. The coke can exercise no cutting or grinding action upon the apparatus; and being tipped from the waggons at the least possible elevation, breeze is reduced to a minimum.

The question of breeze also leads one to consider the methods of disposing of the quantity, whether large or small, which will inevitably be produced, even under the most favourable conditions. This material realizes a most inadequate price in the market; and large quantities of it may be profitably consumed in one of the many types of boiler-furnaces suited for burning it. We have at Newport also used with considerable advantage the larger breeze, freed from dust, mixed with coke in a water-gas generator. Either method releases large quantities of valuable coke for sale.

Another minor economy incidental to carbonization may be mentioned. At Newport, the whole of the water used for coke extinguishing, together with the rain water from the retort-house and yard, is caught, allowed to settle, and pumped back to a high-level tank by means of a centrifugal pump electrically driven, and fitted with a float-switch which renders it automatic. Under the conditions obtaining at Newport, this installation has effected a substantial saving during the time it has been in operation.

Turning to the distribution department, there is a development now gradually taking place to which it may be useful to briefly refer, and that is the supply of gas under high pressure. This method of distribution is as yet in its infancy in this country; but notwithstanding this, it has already shown its immense possibilities, either for the complete supply of a district or the reinforcement of an existing low-pressure supply. At Newport, it is now being utilized in each of these capacities, and with the most successful results. Owing to the immense expansion of consumption by means of prepayment meters, many districts in which the demand for gas had been heretofore negligible, and for the supply of which small mains were amply sufficient, are now using considerable volumes—especially in the daytime, for cooking purposes. The laying of new trunk mains for the adequate supply of such districts merely during the hour or two for which such a peak-load continues, would in many cases be out of the question; and here high-pressure distribution exactly meets the requirements of the case. Where only comparatively small and remote districts are to be supplied, the economy effected is, of course, at once obvious.

In concluding this necessarily brief and cursory sketch, it may perhaps not be inappropriate to draw attention to the fact that, before finally deciding to introduce what at first glance appears an excellent economy, it is well to examine it carefully in its most remote bearings upon one's present working. Apparently trivial changes have often the most far-reaching effects; and it is therefore essential that we should spare no thought or pains in order to ascertain that the alteration we are proposing shall be productive of not merely apparent and superficial, but of real and ultimate economy.

The PRESIDENT (Mr. A. H. Brookman, Tenby) remarked that Mr. Canning's notes were of a most interesting character; and he hoped there would be a good discussion.

Mr. THOMAS ACLAND (Llanelli) thought that Mr. Canning's contribution should prove very useful, not only to the members of the Wales Institution, but to those of other Associations as well. The very word "economy," it seemed to him, had an enchantment attached to it. "Economy," he was sure, should form a kind of watchword to every gas manager. In the first place, as Mr. Canning mentioned, they were all well aware that each gas-works was surrounded by its own special peculiarities, and what would be real economy in connection with one undertaking, might be unreal for another. Coming down to the question of carbonizing and the employment of water-gas plants, he had formed the opinion—and, of course, it was only his opinion—that an installation of water-gas apparatus was not of much use in a works of smaller dimensions than 100 million cubic feet per annum, mainly on account of the great part of the year during which the capital expenditure was lying dormant, in consequence of the plant being out of action. As to vertical retorts, if he remembered rightly he made some reference to this subject in the course of the Inaugural Address which he delivered at the meeting of the Institution at Llanelli last year. With few exceptions in this country, the system of vertical retorts had not as yet made much headway; and they found it was mostly being adopted on big works, where they could confine their verticals to one section, and use them mainly for experimental purposes. He did not think the time had yet to come when small works could make the change. He himself had noticed that with verticals the bottom end of the retort got cooled for about a yard up, when the coke was discharged into water, owing to the rush of steam. Personally,

he was quite satisfied to work with the horizontal system, while he could get as good results from it as he was at present obtaining. Just now, he was engaged in erecting three settings of eights on the horizontal system, after very carefully considering the desirability of vertical retorts for so small a works as his, which had a capacity of about 100 million cubic feet a year. With regard to heats, and that sort of thing, the regenerative system of settings had come to stay. No one, he was sure, would go back to the old style of shallow settings. As to the mechanical handling of coal and coke, this must be considered very carefully and fully in the case of the smallest works. Mechanical stoking was highly desirable in works where they could afford, in the first place to find the capital, in the second to provide the money for upkeep, and in the third to maintain the plant in pretty regular working. The question of distribution was a most important one. Economies might be secured if managers considered the possibility of laying down larger mains in the first instance. Twenty-five years ago, where a side street had mains laid for the lighting of perhaps half-a-dozen consumers or one shop, the consumption was exceedingly small; but the introduction of the gas-cooker, the gas-engine, and improved lighting appliances had changed all this, and now, according to his judgment, nothing less than a 6-inch pipe should be put down a side-street if it was probable that the houses in that street would go in for free slot installations, and the gas undertaking was prepared to carry out such work. He was fitting up at the present time many houses a week on this system; and he found that he had to take up a lot of 2, 3, and 4 inch pipes, and substitute 6-inch ones, in order to supply the houses one after another throughout a street. The trunk mains, also, laid twenty or more years ago would be discovered to be too small in face of the great increase in demand and the higher pressure necessary for the proper use of the incandescent burner. The 12-10ths or so, suitable for a quarter-of-a-century ago must now be altered to at least double this at night. Mr. Canning's notes would be read carefully by every member, and considered from the point of view of the "man on the spot;" for, after all, it was the "man at the wheel" who knew best, or should know best, what was required for his particular works. Everyone would find some points of value to himself in Mr. Canning's notes.

The PRESIDENT said he was going to ask Mr. J. W. Helps, the President of the Institution of Gas Engineers, who had honoured them with his presence that day, to address the meeting.

Mr. J. W. HELPS (Croydon), after making, in his capacity as President of the Institution of Gas Engineers, the remarks which are reported among the general proceedings at the meeting, referred at some length to Mr. Canning's notes. He said he regretted the absence of the author, because it always seemed to him that under these circumstances the discussion of a paper suffered. In the absence of the writer, one did not like to criticize a paper harshly, even if one wanted to, because there was no chance for the author to reply. He did not wish to criticize Mr. Canning's notes particularly; but if he had to offer any criticism, it would be that what Mr. Canning said was applicable more to the very large works than to undertakings of the size of those over which many of the members of the Wales Association had the honour to preside. With regard to the question of electrical power in connection with gas-works, he thought Mr. Canning made a wise remark when he said it was the sentimental aspect of the question which had prevented gas engineers in the past from taking full advantage of this important method of obtaining power. At his (Mr. Helps's) works, they did not care one little bit what was the power they made use of, if they felt it was specially adapted for the purpose they had in view at the moment. He had gas, steam, and hydraulic power, compressed air, and a large installation of electrical power; and he thought he might say that the electric plant lately put into position was not entirely undue to conversations he had had with Mr. Canning, and to opportunities he had enjoyed of inspecting his works. In cases, for instance, in which it was desired to distribute power to various parts of a works where boilers were not available, there was nothing better than an electric motor; and if only they could show that they were able to use their gas and convert it into electrical power as cheaply as they could produce steam or anything else, there was no reason why they should not adopt this method. He had seen Mr. Canning's installation, and had been charmed with it. He himself did not adopt the Telpher system simply because the local conditions at Croydon did not lead one to expect that it would be so successful as an electric crane. There were many other points that Mr. Canning had dealt with on the subject of machinery; but there was one axiom he (the speaker) would like to lay down as the result of no inconsiderable amount of experience. This was, that it was absurd for any gas engineer to go and instal power of any sort for conveying, elevating, or anything else, unless he felt quite satisfied that he could give the plant fairly continuous use. Mr. Acland had emphasized this point. Just because such things might look pretty and scientific, was no reason why they should go to the expense of putting down plant for elevating or conveying coal or coke, &c., if they could not keep it fairly constantly at work. Plant of this character would wear out almost as much from disuse as use; and they could not afford the expenditure on it in cases where hand labour would do just as well. It would be absurd for any company in the East, for instance, to try and put down machinery and do away with hand labour, when coolies were available. He had seen many a time vast numbers of coolies loading coal into the liners at Port Said;

and when these men could be secured at a very low rate of wages, it would be ridiculous to replace them by mechanical appliances, and so, notwithstanding the vast amount of machinery that would be applicable to the purpose, they still continued to load the coal into boats in the East in this manner. In the Calcutta Gas-Works, where he spent some time a little while ago, the whole of the carrying out of the coke from the retort-house was done by coolies, who took it away in baskets on their shoulders. Once the Manager (Mr. Watson) did procure some wheel-barrows; but the men would not use them. They were in advance of their time. When the coolies were induced to try the barrows, they simply filled them and then put them on their heads, just like the baskets. He had, previous to the meeting, had an opportunity of going round the President's beautiful little works; and he asked how often he emptied his purifiers. Mr. Brookman, jun., replied that sometimes they ran for two months. He knew works where they spent much money on machinery for elevating the oxide into the boxes and in taking it out; but when purification could be done for 1-8th of a penny per 1000 feet, there was nothing to be saved. He had himself at times seen huge masses of machinery engaged in operations which could have been carried out equally well by means of hand labour. It was necessary to consider carefully all the conditions before they decided to do away with hand labour and instal machinery in its place. He had had some experience with different forms of conveying plant, and had come to the conclusion that it was far better to pick up the coke and put it somewhere than to push it there. If they pushed the coke, they were bound to have much breeze, in addition to difficulties with wear and tear which would sometimes more than make up for the gain in economy of labour. High-pressure distribution was, of course, also of prime importance at the present day. He could not help thinking that Mr. Acland went a little too far when he told the members that they should never put down less than a 6-inch main where they expected houses on both sides of a street to take gas. Really, Mr. Acland had applied his own answer to this, because in the early part of his remarks he had stated that it did not pay to put down a water-gas plant in a works with an output of less than 100 million cubic feet of gas a year. He (Mr. Helps) agreed with Mr. Acland when he gave as his reason for the statement the fact that they could not afford to have the capital lying idle during some portion of the year. Take Croydon, for instance, 25 years ago the output was 280 millions, whereas now it was about 1400 millions. It would not have paid them to have spent a large amount on mains, and then to have had them lying idle for the best part of 25 years. If Mr. Acland had substituted 4-inch for 6-inch as a minimum in ordinary streets, he would, in his (Mr. Helps's) opinion, have been nearer the mark. He was not sure whether Mr. Canning was referring to very high pressure—where they talked in pounds—or simply up to 10, 12, or 20 inches of water. He thought there were many points in favour of the increase of pressure on the "booster" principle. It was of benefit to gas managers in many ways. Not only did it stave off the day of larger mains, especially where they had to send the gas a great distance, but it increased vastly the storage of the gasholders. He himself found, before he adopted "boosting," that though he had storage equal to something over 5 million feet, only about half was available, because when the holders uncupped the pressure the other lifts gave was not sufficient to furnish a proper supply during cooking hours and the hours of darkness. Now that he had "boosting," every available foot of these holders was of use, because he could draw the gas out and push it through to the town at any desired pressure. It was therefore an important fact that the adoption of this method would very often stave off the evil day when they might otherwise have to spend much money on an increase of their storage capacity.

The President said Mr. Helps and Mr. Acland had so thoroughly exhausted almost every point dealt with by Mr. Canning in his notes, that it left him personally little to say. They had, however, another distinguished visitor among them. He referred to Mr. Norton H. Humphrys, whose name was known far and wide in the gas profession; and he would like to ask him to say a few words.

Mr. N. H. HUMPHRYS (Salisbury) thanked the President for his kind allusions to him, and said that it was a great pleasure to him to be at the meeting. He could claim to be a Welshman himself. He had a Welsh name, and something of a Welsh pedigree; and he was very glad to visit the gas managers in Wales. There were one or two points in Mr. Canning's notes to which he would like to refer. There was one keynote running through from the beginning to the end of the notes which they would do well to bear in mind—namely, the importance of being fully acquainted with one's own works. It was quite right to talk about the need and importance of technical matters; but a young man might have a hatful of medals and no end of certificates and so on, and unless he had a business training and ability to grasp all the bearings of the undertaking he was called upon to manage, be it large or small, he would be sure to get into difficulties. They might almost say that the greater the technical training a man had received, the more necessary it was that he should possess this business ability to take hold of his surroundings. They might call the education the sails and the commercial ability the ballast. This seemed to be the keynote which Mr. Canning very rightly sounded. He remembered a local body in Wales were reminded some time ago that, being a small body, they could not have the advantages that a larger body could; and the same thing

applied to the small gas-works. A 10, 20, or 30 million cubic feet works could not afford to go in for mechanical appliances that might run them into tens of thousands of pounds; but by keeping a hold on all that these things were doing, they could often pick up a hint that might prove useful when fitted in with their own circumstances. He was glad Mr. Canning took them back to the retort-house once more. Sometimes it seemed they were apt to forget nowadays that there was such a thing as a retort-house. About thirty years ago, when these Associations were first started, gas managers used to be told sometimes that they never went out of the retort-house; but he thought occasionally the converse might be applied at the present time, and they might be told they did not go into the retort-house enough. It used to be said that a manager did not go sufficiently outside his own works; but now—what with maintenance schemes, cookers on hire, slot-meters, and the electric light canvasser—it might be urged that there was some danger of them forgetting their primary duty on the works. It was true that dividends could be made or lost in the retort-house; and it was true that with all the new appliances now in use there was a possibility of very great losses in the retort-house, unless they kept their eyes upon all parts of the working. A generator or regenerator setting would not take care of itself. It required more careful attention and watching than the old-fashioned furnaces. Mr. Canning had referred to taking analyses of gases; and it was very necessary that managers should be able to do so. He himself had given a considerable amount of attention to analyzing the flue and producer gases; and he found that several precautions must be taken before they could get reliable and accurate results. If it was worth going in for at all, it was worth doing the thing well. But it did not follow that they must get the most complicated or elaborate apparatus on the market. He believed in simplicity. He had no faith in some of the things they found put before them, with perhaps a dozen little three-way stopcocks, and no end of capillary tubes. They were not much good for practical work, though they were all very well to put on a board-room shelf to impress on the directors and shareholders how scientific the manager was. But on the works they wanted something a little more simple. One thing about these complicated appliances was that they only took a sort of homœopathic dose of the gas. When one considered the quantity of gas—several thousand cubic feet—that went through a chimney in the course of 24 hours, he did not see the use of taking a cubic inch, and then proceeding to take a decimal point on a percentage of what was present. Get a substantial aspirator holding several gallons, and draw off a good sample extending over some time. In this way they could meet the difficulty, that a small quantity drawn off when they were firing-up or directly after cleaning was apt to be misleading. With a good aspirator, and two or three appliances that could be used with baryta solution and phenol phthalein as indicator, one could secure an accurate result with very little trouble. But in drawing the sample, great care must be taken that there was no risk of leakage of air into the gas. An exceedingly small crack in the chimney might often spoil the whole result. Then with reference to water supply, for some years he had provided all his own water supply at the works without much expense. They used to have a flat-rate, and were supplied at so much per annum; but some years ago the water authority took it into their heads that all water supplied for technical purposes must be furnished through a meter at 8d. per 1000 gallons. This meant about £100 a year for water. The works happened to be situated down in a valley, where the ground was simply a sponge, so they arranged to collect the rain water and pump the rest of their requirements in this respect. Thus for some time past he had been supplying all his own water for technical purposes, and only had the public supply for office use, drinking, and so on. He should think from his experience of the previous day at Tenby that it would pay them very well to collect the rain water there. But be this as it might, his plan was to collect the rain water in a cistern about 10 feet above the ground level, which was high enough to run the water to the coke bosh and regenerative furnaces by gravitation; and the rain water represented about one-fifth of their total consumption.

Calcium Chloride for Dust Prevention.—Some time ago, the Roads Improvement Association instituted some tests to ascertain the dust-laying qualities of calcium chloride, manufactured by Messrs. Brunner, Mond, and Co., of Northwich; the judges appointed to conduct the tests being Messrs. A. Dryland (County Surveyor of Surrey), H. P. Maybury (County Surveyor of Kent), Geo. W. Manning (Surveyor to the Staines Rural District Council), and W. J. Atkinson Butterfield, M.A., F.I.C. (Consulting and Analytical Chemist). Their report has just been issued. It is a comprehensive document, dealing with the nature and properties of the material, methods of treatment, analysis of the road surface after the material had been upon the road a certain time, &c. Schedules are attached giving the actual cost of applying the material and also daily observations of its effect upon the road. Summing up their report, the judges say: "We are of opinion that the results of the tests of calcium chloride applied in granular form by the 'dry' method have shown that it is a very effective dust layer, and, provided no ill-effects are experienced in winter as a consequence of the treatment, we are of opinion it is a cheaper and preferable process to that of street watering, which, as now carried out, is undoubtedly very injurious to macadamized roads."

VERTICAL RETORTS FOR SMALL WORKS.

Many managers of small works are of opinion that the more modern systems of carbonization are not for them, and are only for their admiration and interest from a distance. The Vertical Gas-Retort Syndicate, Limited, the sole licensees for the erection of installations on the Dessau system in this country, point out that this is not so for any works requiring 100,000 to 120,000 cubic feet of gas a day. Hitherto the owners of the Dessau patents have not offered to erect settings on their system of less number than four beds of eights, because they have adhered to their own arrangements for coal and coke handling. The Syndicate operating in this country have devised a cheaper method of dealing with both the coal and coke; so that they are now prepared to put up installations as small as two beds of eight 4-metre retorts, or even one bed as a trial, which single bed would meet the present needs of some of the smaller works, and would produce a little over 100,000 cubic feet a day, calculating 14,000 to 15,000 cubic feet per mouthpiece. The managers of certain small works have been making inquiry into this matter lately; so that they will be interested over this announcement.

In connection with the Sunderland installation, which was described in the "JOURNAL" for July 6, pp. 22, 25, we hear that the settings have been undergoing the process of drying during the past few weeks, and are ready for firing-up as soon as the general scheme of works construction (which was also described in the same issue) is completed.

A NAME FOR THE INTERNATIONAL LIGHT UNIT.

In the "JOURNAL" for the 31st of August (p. 565), reference was made to a short article on the above subject contributed by M. Blondel to the "Illuminating Engineer." M. Blondel, it may be remembered, suggested the advisability of having a common name for the agreed common unit of light; and he proposed either the Greek "pyr" or "phos," or a scientist's name, such as Violle. The Editor of the publication named having invited comment on M. Blondel's suggestion, Mr. Clifford Paterson, of the National Physical Laboratory, sent a few observations, which appear in the current number. Mr. Paterson asks whether M. Blondel, in desiring to name the new unit after M. Violle, does not lose sight of the fact that the value of the unit in terms of the Violle standard cannot be regarded as defined with anything at all approaching the accuracy of modern photometric methods. On the one hand, the French authorities, taking M. Violle's own ratio between the platinum unit and the carcel unit (determined in 1881), claim that the so-called "international unit" is exactly 1-20th of the candle power of the platinum standard—viz., the bougie décimale. On the other hand, the International Congress of Electricians declared at Geneva in 1896 that the bougie décimale is the same as the Hefner unit. Mr. Paterson says this unit is known to be 10 per cent. smaller than the proposed international unit; hence there is an uncertainty of 10 per cent. in the true interpretation of Violle's "platinum standard." "Is this," he asks, "really the same as the unit which is now known as the bougie décimale in France, or is it equal to the Hefner unit?" At present, England, France, and America have a common unit; but Mr. Paterson thinks most people would regard it as a mistake to attach to it the name of any one standard. The unit can be maintained at its present value almost indefinitely to a fraction of 1 per cent.; but, he says, it will be generally admitted that no present standard has been proved to be so independent of atmospheric or other conditions of test as to justify its universal and permanent adoption as representing the value of an international unit of light. Indeed, to link the unit with any standard might even prejudice people against its adoption. Should a single unit be ultimately adopted by all countries of the world, Mr. Paterson cannot agree with M. Blondel that it would be cumbersome to call it an "international unit." He points out that we are quite accustomed to the "Int. Ohm." Why not, therefore, have an "Int. Candle"—an expression which, he says, carries its meaning on the face of it, and would be understood by both technical and untechnical persons?

A pleasing little ceremony recently took place in the Board-room at the Portwood Gas-Works, Stockport, when Mr. E. G. Hutchinson, who, as already announced, has been appointed Engineer and Manager of the gas-works of the Workington Corporation, was the recipient of a kit bag and a pair of pipes from the men and staff of the Gas Department, as a token of esteem. The Corporation Gas Engineer and Manager (Mr. S. Meunier) made the presentation on behalf of the donors, and said he was very pleased to see that Mr. Hutchinson was rising in the world, and that while they were sorry to lose him, they would all wish him every success in his new position. In acknowledging the gifts, Mr. Hutchinson assured the donors that they were thoroughly appreciated; and that in years to come he would not forget the pleasant time he had spent at Stockport. He thanked them for the courtesy and kindly consideration which had at all times been accorded him, and expressed the hope that in his new sphere he might meet with the same hearty co-operation and good-will.

MANCHESTER DISTRICT JUNIOR ASSOCIATION.

Visit to Mossley.

The First Meeting of the Session 1909-10 of the Manchester and District Junior Gas Association took place on Saturday, when the members, at the invitation of the President (Mr. James Taylor), paid a visit to the Mossley Corporation Gas-Works, of which he is Engineer and Manager; this being followed by an inspection of the Chew reservoir now being constructed by the Ashton, Stalybridge, and Dukinfield Water-Works Board, among the hills which overlook Greenfield and Mossley.

The main body of the party, including Mr. E. J. Wellens (Past-President), Mr. R. H. Garlick (Hon. Treasurer), Mr. J. Alsop (Hon. Secretary), and most members of the Council, left Manchester by train early in the afternoon, and on reaching the Mossley Gas-Works, were welcomed by Alderman Noel, J.P., Chairman of the Gas Committee, who, in the course of his remarks, expressed the hope that the Association would have a profitable and enjoyable day, following out the programme arranged for them by their President—a gentleman whom the Mossley Corporation were glad to have as their Gas Engineer. Alderman Noel added that the Mayor of the borough had written to say that it was absence on a holiday that prevented his personally welcoming the members of the Association to Mossley. Mr. E. J. Wellens acknowledged the welcome on behalf of the members.

Then followed an inspection of the works under the guidance of Mr. Taylor, who had prepared the following particulars for the benefit of those present.

MOSSLEY CORPORATION GAS-WORKS.

The works originally belonged to the Stalybridge Gas Company, which was formed in 1829. In 1885, the Corporations of Stalybridge and Mossley purchased the undertaking of the Gas Company, and commenced to supply gas in their separate districts. The district supplied by the Mossley Corporation includes Mossley, a portion of Springhead, Greenfield, Uppermill, Dobcross, Diggle, Delph, and Denshaw; the six latter districts forming the Urban District of Saddleworth. On account of the hilly situation of Mossley and Saddleworth, the maintenance of suitable pressures of gas throughout the district is difficult in the extreme. The Ordnance level at the works is 470 feet above sea-level; and the district varies in altitude from 434 feet at Egmont Street, Mossley, to 964 feet at Old Tame, Denshaw. The town is situated in three counties—Lancashire, Yorkshire, and Cheshire—the gas-works being in Cheshire.

The coal-store is alongside the Manchester and Huddersfield Canal, by means of which about a fourth of the amount of coal used is delivered. The remainder is carted from the Mossley coal-sidings (L. & N. W. Ry.), distant a mile from the works. The total storage capacity is about 1200 tons.

The retort-house contains twelve through settings of eight retorts, each 22 in. by 16 in. by 20 ft. The furnaces are deep regenerators; and one furnace only is provided for each through bed. Six cwt. charges are used, of six hours duration. The total capacity of the house is 1,260,000 cubic feet per day. The equipment includes tar-mains, tar-towers, retort-house governor, &c.

The condensing plant consists of nine horizontal rows of 18-inch pipes; each row being 68 feet long.

The No. 1 exhauster is of 35,000 cubic feet per hour capacity, and is of the two-blade rotary type, belt driven by counter-shafting from a steam-engine in the adjoining room. This exhauster has been in use over forty years. The No. 2 exhauster is of 40,000 cubic feet per hour capacity, and is of Waller's four-blade rotary type, direct driven from a steam-engine on the same bed-plate, and was erected last year. A steam-engine which was taken out last year had been in continual work for over seventy years. The boilers are two in number, Cornish type, and are fitted with Meldrum's furnaces. The fuel used consists entirely of coke breeze.

Six scrubbers were originally erected; but two of them are now used for the storage of tar and ammoniacal liquor. The four which are used as scrubbers are filled three with coke and one with wooden grids. They are 7 feet in diameter by 25 feet high. A Clapham rotary washer is also used, and is supplied with clean water; weak ammoniacal liquor being used in the scrubbers.

The purifiers are six in number, each 20 ft. by 18 ft. by 5 ft. 6 in. deep. The gas is first passed through a set of four boxes filled with oxide, and afterwards through two boxes filled with lime.

The station meter is of 50,000 cubic feet per hour capacity, and is of John West's make.

A carburetting plant of Parkinson's make is installed, but is only used to a very limited extent.

As to the gasholders, No. 1 is a three-lift holder, column-guided to the height of two lifts. The capacity is 590,000 cubic feet. No. 2 is a two-lift holder, and is cable-guided throughout. The capacity is 370,000 cubic feet. The total storage capacity is 960,000 cubic feet.

There are four governors; two being of Braddock's ordinary compensating pattern, and used for controlling the supply to the higher and lower levels of Mossley. The other two are Braddock's balance-governors, and are fitted with automatic pressure-changers. One supplies the Greenfield district, and the other the remainder of Saddleworth.

There are 45 miles of distributing mains; and, as may be supposed from the straggling and hilly nature of the district, the unaccounted for gas is very heavy—being 9 per cent. of the total gas made. The number of consumers is 5514, of whom 2163 are supplied through prepayment meters. The maximum gas delivered in 24 hours is 665,000 cubic feet. The quantity of gas made in the year ended March 25, 1909, was 126,369,000 cubic feet. The illuminating power supplied is 16·8 candles; and the price of gas is 2s. 8d. and 2s. 10d. per 1000 cubic feet for lighting purposes, and 2s. 5d. and 2s. 7d. for power. The district is extensive considering the quantity of gas supplied, but is very straggling. There are many mains from 1 to 2 miles in length with no more than three consumers supplied from them, apart from the street-lamps. From end to end of the district is a distance of 11 miles.

Mr. Taylor has, by installing suitable incandescent burners throughout the works, reduced the gas consumption by 800,000 cubic feet in the last nine months; and by the introduction of pneumatic switches in certain places, he hopes to still further economize. Along with this economy, there is a much more brilliant light—at least threefold. He holds strong views as to the great waste of gas which occurs in the majority of gas-works, and as to the undoubted inadequacy and inefficiency of the lighting. Mr. Taylor is an advocate for the removal of all carbonic acid from gas. He finds that much greater satisfaction is given to users of gas in incandescent burners, cookers, gas-engines, &c., with the same illuminating power; and this he attributes to the higher calorific value of the gas. By equalizing the levels of the dip-pipes and reducing the amount of seal in the hydraulic mains, together with the introduction of a retort-house governor, he is now making 1200 cubic feet of gas per ton of coal more than was formerly obtained with a similar illuminating power.

At the conclusion of the inspection of the gas-works, the party (which numbered over sixty) proceeded up the Chew Valley for a view of the new reservoir. Three miles of the journey was made by the light railway used by the Contractors; and then there was a climb of about two miles to the site of the dam. It was a pleasant October day; and the walk was greatly enjoyed. Mr. A. Lang, the Resident Engineer for Messrs. Morrison and Masons, the Contractors for the new reservoir, and Mr. F. J. Dixon, the Engineer to the Joint Water Board, acted as guides to the party, and described the work in progress.

The following is an extract from a report and history of the undertaking, prepared in view of the visit.

ASHTON, STALYBRIDGE, AND DUKINFIELD WATER-WORKS.

By Mr. F. J. DIXON, Engineer.

The district supplied by the Joint Committee consists of the following Authorities: Ashton-under-Lyne Corporation; Stalybridge Corporation; Dukinfield Corporation; Mossley Corporation; Audenshaw Urban District Council; Hurst Urban District Council; Saddleworth Urban District Council; and Limehurst Rural District Council. The parliamentary limit of supply sanctioned by the Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water Act of 1870 consists of an area of some 42 square miles, or 26,880 acres in extent. It stretches from Denton and Hyde on the south, to Diggle and Delph on the north; and from Oldham and Openshaw on the west, to Arnfield and Owl's Head on the east. The estimated population supplied at this date is between 150,000 and 160,000 persons.

The source of supply is taken from three valleys—Swineshaw Valley, Greenfield Valley, and Chew Valley, with the following drainage areas: Swineshaw, 1300 acres; Greenfield, 1170 acres; and Chew, 1730 acres—total, 4200 acres. The geological formations consist of peaty subsoil, clays, &c., resting on the millstone grit series. The average yearly rainfall over the drainage area is 48·4 inches.

There are seven impounding reservoirs; and the capacities are as under:—

	Depth.	Gallons.
Swineshaw Valley—		
Walker Wood reservoir (compensation only)	61 feet.	202,084,000
Brushes reservoir	44 "	52,165,000
Lower Swineshaw reservoir	33 "	55,500,000
Higher Swineshaw reservoir	53 "	168,908,000
Greenfield Valley—		
Yeoman Hey reservoir	65 "	205,596,000
Greenfield reservoir	62 "	101,686,000
Chew Valley—		
Chew reservoir (compensation only), now in course of construction	75 "	(say) 200,000,000
Total capacity		985,939,000

The water is conveyed from the Swineshaw Valley by 18-inch, 12-inch, and 9-inch cast-iron pipe aqueducts direct into consumption, without any filtration whatever; from the Greenfield Valley, by two 15-inch cast-iron pipe aqueducts, and up to Aug. 9, 1909, it was also sent direct into consumption, without any filtration.

As the water in the Lower Swineshaw reservoir, which supplies part of the Borough of Mossley, is somewhat of an acid nature, due to the peaty formation of the gathering-ground, it is, previous to consumption, treated with pure powdered carbonate of lime or paris white; the solution being mechanically discharged into the water which is to be treated, by means of a small apparatus driven by a water-motor, at the head of the reservoir. The quantity used is 4·28 cwt. per 1,000,000 gallons of water treated, or

3·16 grains per gallon. The cost of such treatment is 7s. per 1,000,000 gallons, or 0·084d. per 1000 gallons. This treatment has proved satisfactory, and makes the water practically neutral and non plumbo-solvent.

The water from the Greenfield reservoir, which supplied the Saddleworth district, is also somewhat acid; and under the Act of 1907 (section 19), the Joint Committee were enforced to put down filters or other apparatus to efficiently and continuously filter or chemically treat the water, so as to prevent the action of such water on lead-pipes, &c. The Committee have erected three mechanical filters of Messrs. Mather and Platt's type at the foot of the Yeoman Hey reservoir, which are now working. The water is filtered through some 3 feet of fine quartz sand and 1 foot of quartz the size of a pea, at the rate of 6000 gallons per hour each filter. Chemicals consisting of carbonate of lime and alumina ferric will be continuously injected into the water previous to the filtration. Pelton wheels drive the agitating gear in connection with the washing-out of the filters. A stone house is being erected round the filters, which will be lighted by electricity. The total cost, including filters, house, &c., is about £2500. The average working pressure at the filters is about 80 lbs. per square inch.

There are three service reservoirs, one at Knott Hill, Ashton-under-Lyne, and two at Dukinfield, which supply the respective boroughs; the water for Ashton being supplied from the Greenfield Valley, and for Dukinfield from the Swineshaw Valley. The capacities are as follows:—

	Depth.	Gallons.
Knott Hill	44 feet	64,000,000
Dukinfield	24 feet	33,000,000
Total capacity		97,000,000

Compensation water has to be supplied from the Greenfield Valley, Swineshaw Valley, and Chew Valley as under:—

Swineshaw Valley at the rate of	801,000 gallons per 24 hours
Greenfield Valley " "	931,680 " "
Chew Valley " "	1,376,640 " "

Total daily consumption, 3,109,320 gallons

The water for dietetic purposes is somewhat soft; being 3·3 degrees of hardness by Clarke's scale. The daily average consumption, including compensation water for the Swineshaw and Greenfield Valleys, is about 4,600,000 gallons. The working pressure in the various towns varies from 40 to 180 lbs. per square inch; the districts being divided into two—high and lower zones. The water for trade purposes is supplied through meter, except in special cases. There are some 700 water-meters in use. All water-mains for new connections are drilled and connected under pressure, also all service ferrules, which prevents interference with the supply.

The Joint Committee are now constructing their last impounding reservoir up the Chew Valley. The Consulting Engineers for these works are Messrs. G. H. Hill and Sons, of Manchester; and the contractors, Messrs. Morrison and Mason, of Glasgow. The estimated cost, including all subsidiary works, is about £110,000. The area of water impounded is 43·5 acres. The length of the earth dam is 990 lineal feet, with 363 lineal feet of a north wing trench. The capacity of the reservoir when full will be about 200,000,000 gallons. The level of the top-water will be 1600 feet above Ordnance datum. The core of the embankment is to be made of clay puddle (obtained from the Micklehurst district some 3 or 4 miles distant from the reservoir), which will rest on a cement concrete cradle or shoe. The greatest depth in the excavation of the trench is about 110 feet below the surface of the ground.

COMPLIMENTS TO THE GAS ENGINEER.

On returning to the Mossley boundary, special tramcars conveyed the party to the Argyle Hall for tea. Alderman Noel presided, and was supported by Alderman H. Sykes and a number of Town Councillors, including members of the Gas Committee.

Mr. A. L. Holton, proposing a vote of thanks to the Chairman and members of the Mossley Gas Committee, and to Mr. Taylor for the arrangements they had made to entertain the party, said they had had made evident to them the difficulties which the Mossley Corporation and their Gas Engineer had to contend with, not only because of the scattered area they were called upon to supply, but owing to the hilly district within their boundary. There were many lessons to be learned from even the smallest of gas-works by members of their Association; and Mossley had proved no exception to the rule. The questions put during the afternoon's proceedings indicated more than words could convey the appreciation of the members taking part. If the Mossley Gas Committee were glad to call Mr. Taylor their Engineer, the Association were pleased to call him their President.

Mr. C. Berry seconded, and in the course of his remarks said that from what they had seen of the Mossley Gas Committee and the relationship existing between them and their Engineer, it was clear that Mr. Taylor's lot had fallen in a pleasant place. He could assure the Mossley Gas Committee that they had got hold of a Manager second to none, for a good many miles round there, at any rate.

The motion having been carried, Alderman Noel responded first. He paid a high compliment to Mr. Taylor's abilities; adding that they had found him to be an honourable and straightforward business man to deal with. Never in the history of the Council

had they had such pleasant work in connection with the gas undertaking as was the case to-day. What was more, he not only esteemed Mr. Taylor as their Gas Manager, but as a personal friend.

Mr. Taylor, also responding to the vote of thanks, referred to the generous way his Committee had met him in catering for the visit of the members that day. He could assure Mr. Berry and other members of the Association that, if their lot fell on such pleasant lines as his at Mossley, they would have no occasion to be dissatisfied.

County Councillor Bradbury, a member of the Corporation, who serves on the Gas-Works Sub-Committee, had also something to say in appreciation of Mr. Taylor, when called upon by the Chairman to respond to the vote of thanks. He briefly referred to what their Engineer had done since his appointment in overhauling the different departments at the gas-works. In Mr. Taylor, the Council recognized that they had an able and conscientious official—a man who was thoroughly straight, and those present knew what that meant—a man who could not be bought and could not be sold. In a year or two, they hoped to have at Mossley as good a gas-works as anywhere, for the size of the place; and he hoped Mr. Taylor would not look elsewhere until this had been accomplished, at any rate.

Alderman H. Sykes likewise had praise for Mr. Taylor's management of the gas-works. He was, he said, an official who had the confidence of every member of the Gas Committee.

On the motion of Mr. C. Woodhouse, seconded by Mr. Hill, a cordial vote of thanks was passed to Mr. Dixon and Mr. Lang for conducting the party over the works at the Chew reservoir and explaining the different phases of the undertaking. Both gentlemen, in response, said in effect that they were only too pleased to have rendered service to the party, and to have done something to make the visit interesting.

A vote of thanks to the Chairman, proposed by Mr. J. Sykes and seconded by Mr. E. J. Wellens, concluded the proceedings. Then by rail or tram the visitors started for home, having spent a very pleasant day.

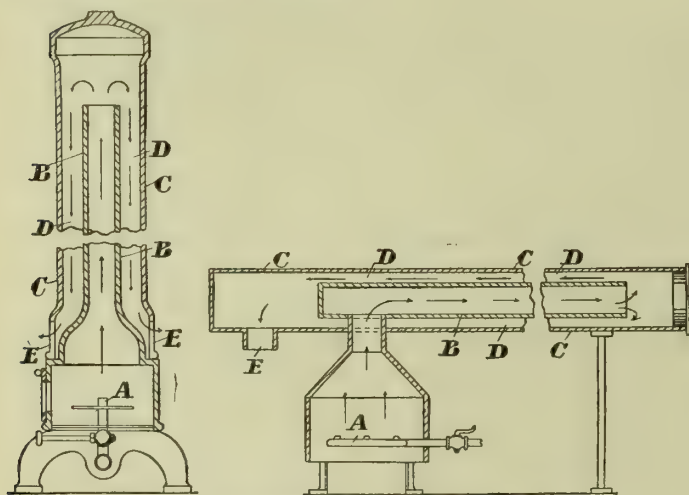
REGISTER OF PATENTS.

Gas-Heated Radiator.

FLETCHER, RUSSELL, AND CO., LIMITED, NEIL, J., and FLETCHER, T. W., of Warrington.

No. 18,466; Sept. 3, 1909.

This gas-heated radiator (either vertical or horizontal) consists of two tubes of different diameters, the larger one having the end farthest from the gas-burner closed but open at the base, and the smaller tube inserted therein, with one end placed over the burner. The inner end of the tube is open and extends to within a short distance of the closed end of the larger tube, so that the heated air passes through the smaller tube into the closed end of the larger tube and returns between the inner and outer tubes to the outlet.



Fletcher, Russell, and Co.'s Gas-Heated Radiators.

In the vertical radiator, the burner A is placed at the base of a tube B with an enlarged mouth. The upper end is open. A tube C, of larger internal diameter, is fitted over the tube B, with the upper closed end at a little distance from the open end of the tube. The heat from the burner passes up the tube C and down the space D between the tubes B and C to the base, where it passes to the open through the apertures E, or may be conveyed to the outside of the building.

If a radiator of horizontal form is required, the construction of the tubes is the same as before described; but the tube B is formed with an elbow at a convenient distance from the burner.

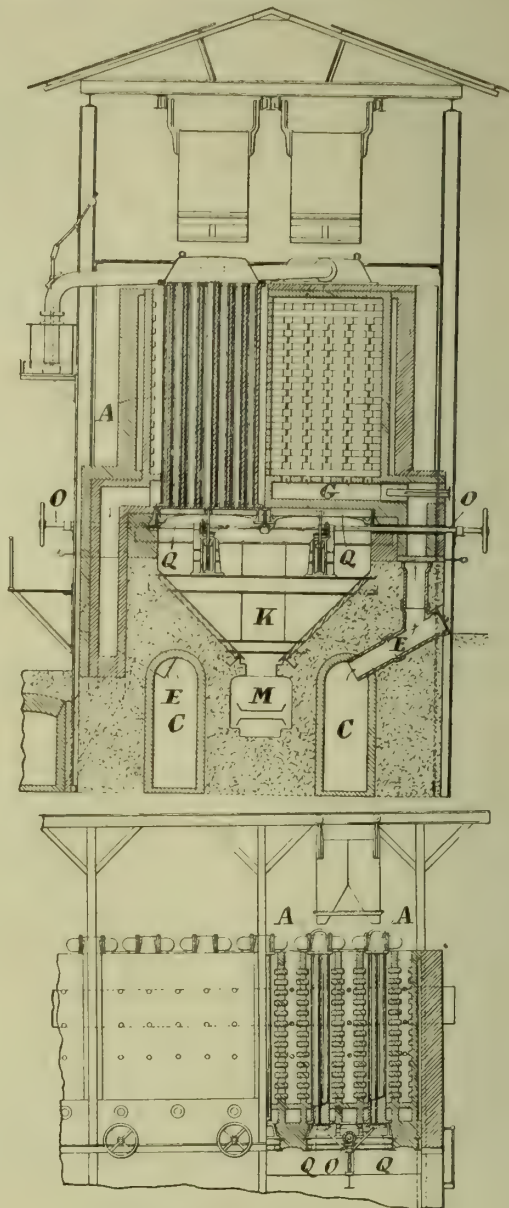
In this way, the heated air from the centre tube passing down between the inner and outer tubes "enables an even temperature to be maintained throughout the length of the tubes, and all fumes arising from combustion can be exhausted outside the building."

Destructive Distillation of Coal—"Coalite" Process.

PARKER, T., of Wednesfield.

No. 14,167; July 3, 1908.

This apparatus comprises a number of groups of retort-tubes with mixing-chambers disposed between the groups for the intimate mixture of the gas and air used for heating the retorts; the gas being led thereto from gas-chambers arranged within the setting, and valves being provided for the regulation of the supply of air and gas. Two gas-chambers provided within the setting are each connected with a number of transverse mixing-chambers above them by separate conduits having means for the regulation of the quantity of gas passing; and the admission of air to the mixing-chambers is controlled by a valve consisting of a pipe extending through the brick setting, closed at the inner end, and provided with a lateral air-slot—the passage of air being controlled by sliding the pipe in or out as the case may be.



Operating "Coalite" Plant.

Vertical sections of the apparatus, at right angles to each other, are shown.

The two series of batteries of retort-tubes or retorts A are disposed in line parallel to each other, with a brickwork setting intermediate of the batteries through which gas is led on either side for heating the retorts. Gas-chambers C provided in the setting beneath the retorts are disposed transversely to the batteries, and the producer or water gas is led from these chambers through inclined conduit pipes E, the upper extremity of which on each side lies near the side face of the setting, and is closed by a loose door "suitably luted, so that in case of an explosion the cover is easily forced away—thus relieving pressure and avoiding destruction of the setting."

Through the conduit-pipes on each side gas is led upwards and into mixing-chambers G near the lower part of the series of retort-tubes. Into each of the chambers air is admitted from a tube with a closed end mounted so as to extend to the outside and provided with lateral slots "through which air may pass into the mixing-chamber, so that the admission of air for the purpose of combustion may be capable of regulation according to the extent to which the air-tube is projected into, or withdrawn from, the mixing-chamber to increase or reduce the area of the lateral slots open to the passage of the air."

Above the chambers C, and below the lower ends of the retorts, a chamber K is provided, formed at its lower part "with inclined walls of the usual type, by which the residue of the distillation, on its discharge, may be broken on its fall" and pass into a space M running centrally in the setting, within which a conveyor is provided to carry the discharged mass outside the furnace. The chamber K is of such

height that the charge in the retorts falls on to the inclined walls of the chamber, and is thus "broken into pieces of convenient size."

Between the gas-chambers C and the mixing-chambers G, suitable valves are provided, so that "any particular mixing-chamber may be cut out according to the requirements of working."

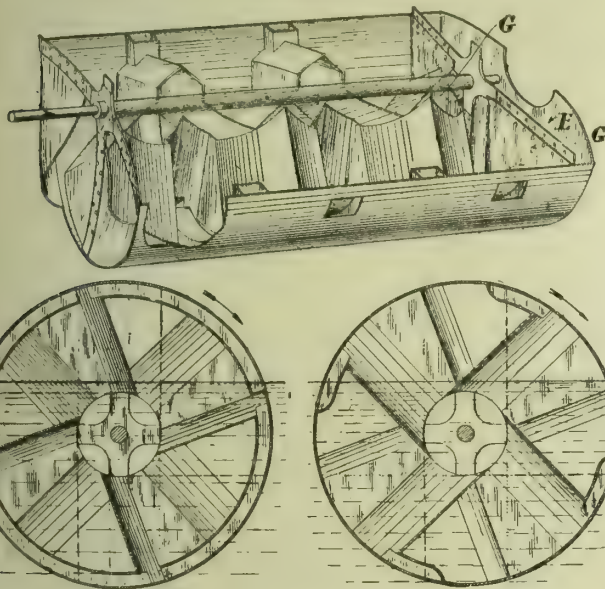
The chamber K serves at the same time to carry the gear by means of which the lower cover plates Q of the retorts are opened and closed by mechanism deriving movement from outside the furnace; a shaft O (with gear) being provided to permit of the lower cover plates for the respective series of bunches of retorts being operated from the respective sides of the setting.

Gas-Meters.

COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATÉRIEL D'USINES À GAZ, of Paris.

No. 18,851; Sept. 8, 1908. Date claimed under International Convention, Sept. 11, 1907.

This invention relates to a gas-meter cylinder having propellers each of which is bent so as to constitute partitions inclined in opposite directions relatively to the axis of the cylinder, and forming compartments each composed of a series of buckets so shaped that, when the cylinder rotates, the various buckets forming a compartment are disconnected from each other owing to portions of their surfaces being immersed in the water. Each bucket is also provided with a conduit or other means of communication with a bucket in the compartment preceding in the movement of rotation, and with a conduit opening through the wall of the cylinder.



A French Gas-Meter Cylinder.

The patentees point out that the cylinder for gas-meters which forms the subject of their invention differs from similar apparatus by a special construction and arrangement of propellers separating the compartments, with the object of facilitating the movement of the propellers in the water, and enabling a cylinder thus designed to handle a given volume of gas with a much smaller driving effort—in other words, with a smaller absorption of pressure—than that required by a cylinder of the same power constructed in the usual manner. If, on the other hand, in constructing a cylinder according to this invention, it is desired, instead of greatly reducing the absorption of pressure, merely not to exceed a given absorption, the cylinder could be made of smaller dimensions than a cylinder of the same power of ordinary construction, absorbing the same pressure.

In the construction of gas-meters of the kind at present in use, they continue, it has been found necessary to arrange the propellers dividing the drum into compartments at an angle, or inclined relatively to the axis, because if they are arranged along the generatrix of the drum they act like a paddle-wheel in water, and consequently produce a great disturbance of the water and bring about a considerable absorption of pressure. The propellers of a cylinder move in water at a speed which is greater as the angle in question is greater; but the angle or inclination must not be allowed to exceed a certain limit, or the useful capacity of the compartments will be reduced and the regularity of working of the meter be affected.

In order to obtain the best possible utilization of the pressure of the gas with the greatest efficiency, it is usual to give to the ordinary cylinders a length measure along the generatrix approximately equal to their diameter. If these proportions are modified by considerably increasing the diameter, it is possible to remain within the admitted limits of absorption of pressure only on condition of reducing the speed of rotation. If, on the contrary, the length is increased, the inclination (or the angle) of the propellers is thereby reduced, which brings about movements and disturbances of the water, and produces the same result as the increase of diameter. It has, however, been proved by them that, by increasing the length relatively to the diameter, it is possible to reduce the dimensions of the cylinders provided the inclination of the propellers remains within the limit of useful capacity. Such a construction is shown in perspective horizontal section of a gas-meter cylinder for large volume, in which the buckets are arranged longitudinally in several series; also in cross sections.

The compartments, instead of being separated by regular propellers or by planes slightly inclined relatively to the axis, are divided by bent propellers into compartments; the propellers being of such a shape

as to form a number of partitions which are alternately inclined in one and in the other direction to the degree desired for obtaining the maximum of speed. The gas penetrates into the chamber E of the cylinder, and passes over the edges of the extreme partitions G into the different buckets shown; and then, by means of the outlet edges, it escapes in the same manner as in ordinary cylinders. It must, however, be pointed out that at the moments when any compartment—a compartment representing the volume comprised between the outer wall of the cylinder and two adjacent propellers—commences to be filled with gas, or completes its exhaustion, some of its parts are without any communication with the inlet or outlet orifice. It is thus necessary that the parts should be put into communication in a special manner with the gas inlet or discharge.

Incandescent Mantles for Inverted Burners.

FRIEDEBERGER, L., of Schoeneberg, Berlin.

No. 24,630; Nov. 16, 1908.

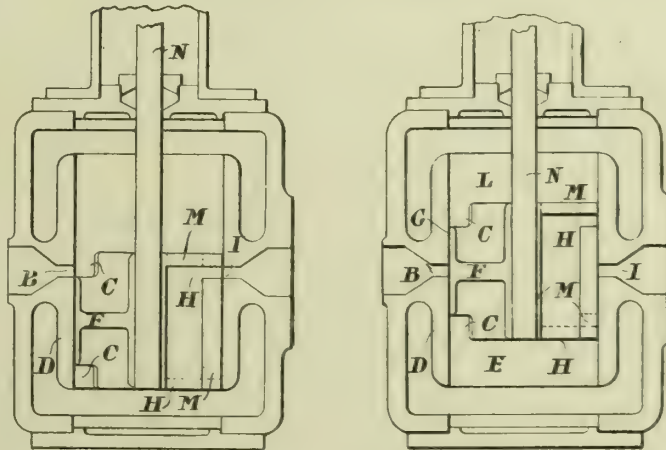
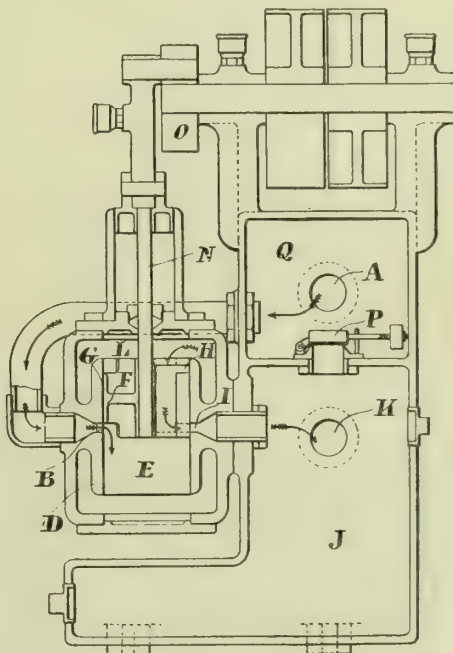
This present invention refers to fastenings for incandescent mantles of the inverted kind, in which the mantle is fastened to the fixed supporting ring or holder and strengthened by the addition of a separate piece of woven fabric. The invention consists in the provision of a ring-like strip of flexible (as far as possible), pervious, fire-proof, and bad heat-conducting material (for example, asbestos tissue) that is itself fastened directly to the supporting ring and serves to support the edge of the mantle around its whole circumference, and does not come in contact with the supporting ring—it being simply attached to the edge of the flexible ring. There thus results "the essential new effect that the mantle is not only rendered incandescent and hardened throughout—that is to say, even the uppermost portion situated next to the support—and the disadvantage of the incandescent mantle easily breaking off at the point of suspension is avoided, but the arrangement permits at the same time of automatically forming the mantle on the burner itself."

Gas and Air Compressors for Lighting and Heating Purposes.

FLETCHER, E., of Tottenham.

No. 26,719; Dec. 9, 1908.

This apparatus, for the compression of gas and air, comprises a piston having two portways through it, each communicating between a



Fletcher's Gas and Air Compressor.

chamber at either side of the piston face, and with an outlet port to the reservoir (or burner) for the emission of the high-pressure gas; the chambers being alternately open, through ports in the piston, to an inlet

port in the cylinder communicating with the source of supply, whereby the low-pressure gas and air admitted through the inlet port are compressed and fed to the reservoir or burner.

The illustrations show the plant referred to, with the piston at various positions of its stroke.

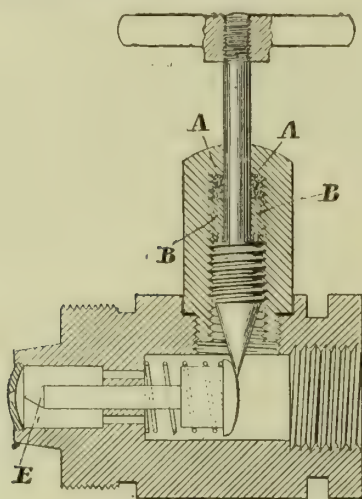
When air and gas enter the apparatus through the port A, the mixture passes to the inlet ports B C in the cylinder D and piston respectively, to the chamber E. On the return stroke of the piston F, the port B is closed by the edge of the piston G, and the gas and air in the chamber E are compressed until the end of the stroke, when the portway H, connected with the chamber, will have come opposite to the outlet port I, through which the compressed air and gas will escape to the chamber J, whence it is led, through the port K, to the point of consumption. On the next (backward) stroke of the piston, the chamber L will have been filled with gas or air, which will be compressed throughout the stroke, until the portway M comes opposite to the outlet port I, through which the compressed air and gas will escape to the chamber J, and thence, by the port K, to the point of consumption. The piston-rod N is supported in standards and coupled to the wheel O, which is driven by a pulley and shaft. P is a bye-pass, weighted to any predetermined pressure, so that when the pressure in the chamber J exceeds the required maximum, it will be automatically opened, and the excess pressure allowed to escape to the inlet chamber Q, whence it will again pass through the port B into the compressor; the bye-pass remaining open until the volume of air and gas in the chamber J has been reduced to the predetermined pressure, when it will again automatically close.

Stuffing-Box for Gas-Valves.

BLAND, C. W., of Little Trinity Lane, and GLOVER, T., of Queen Victoria Street, E.C.

No. 26,961; Dec. 11, 1908.

This invention consists of an improved construction of stuffing-box applicable for use with gas, water, air, steam, or other liquid or fluid valves, and is shown in sectional elevation as applied to a gas-valve for incandescent gas lighting (preferably inverted).



Bland and Glover's Valve Arrangement.

The stuffing box is made with an internal flange A at one end leaving a hole for the reception of the rod. The inside of the stuffing-box is screw-threaded, and the packing material is at the flanged end, held in place by a loose collar or gland B screwed into the box and pressing the packing material on to the rod and the flange and wall of the stuffing-box, so as to ensure a tight joint. One end of the gland is provided with holes, slots, pins, or other means to enable it to be screwed-home or unscrewed by a tool.

The stuffing-box is especially applicable for gas and water valves; and the end C of the gland may be roughened or cut, as also is the end of the screw portion of the rod, so that the packing can be tightened in the box by the screw portion of the rod gripping or engaging the end of the gland and turning it in the box—the gland remaining at the placed position on the return movement of the rod. The stuffing-box forms part of, or is connected to, the apparatus.

When used for inverted incandescent gas lighting, the rod has a coned end, which acts upon the head of the valve E. The end is normally held away from the gas-nozzle by a coiled spring; but by operating the rod, the coned end acts upon the head and pushes the end of the rod nearer to the gas-nozzle.

Power-Gas Plant for Use on Board Ship.

OSWALD, T. H. & T. H., JUN., of Fenchurch Street, E.C.

No. 5581; March 8, 1909.

This invention relates to the adaptation of suction-gas engines and producers for propelling vessels of all kinds, whereby sea water is treated so as to produce the necessary vapour for admixture with air in the process of generating power gas by which the engines are operated.

Fatal Case of Gas Poisoning.—A verdict of "Accidental death" was returned at an inquest held at Kilburn on Monday last week on the body of George Mont, aged 62, a retired grainer, of Victoria Road, Kilburn, who was found dead in bed the previous Friday morning, with his room full of coal gas. An inspector of the Gaslight and Coke Company explained that a gas-bracket had become defective from age and decay, and had allowed the gas to escape.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Fuel and Metallurgical Department at Leeds University.

SIR,—I should feel much indebted to you if you would be so good as to intimate to your readers that it would materially help us in arranging for the delivery of special lectures in "Gas Manufacture" during the coming winter, if intending students would as soon as possible send in their names to me.

I may say that the course, in the "Manufacture and Distribution of Coal Gas," given here during last winter by Dr. Colman and Mr. Hole was very successful, from the point of view both of attendance and of general interest shown in it; and although it was only sanctioned by the University by way of an experiment for one session, the results were such as would probably justify its repetition as a more permanent feature of our work, if a sufficient number of intending students send in their names within the next few weeks. The lectures would probably be given twice weekly (Wednesdays at 6 p.m. and Thursdays at 9 a.m.) during ten successive weeks between January and March, 1910—the arrangement of times being precisely as last winter.

I am personally anxious to propose a scheme of special lectures in the "Technology of Coal Gas and Gaseous Fuel," which shall be more comprehensive in scope than the limited scheme last winter, and shall extend over two or three years, instead of only one season; so that students from a distance who are engaged in works may derive the best possible advantages in the way of systematic advanced study. But, as you will readily understand, the prospect of the early consideration, not to say the adoption, of a more extended scheme than that of last winter would be materially enhanced if we were assured, during the next few weeks, of a good response to our proposals for the coming winter.

Leeds University, Sept. 28, 1909.

WILLIAM A. BONE.

Technical Classes.

SIR,—Now that so much interest is taken in the spread of technical and commercial education, the following particulars of the work done in this direction by the Bournemouth Gas and Water Company may be of interest to other gas undertakings (who may be thinking of moving in the same direction), as showing the extent to which local authorities are prepared to go in assisting the spread of technical education.

For the past four years, classes have been held at the gas-works in "Gas Manufacture;" and during that time seven passes were obtained in the Honours Grade and 21 in the Ordinary Grade. Last year a class was formed in "Gas Supply;" and six passes were obtained in the Ordinary Grade. This year, these classes will be continued; and an attendance of from 20 to 25 students is expected.

The Bournemouth Education Committee have this year arranged a four years' course as follows:—

First Year—Elementary chemistry, drawing, and arithmetic.

Second Year—Drawing, arithmetic, and gas manufacture.

Third Year—Mathematics, building construction, or machine drawing, gas manufacture or supply.

Fourth Year—Advanced gas manufacture or supply, building construction, and machine drawing.

This course is arranged for the benefit of the younger fitters, maintenance lads, &c.; and already 43 names have been given in of employees wishing to take the course.

In addition to this, another 26 of the Company's employees are attending classes, held at the School of Art, in chemistry, machine drawing, mathematics, French, &c. The classes in gas manufacture and supply are taught by members of the Company's staff; and the Company pay all fees, &c., for classes held at the school.

H. W. WOODALL, General Manager,
Bournemouth Gas and Water Company.

Bournemouth, Sept. 29, 1909.

American Combined Vertical Retort and Water-Gas Generator.

SIR,—On looking over the "JOURNAL" for May 11, on page 372 I notice, in referring to patent No. 16,614, that the word "air" appears on the drawings accompanying the specification, whereas it should be "oil" in place of "air." A correction will be appreciated.

INTERNATIONAL GAS DEVELOPMENT COMPANY.

VICTOR A. RETTICH,

New York, Sept. 18, 1909. Second Vice-President and Engineer.

[The mistake is the engraver's, who, reproducing the Patent Office drawings referred to, misread a very indistinctly-written word "oil" for "air."—ED. J.G.L.]

Additional Capital for the Aldershot Gas, Water, and District Lighting Company.—As will be seen from an announcement which appears elsewhere, Messrs. A. & W. Richards have received instructions from the Directors of the above-named Company to offer for public competition, at the Auction Mart, Tokenhouse Yard, on the 26th inst., two new issues of capital, each of the nominal amount of £5000. One issue is of consolidated preference stock, and is entitled to a dividend of 4 per cent.; and the other is of "C" consolidated stock, which ranks for a maximum dividend of 5 per cent. per annum. The new capital is required for the acquisition of the undertakings of the two Companies purchased under the provisions of the Act obtained in the present session, and noticed in the "JOURNAL" for the 21st ult. (p. 747), for the laying of the necessary mains to connect up the respective works, and for other extensions.

PARLIAMENTARY INTELLIGENCE.

GAS AND WATER PROVISIONAL ORDERS FOR 1909.

The Board of Trade have issued their report on their proceedings under the Gas and Water Works Facilities Act, 1870, during the present session. It shows that in December last eighteen applications were made to the Board for Provisional Orders—fourteen relating to gas and four to water undertakings. The amount of capital proposed to be authorized was £267,500 by shares and £81,663 by loan—£190,000 share and £59,663 loan capital being for gas, and £77,500 share and £22,000 loan capital for water purposes. The Gas Orders related to Bideford, Brough and Elloughton, Bude, Coatbridge, Comber, Compstall, Fermoy, Hayfield, Langley Mill and Heanor, Llynvi Valley, Long Eaton, Prestatyn, Settle, and Sutton and Hooton District; and the Water Orders to Bradfield, Gravesend and Milton, Hungerford, and Kingswood.

Gas Orders.

The principal objects of the applications in regard to gas were as follows: To authorize the Bideford Gas Company to construct and maintain additional works and raise further capital. To empower the Brough, Elloughton, and District Gas Company and the Bude Gas Company to raise additional capital, and the latter Company to maintain gas-works and extend their limits of supply. To authorize the Coatbridge Gas Company to reduce the illuminating power of their gas; and the Comber Gas Company to maintain and continue existing works, and manufacture and supply gas in part of the parish of Comber in the county of Down. To authorize the maintenance and continuance of existing gas-works, the construction and maintenance of additional works, and the manufacture and supply of gas in the parish and urban district of Compstall, in the county of Chester, and in the parish of Ludworth, in the county of Derby. To empower the Fermoy Gas Company to maintain and continue their works, and manufacture and supply gas in the Urban District of Fermoy, in the county of Cork; and the Hayfield Gas Company to maintain and continue their existing works, construct and maintain further works, and manufacture, store, and supply gas in the parish of Hayfield, in the county of Derby. To extend the limits of supply of the Langley Mill and Heanor Gas Company, and to empower the Company to acquire additional lands for the storage of gas and residual products, and raise additional capital. To give permission to the Llynvi Valley Gas Company to raise new capital. To provide for the transfer to the Long Eaton Gas Company of the undertaking authorized by the Sandiacre Gas Order, 1905, to extend the limits of supply of the Company, and to authorize them to construct additional works and raise more capital. To authorize the raising of additional capital for the Prestatyn Gas undertaking; to empower the Settle Gas Company to obtain additional capital and construct works; and to enable the Sutton and Hooton Gas Company to construct and maintain further works, extend their limits of supply, and raise more capital. Four of the applications—those from Comber, Compstall, Fermoy, and Hayfield—were in respect of existing non-statutory undertakings. All the others had reference to undertakings already authorized by Special Acts or Provisional Orders.

There was no opposition to the Brough and Elloughton, Bude, Comber, Langley Mill and Heanor, Llynvi Valley, and Sutton and Hooton applications. Objections were lodged in respect of each of the remaining applications, but were withdrawn in the cases of Bideford, Compstall, and Hayfield. Those relating to the Coatbridge, Fermoy, Long Eaton, Prestatyn, and Settle applications were fully considered by the Board of Trade; and in the case of Long Eaton, a local inquiry was held on behalf of the Board by Mr. Hamar Greenwood. A Provisional Order was granted in each instance, subject to such modifications and amendments as seemed to be required.

In the following Orders, a maximum price per 1000 cubic feet of gas was fixed: Brough and Elloughton, 5s. 3d.; Comber, 5s. 9d.; Compstall, 4s. 6d.; Hayfield, 4s. 6d.; and Llynvi Valley, 4s. 9d. In the Fermoy Order, the Board of Trade allowed a standard price of 5s., with a sliding-scale as to dividends; and in the Coatbridge Order the existing authorized standard price of 2s. 6d., with a "neutral zone" between 2s. 6d. and 3s., was modified by the abolition of the "neutral zone."

An illuminating power of 14 candles was prescribed in the Brough and Elloughton, Comber, Compstall, Fermoy, Langley Mill and Heanor, Llynvi Valley, and Long Eaton Orders; and of 15 candles in the Bideford and Coatbridge Orders. The prescribed illuminating power previously required in respect of the Brough and Elloughton undertaking was 12 candles; at Long Eaton it was 15 candles; and at Coatbridge 20 candles.

In the Bideford Order, provisions were inserted with regard to the disposal of a part of the balance carried forward at the end of the year; and the promoters have within six years to reduce this balance to a sum not exceeding one year's dividends. In the Coatbridge Order, the promoters were required, in consideration of the reduction allowed in the prescribed illuminating power of the gas, to supply new burners to consumers free of charge. In the Fermoy Order, the standard rate of dividend on the original capital was fixed by the Board at 8 per cent.; but the rate was reduced to 7 per cent. by the Parliamentary Committee to whom the Bill to confirm the Order was referred. In the Hayfield Order, an agreed clause was inserted providing for the sale of the undertaking, in certain circumstances, to the Hayfield Rural District Council. Clauses were inserted in various Orders for the protection of road and other authorities.

Water Orders.

The principal objects of the applications for Water Orders were as follows: To empower the undertakers of the Bradfield Water-Works to construct and maintain additional works, extend their limits of supply, and increase the capital of the undertaking. To confer upon the Gravesend and Milton Water Company power to construct addi-

tional works and raise more capital. To authorize the Hungerford Water Company to use and maintain their existing works, and acquire lands for additional works for the supply of water in the parish of Hungerford, in the county of Berks. To give authority to the Kingswood Water Company to construct and maintain works, and supply water in the parish of Kingswood in the county of Surrey. With the exception of the Kingswood Water Order, which was in respect of a new undertaking, all the applications referred to undertakings already authorized by Special Acts or Provisional Orders.

Objections were lodged against the Gravesend and Milton and the Kingswood applications. In both cases the promoters failed to obtain the consents of some of the local and road authorities concerned, and requested the Board to exercise their powers, under section 4 of the Gas and Water Works Facilities Act, 1870, and dispense with such consents. A local inquiry was held on behalf of the Board with regard to the Gravesend and Milton application; and the Board decided to dispense with the consents of the Gravesend Corporation and the Northfleet Urban District Council, and grant the Order, subject to an alteration of the basis of the charges for water supplied by the promoters from rack-rent to rateable value, and an alteration of the present authorized scale involving a reduction of charges in the case of the smaller consumers. An inquiry was held at the office of the Board with regard to the application in respect of Kingswood, which was opposed by the Reigate Corporation, the East Surrey Water Company, and the Sutton and District Water Company. Having regard to all the circumstances, the Board decided to refuse the application. The Bradfield and Hungerford applications were unopposed; and Provisional Orders were granted by the Board in each case, subject to such modifications and amendments as seemed necessary.

Confirmation of Orders.

Bills to confirm the Orders granted by the Board were introduced as follows: In the House of Commons, the Gas Provisional Orders Bill, to confirm Orders relating to Prestatyn Gas and Fermoy Gas. In the House of Lords, the Gas Orders Confirmation (No. 1) Bill, to confirm Orders relating to Bideford Gas, Bude Gas, Comber Gas, Compstall Gas, and Hayfield Gas; the Gas Orders Confirmation (No. 2) Bill, to confirm Orders relating to Brough and Elloughton Gas, Langley Mill and Heanor Gas, Long Eaton Gas, Settle Gas, and Sutton and Hooton District Gas; and the Gas and Water Orders Confirmation Bill, to confirm Orders relating to Coatbridge Gas, Llynvi Valley Gas, Bradfield Water, Gravesend and Milton Water, and Hungerford Water.

Petitions were lodged in the House of Commons against the Gas Provisional Orders Bill by the Prestatyn and Fermoy Urban District Councils respectively. The Prestatyn Council were promoting a Bill for the purchase of the local gas undertaking, and the Local Legislation Committee, to whom the Bill and the Provisional Order were referred, passed the Bill, and rejected the Order. The Committee to whom the Fermoy Gas Order was referred decided to pass it, subject to amendments relating to capital, dividends, and price of gas. The remaining stages of the Bill passed without further opposition.

The Gas and Water Orders Confirmation Bill was petitioned against in the House of Lords by the Coatbridge Town Council in respect of the Coatbridge Gas Order, and by the Glamorgan County Council in respect of the Llynvi Valley Gas Order. The Committee to whom the Bill was referred passed the Orders, subject to certain amendments in the case of the Coatbridge Order, and without amendment in the case of the Llynvi Valley Order. The Coatbridge Town Council also petitioned against the Coatbridge Gas Order when the Confirmation Bill was before the House of Commons, and the Committee who considered the Bill passed the Order with certain further amendments.

With these exceptions, the Orders were unopposed; and all the Confirmation Bills received the Royal Assent on the 16th of August, except the Gas and Water Orders Confirmation Bill, to which the Royal Assent was given on the 20th of September.

Bradford Corporation Going to Parliament Again.—At a meeting of the Parliamentary Sub-Committee of the Finance and General Purposes Committee of the Bradford Corporation, held at the Town Hall last Wednesday, the question of the promotion by the Corporation of a Bill in Parliament next session was again considered. Last year, it may be remembered, the Corporation framed two Bills; but, owing to the project being defeated at a ratepayers' meeting, they were withdrawn. The Sub-Committee provisionally decided to promote a Bill to acquire certain of the powers included in last year's Bills—one being the purchase of Messrs. Ripley's gas-works.

Liversedge and the Heckmondwike Gas Undertaking.—The first of a series of ward meetings promoted by the Liversedge District Council was held last week at Norristhorpe, to consider the proposal which has been made that the Heckmondwike and Liversedge District Councils should promote a Bill for the acquisition of the undertaking of the Heckmondwike Gas Company. Figures were given which it was held would justify the authorities in purchasing the gas-works, though it was made quite clear that the ultimate decision, whether to proceed or not, would be left with the ratepayers. Considerable opposition to the promotion of a Bill was offered; one speaker suggesting that the acquisition of the gas-works by the two Councils would involve an addition to the rates of 1s. in the pound. No vote was taken.

Cirencester Gas Company, Limited.—At the ordinary general meeting of this Company last Wednesday, the Directors submitted the report and accounts for the year ended the 30th of June. They showed a balance of £2731 in respect of profits; and, after allowing for interest on debentures and the interim dividend, this was sufficient to pay final dividends, which the Directors recommended should be after the rate of £12, £6, and £8 8s. per cent. on the different shares—making with the interim dividend, paid in April last, £11, £5 10s., and £7 14s. per cent. for the year. The Directors reported that there had been a steady progress in the undertaking, notwithstanding that a few of the larger consumers had adopted electric and acetylene gas lighting. The number of prepayment meters exceeded 760; and the cooking-stoves used with them and with ordinary meters were upwards of 1000. Under the supervision of Mr. E. M. Beecham, the Manager, the plant and mains had been kept in good order, chiefly out of revenue.

LEGAL INTELLIGENCE.

RESPONSIBILITY FOR A DEFECTIVE FOOTPATH.

At the Liverpool County Court, on Monday last week, before his Honour Judge SHAND, the Liverpool Corporation and the Gas Company were joint defendants in an action brought by Mrs. Elizabeth Braley, a widow, to recover damages for injuries sustained by her as the result of falling on the pavement near her house on the night of the 12th of April last, in consequence, as she alleged, of it having been left in a defective state.

Mr. RUDD appeared for the plaintiff; Mr. RIGBY SWIFT (instructed by the Deputy Town Clerk) represented the Corporation; and Mr. A. H. MAXWELL (instructed by Messrs. Garnett, Tarbet, and Co.) attended on behalf of the Gas Company.

Mr. RUDD explained that on the 8th of April a party of the Gas Company's men took up the flagging of the footway facing a house near plaintiff's, for the purpose of laying a gas-pipe into the house; and the work was left in an unfinished state until the Tuesday following. On the preceding day, about half-past nine, when Mrs. Braley was returning home, at the point where the pavement had been disturbed, she struck her foot against the elevated edge of a flag-stone which had been carelessly replaced, lost her balance, and fell heavily, injuring her face and arm, and sustaining a severe shock, through which she was confined to the house under medical care for several weeks. On his (Mr. Rudd's) applying on her behalf to the Gas Company for compensation, he was referred to the Corporation as being the authority responsible; and by the Corporation he was referred back to the Gas Company. Consequently, he had no alternative but to sue both parties, so as to ascertain where the liability really lay.

The plaintiff and several of her neighbours having given evidence as to the accident, and its cause and consequences,

Mr. RIGBY SWIFT submitted that there was no evidence against the Corporation. He maintained that, by the provisions of the Gas-Works Clauses Act, the Gas Company were primarily responsible to the public in regard to street repairs, restorations, &c., after disturbance caused by or for them; and though, as a matter of mutual convenience, the Corporation had for many years undertaken the work of restoration, it was as contractors and not as principals. Therefore they could not, in any case, be held responsible until they had received notice of the work to be done, and had actually taken charge of it. In this case, they did not receive such notice until the afternoon of Saturday, April 10; and the Monday following being a Bank Holiday, the Corporation's share of the work did not commence until the Tuesday morning, before which time the accident occurred. The Corporation, therefore, could not be held responsible; and the onus of guarding or protecting the public in the interval rested with the Company.

Mr. MAXWELL submitted that the Company finished their work on the 8th of April, and sent notice of the fact to the Corporation department, which was the only onus resting upon them.

His HONOUR said there was no question that the plaintiff had met with an accident, for which she was entitled to compensation from somebody; and, the damages having been agreed at £7 7s., he gave judgment for the plaintiff for this amount—the question as to which defendant was liable being left for further argument and evidence.

The parties having been heard,

His HONOUR said it was unreasonable to suppose that the Corporation could at all times and seasons undertake any amount of work and relieve their principals of all risk. He thought they had acted reasonably and properly in the case, and were not to blame. His judgment would, therefore, be against the Gas Company for the amount at which the damages had been agreed.

Mr. RIGBY SWIFT applied for costs against the Company on the higher scale, on the ground that the case was one of great public interest and importance.

After considerable discussion on the point, his Honour declined to make any special order as to costs.

SEQUEL TO A GAS EXPLOSION.

Judge's Suggestion as to Medical Evidence.

At the Clerkenwell County Court, on Monday last week, before his Honour Judge Edge, an award under the Workmen's Compensation Act was applied for by William Pope, watchman, of Lillington Street, Pimlico; the respondents being the London County Council.

The applicant was in the employ of the Council as a watchman at the School of Art, Southampton Row; and on the 25th of October last, which was a Sunday, a man named Cullen, who was on duty as a watchman at the Council's School of Arts and Crafts in Queen Square, Bloomsbury, went to him in the morning and said there was a smell of gas at the school. The two men went together to the school, and opened the doors and windows; and Cullen turned off the gas at the meter. The applicant returned to Southampton Row, and some time later went again to the Queen Square school. He put his hand over the gasolier burners, and found there was a faint smell of gas. Thinking it was caused by waste gas in the pipe, he applied a light, considering this would give a clue to the place where the gas was passing through. The result was a violent explosion, and he received injuries on the face and hands. He was taken to the Italian Hospital in Queen Square, where he remained till the 23rd of November. Afterwards he went to St. George's Infirmary, Fulham, where he stayed till the 4th of March. He had not yet been able to do any work. The Council paid him half wages up till the 23rd of January.

Medical evidence having been given to the effect that the applicant was unable to do heavy manual work, and that it was doubtful if the joints of his right hand would ever be restored to their original condition, it was submitted by Mr. Glasgow, on behalf of the Council, that

there was no case for them to answer. If the explosion had happened when the applicant first went to Queen Square, his going there at the time of an emergency would have been in his favour in the present claim. The doors and windows in the building were opened, and the smell of gas had passed off. Therefore, when the applicant returned three hours later, there was no emergency. The premises were then safe; and if he had not applied the light, there would have been no accident. Mr. Firminger, who appeared for the applicant, said it was, no doubt, an injudicious act; but the material question here was whether he did *bonâ fide* believe that what he was doing was helpful to his master.

Medical evidence was then given for the respondents to the effect that as far back as January last there was no reason why the applicant should not have used his hand; indeed, the use of a spade was the very thing that would have cured him.

In giving his decision, his Honour said he was not going to deal with the question of law as to whether at the time of the accident the applicant was acting in the course of his employment. The conclusion he had come to was that on the 15th of January the applicant was quite able to resume his work, and that he had then practically recovered from the effects of the accident. He (his Honour) was bound to say, though he did it with some reluctance, that no case had been made out, and that his award must be for respondents. In the course of giving judgment, his Honour remarked that, in cases where the question was purely one of medical evidence, it would be much better if, instead of bringing the matter before a Judge in Court, a rota of leading medical and surgical practitioners in London should be formed by the authority of the Home Secretary. Then, in cases of the sort he was now dealing with, the medical men on each side could agree upon some member of the rota, who should examine the patient in the presence of the medical men on both sides, and whose report to the Court should be taken as conclusive. He added that he was sure that much more satisfactory decisions would be given then than it was possible to arrive at now in cases where the question was purely one of medical evidence.

UNSUCCESSFUL ELECTRIC UNDERTAKING AT UXBRIDGE

The Official Receiver in the Companies Winding-Up Division of the High Court of Justice has issued particulars to the creditors of the Uxbridge and District Electric Supply Company, Limited, from which it appears that a statement of affairs has been filed showing gross liabilities amounting to £59,290, of which £6622 is due to unsecured creditors. The assets are estimated to be worth £75,039, from which have to be deducted the claims of preferential creditors for wages, &c., and those of the debenture-holders; the assets showing an estimated surplus of £15,748. As regards contributories, the paid-up capital is £26,275, and the assets consist of the above-mentioned surplus; so that the deficiency as regards shareholders is £10,527.

The report and observations of the Official Receiver are to the following effect: The winding-up order was made on June 29 last, on the petition of a creditor; and Mr. John Conacher, the General Manager of the Company and of the Metropolitan Electric Supply Company, Limited, was appointed Special Manager for the Official Receiver. The Company was registered on June 24, 1899, as the Uxbridge and District Development Syndicate, Limited, with a nominal capital of £1000, in shares of £5 each; the intention being to apply for a Provisional Order granting a monopoly for the supply of electricity in Uxbridge and the adjoining districts. The nominal capital of the Company was eventually increased to 10,000 ordinary and 5000 6 per cent. cumulative preference shares of £5 each; and 5255 ordinary shares, representing £26,275, have been allotted—the whole being subscribed for in cash except 45 shares issued as fully-paid. No preference shares have been issued. A Provisional Order was granted to the Company, under which they obtained power to supply electricity in Uxbridge and the immediate neighbourhood. The area of supply was afterwards extended by further Orders; and the name was changed to the Uxbridge and District Electric Supply Company, Limited. A prospectus was issued on May 20, 1901, offering 2650 £5 shares for public subscription; but only a small number (128) were applied for. The original shareholders received £1000 for waiving the right they claimed to convert their holdings into founders' shares; and the money was applied by them in taking up 200 further shares in the Company.

Under an agreement dated March 26, 1901, the General Electric Company (1900), Limited, agreed to make advances from time to time to the Company, not to exceed a total of £20,000, on the security of the debentures. The agreement provided that orders for the plant and works necessary for the Company's undertaking should be placed with the General Electric Company at rates equal to 10 per cent. above competition prices. In May, 1901, the Company acquired a freehold site at Uxbridge, a generating station was built and equipped, and the laying of mains proceeded with. The approximate length laid is 37½ miles of high-tension mains and 11½ miles of low-tension mains. The public supply of electricity commenced in May, 1902. By September, 1904, the General Electric Company had subscribed for a total of £20,000 of debentures, and a further £3900 was taken up by Directors and the public. The debentures carried interest at a minimum rate of 4 per cent., and were exchanged in September, 1904, for others bearing interest at 5 per cent. The Company at the same time issued debentures for £3000 to Callender's Cable and Construction Company, Limited, in payment of a debt. In May, 1905, the General Electric Company held debentures for £21,500 and 320 shares (£1600), and Callender's Company held debentures for £3000 and 730 shares (£3650). By an agreement of May 8, 1905, in consideration of the Company withdrawing their opposition to a Bill in Parliament, the Metropolitan Electric Supply Company, Limited, agreed, in the event of the Bill receiving the Royal Assent, to acquire the interest of the General Electric Company and Callender's Company, and to take up an additional 500 shares in the Company. The Metropolitan Company were also to have the right to nominate Directors up to four in number. The arrangement was duly carried out in December, 1905, and the Metropolitan Company have since taken up further debentures for £19,000, which were issued to them at a discount of 10 per cent. The total debentures issued by the Company

amounted to £50,000, of which £43,500 are held by the Metropolitan Company and £6500 by the Directors and the public. The total capital expenditure of the Company in connection with the undertaking, according to the accounts for the year 1908, was £81,358—being £7183 in excess of the share and debenture capital subscribed.

The Company have been unable to pay the interest due on debentures for the half year ending December, 1908, or to meet their other liabilities. On the presentation of the petition to wind up, the Metropolitan Company commenced an action, and on July 20 last the Court appointed an Official Receiver for the debenture-holders. The assets of the Company are valued in the statement of affairs at £63,038. The failure of the Company is attributed by the Directors to want of working capital, and to loss of business caused by closing-down customers' works.

TAMPERING WITH A PREPAYMENT GAS-METER.

At the Tottenham Police Court last Thursday, William Griffin was summoned for wilfully and fraudulently impairing an automatic gas-meter belonging to the Tottenham and Edmonton Gas Company. Mr. W. Windsor prosecuted; Mr. Kershaw appeared for the defendant. Sidney Griffiths, a collector in the employ of the Company, said he called at the defendant's house on the 9th of July, and collected 1s. 11d. from the meter, the index of which recorded the consumption of 5600 cubic feet, which was an increase of 1700 cubic feet since the previous reading. There should have been 5s. 6d. in the box. Herbert Thomas Smallbones, another collector, said he examined the meter on the 20th of August, and the reading was exactly the same as on the 9th of July. There was 3d. in the money-box. He spoke to Mrs. Griffin about this; but she made no remark. Frederick Lambert, a gas-fitter, said he inspected the meter at the defendant's house on the 1st of September. The reading then was 5100 cubic feet. He removed the meter to the stores to be tested. William Edward Barney, Inspector of Meters for the Middlesex County Council at the Angel Road testing-station, stated that on the 10th of September the meter came into his possession to be tested; and he found that it had been tampered with. It passed gas satisfactorily; but the index door-frame had been forced from the front of the meter sufficiently to allow the glass to be withdrawn. The index hands had been taken off their centres; such force being used in the operation as to crack the enamel dial. The hands had then been refixed in wrong positions, so that they contradicted each other. Transparent cement had been used to put them on again. It was usual to rivet them on. The glass and frame were afterwards put into their former positions with wax, and then repointed to correspond with the surrounding parts. It must have taken at least four hours to do this work. The extent of the damage was about 20s. In answer to Mr. Kershaw, witness said he did not think the meter could have been tampered with two or three times. Though set wrong, the index would still record; but it would not start from the right point. Alfred Whitchurch, in the employ of Messrs. Thomas Glover and Co., Limited, said he was present when the meter was tested, and agreed that it had been tampered with. He considered this had been done between July 9 and September 1. The witness Smallbones was recalled, and said that at the time of the tenancy of the previous occupier of the house the same meter was in use there, and worked in a perfectly regular manner. Mr. Kershaw, for the defence, contended that there was no proof that the meter was in proper condition when it was first used by the defendant. He called Griffin, who stated that when he went into the house there were other people on the top floor, and he believed that proceedings had to be taken to eject them. He denied that he had ever tampered with the meter. In answer to Mr. Windsor, he said his suggestion was that the tampering was done before he became the tenant. Mrs. Griffin, wife of defendant, said that on two occasions she complained to the Company's collector that she did not think she was getting sufficient gas for a penny. She had no knowledge of any interference with the meter. The Bench imposed a fine of 40s. and costs, or 21 days' imprisonment.

The Dangers of Geysers.

Last Tuesday, an inquest was held at Sheffield on Robert James Bennett, aged 50, a draughtsman, residing at Bolton, who died in the Sheffield Royal Hospital. While visiting at the house of a friend in Sheffield, he had a bath in a room in which there was a gas-heated geyser; and this was thought to have had something to do with his fatal illness. Dr. Robertson said his death was due to a peculiar kind of pneumonia, which was partly caused by coal-gas poisoning. The deceased also suffered from congestion of the brain and inflammation of the lungs. Mr. Arthur Mead said he had examined the geyser and found that on lighting it and leaving it for about two minutes the flames were extinguished. This might be occasioned either by the outlet-plug for the disused gas constituents being blocked up, or by a strong downward draught. The geyser was lighted by five bunsen burners. The products of combustion were meant to escape outside by means of a flue. To fill the bath, water had to be run through the geyser for about twenty minutes by means of a tube. If the burners were lighted and the water was flowing, carbon dioxide, the product of combustion, would escape through the flue if it were in order. If the burners were not alight, and the water were off, ordinary coal gas containing 7 per cent. of carbon monoxide, which was much more poisonous and deadly to life than carbon dioxide, could quickly fill the bath-room. On the other hand, providing the flames were touching the cold surface, there would be a certain amount of carbon monoxide generated; but he did not think it was in this case. It was not safe to use the geyser with the gas on and the water off, even now that a new and effective flue had been attached. A verdict of "Accidental death" was returned.

The officials of the Chichester Gas Company have found it necessary to caution the residents in the city against the hawkers of fittings in the Company's name. The fittings in question have been sold at a much higher price than that charged by the Company.

MISCELLANEOUS NEWS.

BRITISH GASLIGHT COMPANY, LIMITED.

Bad Trade and Gas Consumption—Righting an Income-Tax Error.

The Half-Yearly Meeting of this Company was held last Wednesday, at the London Offices, No. 11, George Yard, Lombard Street, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. A. W. Brookes) read the notice convening the meeting, as well as the report of the Directors and the statement of the Norwich accounts. The report was as follows:

The Directors submit the half-yearly accounts of the Company to June 30 last, as examined and certified by the Auditors, who have also vouched for the correctness of the several investments held by the Company.

The available profit is £23,444 11s. 5d., after deducting [omitting shillings and pence] the following sums: Income-tax, £2012; Hull debenture interest £2128; Norwich debenture interest, £1773; Potteries debenture interest, £662; Trowbridge debenture interest, £105; and interest on debenture stock, £2270—total, £9013.

HULL.—The gas-rental shows an increase of £644, as compared with that of the corresponding period of 1908; the price of gas having been the same—viz., 2s. per 1000 cubic feet. Coke shows a decrease of £991; tar and tar distilling, of £67; ammoniacal liquor and sulphate of ammonia, of £512. Coals have cost 13s. 1d. per ton, as against 14s. 6d. Coke has realized 10s. 8d. per ton, as against 12s. 6d.

The gas sold was 633,910,981 cubic feet, against 629,005,291 cubic feet in the corresponding period of 1908—an increase of 4,905,690 cubic feet, or equal to 0.78 per cent. Of this quantity 44,657,000 cubic feet were supplied in bulk to the Corporation for the supply of the Old Town.

The profit realized is £2651 in excess of the parliamentary interest. This sum has been invested, making the reserve fund £37,105.

NORWICH.—The gas-rental shows a decrease of £4824, as compared with that of the corresponding period of 1908, owing chiefly to a reduction in the price of gas from 3s. 3d. to 3s. per 1000 cubic feet from Jan. 1 last. Coke shows a decrease of £368; and tar and ammoniacal liquor, an increase of £33. Coals have cost 17s. 1d. per ton, against 18s. 9d. Coke has realized 14s. 10d. per ton, against 16s. 5d.

The gas sold was 252,834,400 cubic feet, as against 264,538,000 cubic feet—a decrease of 11,703,600 cubic feet, or equal to 4.42 per cent.

The profit realized, after writing off £3482, the balance of cost of reconstruction of works, is £5260 less than the parliamentary interest.

POTTERIES.—The gas-rental shows a decrease of £554, as compared with that of the corresponding period of 1908; the price of gas having been the same—viz., 2s. 6d. per 1000 cubic feet. Coke shows a decrease of £531; tar, of £626; and ammoniacal liquor and sulphate of ammonia, of £184. Coals have cost 10s. 9d. per ton, as against 11s. 2d. Coke has realized 8s. 7d., as against 8s. 8d. per ton.

The gas sold was 186,733,778 cubic feet, as against 191,379,855 cubic feet—a decrease of 4,646,077 cubic feet, or equal to 2.42 per cent.

The profit realized, after writing off £2000 on account of buildings and plant thrown out of use and £2000 part cost of levelling new land and making drains and roads, is £1332 less than the parliamentary interest. This sum will be taken from the reserve fund; leaving a balance of £3235 to the credit of that account.

TROWBRIDGE.—The gas-rental shows an increase of £175, as compared with that of the corresponding period of 1908; the price of gas having been the same—viz., 3s. per 1000 cubic feet, with discounts. Residual products show a decrease of £139. Coals have cost 16s. 11d. per ton, against 16s. 6d. Coke has realized 13s. 2d., against 13s. 4d. per ton.

The gas sold was 33,688,488 cubic feet, against 33,175,376 cubic feet—an increase of 513,112 cubic feet, or equal to 1.54 per cent.

The profit realized is £463 less than the parliamentary interest.

HOLYVELL.—The gas-rental shows an increase of £79, and residual products a decrease of £7. The profit realized is £223.

FINANCIAL RESULT.—The available profit, added to the previous balance of profit and loss, amounts to £78,211. From this sum, the Directors recommend a dividend at the rate of 10 per cent. per annum, free of income-tax. This will amount to £24,500, and leave a balance of £53,711.

The Directors who go out of office are Major-General William T. Corrie and Mr. Leonard R. Wilkinson; and the Auditors are Mr. E. Knowles Corrie and Mr. William Cash. They respectively offer themselves for re-election.

The CHAIRMAN, in moving the adoption of the report and accounts, said there were a good many points about which to speak, and there were some explanations to make. In the first place, the half-year's report was a little disappointing to the Directors, from the fact that the business had not gone ahead in the way they could have wished. He was not going to enter into a political speech with regard to the business of the country and trade generally; but there was no doubt that the Company had felt the effect of bad trade to a considerable extent, both at Hull and at the Potteries. At the latter station, there had been a decrease in the amount of gas consumed of 2½ per cent., and at Hull where the principal business was situated, there was an increase of only ¾ per cent. With regard to Norwich, there was an apparent alarming decrease of 4½ per cent.; but that he would explain more particularly when he came to the Norwich station. Then, with regard to the profits of the half year, it would be noticed that they had not quite earned the full dividend. This also was largely due to the bold step the Directors took at Norwich in reducing the price of gas from 3s. 3d. to 3s. But he did not think there was anything to be alarmed at in the fact that, in the half year, the full profit had not been quite made. The Board had every reliance that in the future the Company would still be doing a prosperous business at both Norwich and Hull, and they also wished to point out that they had a carry-forward this half year of £53,700; so that the Company were in a very good financial condition. To refer now to a few matters of interest with regard to the different stations. Concerning Hull, the Directors had, he believed for the first time in the history of the Company at that place, entered into a five years' contract for the public lighting of Hull. Hitherto they had gone on from year to year in the most amicable manner with the Corporation; but lately they had been called upon (and had done it with the greatest pleasure) to light a large number of what were called terraces in Hull, but which were really what would be called in London "blind alleys." These terraces had never been properly lighted,

because they did not come, in the old days, under the jurisdiction of the Corporation, but were private property. However, it was now felt that these terraces should be properly lighted; and so the Company came forward with a scheme, in conjunction with their neighbours the East Hull Gas Company, to light these terraces (of which there were a large number) at a very small cost. He might say that one of the Directors (Major-General Corrie) went down to Hull the previous week to attend a public function, at which there were present the Mayor and other members of the Corporation; and they expressed, in the highest terms, their gratitude to the Company for the liberal way in which they had treated the town in respect of this special lighting. Then they had their usual gas exhibition at Hull, and orders were taken for 443 cookers, and for a great many other fittings and appliances. His colleague (Mr. Corbet Woodall) attended, and said that it was a remarkably good show. Then at the last meeting he spoke to the shareholders about the very cramped condition of their offices in Baker Street, and mentioned that they had purchased the adjoining properties with the intention of adding to their workshops and also to the offices. These changes were not yet completed. The tenders, however, were out; and it was found that it would cost about £4000 to erect the buildings. But they would be a great benefit to the Company when the work was done. To refer to a small matter that had taken place since the close of the half year, he had no doubt that some of those who read the "GAS JOURNAL" had seen the interesting account of the visit of the Eastern Counties Gas Managers' Association to Hull, in connection with which Association their Engineer at Hull was the President this year; and therefore, on the occasion of the meeting, the Company entertained the visitors and many of the public men of Hull at luncheon. With reference to Norwich, the decrease in the gas-rental had been mentioned in the report—viz., £4824. This was mainly owing to the reduction of 3d. per 1000 cubic feet in the price of gas. Approximately the 3d. came to a little over £3000. Then a year ago there was an old method in vogue of reading the meters, which did not commend itself to the Company's Manager in that City; and so a method of reading was instituted by which the meters were taken at exactly, or, as near as possible, exactly with, the half year. As a result, this half year they had an apparent exceptional loss. It was not really a loss, but was less profit in the half year, amounting to about £1800. In this way, the decrease of £4800 was fully accounted for. On the other hand, he should like to point out that the Directors had now finished the writing off of all the constructional work that had taken a great many years to do. The shareholders knew the Company had had a large suspense account there. The Directors had gradually, half year by half year, been writing it down; and now, on this occasion the balance of the cost of the reconstruction had been written off. As this was no less a sum than £3482, he hoped that in the near future they would come in for more of their authorized earnings. During the half year they had, with the approval of the Board of Trade, brought into use the "Metropolitan" No. 2 burner, which, of course, would be of considerable advantage to the Company, and would regularize the testing under modern conditions as had been done in the case of other companies. In prospect was the early construction of a new gas tank and holder at Norwich. There was a suitable site on the scheduled land; so that they did not anticipate any difficulty with regard to the public in that respect. It was hoped that the new tank and holder would be erected next year. It would be absolutely necessary because the business was increasing there; and it was hoped with the reduction in the price of gas, if trade revived, they would have a considerable increase in the amount of gas supplied in Norwich and the surrounding districts. He had no doubt that some of the shareholders had read in the papers that during the half year (on June 18), the Company had the honour of giving a handsome entertainment to the Institution of Gas Engineers, who made an excursion to Norwich on the occasion of their annual meeting in London, their respected Manager at Norwich being the President of the Institution at the time. He (the Chairman) was exceedingly glad to be able to report that everything went off very well, and not only did the Corporation join with the Company in most heartily welcoming the Institution, but they provided part of the entertainment by a trip on the Norfolk Broads. Concerning the Potteries, he had very little to report, except to say how very bad trade was there; and this had been particularly felt by the Company. He had been looking back for a few half years; and it was wonderful how well they had maintained the business at the Potteries. He had no doubt Mr. Corbet Woodall would bear him out when he said that it had been a source of wonderment to him who knew the district so thoroughly, and who was so very much interested in the place, that the gas business had done so well as it had. Though they were now feeling the effects of the bad trade at the Potteries, he (the Chairman) sincerely hoped that the trade of the district would recover, and that the Company would go ahead there as formerly. He heartily trusted it would be so, because the Company had been going to great expense in building new works and putting up new gasholders to meet the wants of the large and extensive area which they lighted. There was another matter to which he wished to allude, and of which notice had been sent to the shareholders. It was with reference to the income-tax on the Directors' and Auditors' remuneration. It was a matter which he thought required adjustment, and which the Directors felt must be laid before the shareholders in order that it might be set right. It had been an absolute rule in the Company from time immemorial to pay the shareholders their dividends free of income-tax. That was within the province, and rightly so, of the Directors to decide; and it had also been from time immemorial the custom to pay, clear of income-tax, the salaries of the officers and staff and the remuneration of the Directors and Auditors. In this case, he felt the Directors had been in error. In looking into this matter so far as the Directors and Auditors were concerned, it was found the resolutions passed by the proprietors had never stated that the remuneration was to be paid free of income-tax; so that technically they had been doing something they ought not to have done without the authority of the shareholders. The moment the Directors' attention was drawn to the state of things, they thought the only thing to be done was to leave the matter in the shareholders' hands, and ask them to pass a resolution giving the absolution that would put them straight. A resolution dealing with it was in the hands of one of the shareholders. Then there was the

question of the Auditors. It would be remembered that, within the year with which they were dealing, after the last election of Directors and Auditors took place, they lost one of the Auditors. By the Company's statutes, the Board were empowered to appoint a gentleman as Auditor temporarily; and the gentleman appointed was Mr. William Cash, the well-known Accountant in the City, whose whole business life had been devoted to accounts, and more particularly to gas accounts. Speaking personally—not as Chairman, but as an individual—he thought no better solution of the position in which they were placed could possibly have been made. Mr. Cash had audited the present accounts; and the Secretary reported that a most searching investigation was made of the accounts before Mr. Cash passed them. He (the Chairman) hoped and trusted the shareholders would re-elect Mr. Cash.

Mr. F. WILKIN seconded the motion; and it was unanimously carried.

Moved by the CHAIRMAN, and seconded by Mr. F. WILKIN, a dividend was declared at the rate of 20s. per share for the half year, clear of income-tax.

Mr. L. R. ABBEY-WILLIAMS said, as to the remarks of the Chairman about the payment of income-tax on the remuneration of Directors and Auditors, he had a resolution to propose which he thought would, in the words of the Chairman, give absolution for the past, and protection for the future. He remembered that not long ago he was reading over the half-yearly report of a well-known Gas Company on the south coast, and the same thing he found had happened there. The authorization had been entirely omitted; and, at the first half-yearly meeting after the matter was discovered, the shareholders passed a resolution regularizing the matter. The resolution he had to propose was—

That all payments of income-tax in respect of the remuneration of Directors and Auditors heretofore made by the Board out of the funds of the Company be, and the same are hereby, confirmed and approved; and that the Board be, and they are hereby, authorized to pay out of the Company's funds as additional remuneration all income-tax assessable on any remuneration henceforth payable to any Director or Auditor.

Mr. A. G. BURNEY seconded the motion, remarking that he knew of a precisely similar case to this occurring in another Company carrying on business in the City. This happened only a short time ago; and the Directors in that instance adopted precisely the same course as was being followed now.

The resolution was unanimously carried.

The CHAIRMAN, on behalf of himself and his colleagues, thanked the shareholders for the kind way in which they had rectified the errors of the past, and had granted the Directors the rights in this matter for the future.

Moved by the CHAIRMAN and seconded by Mr. WILKIN, Major-General Corrie was re-elected to his seat on the Board; and on the proposition of Mr. CORBET WOODALL, seconded by Mr. R. S. GARDINER, Mr. Leonard R. Wilkinson was also returned to his seat.

Moved by Mr. BERNARD F. HARRIS, and seconded by Mr. KENNETH R. MACKAY, Mr. E. Knowles Corrie was re-elected an Auditor, as was also Mr. Cash, on the motion of Mr. MACKAY, seconded by Mr. WILLIAM HILL.

Mr. CASH, in replying for himself and colleague, remarked that he should like to say on this first occasion of addressing the shareholders, that he had found the books of the Company excellently kept, and everything in first-class order; and he was sure the shareholders, who had already every confidence in the Directors, must feel gratified that the whole of the financial affairs of the Company were in such a sound position. He had had an opportunity of calling at Hull, and he had found there that, throughout, the accountancy side of the station was excellent.

A vote of thanks was passed to the Chairman and Directors, on the motion of Mr. A. G. BURNEY, seconded by Mr. CASH.

The CHAIRMAN, in responding, said it was very satisfactory to have this testimony as to the manner in which their books were kept from such an authority as Mr. Cash.

Mr. CORBET WOODALL proposed a vote of thanks to the Secretary, Engineers, and staffs generally in London and at the stations. He remarked that what Mr. Cash had said with regard to the Secretary was sufficient. Mr. Brookes had been their Secretary now some twelve months; and on the Directors' side of the table, there had already been formed a completely satisfactory view of Mr. Brookes' services in that capacity. With regard to the business at the stations, they were coming to look upon the British Gas Company as a sort of training school for Presidents. They had already supplied from Norwich a President for the great Institution of Gas Engineers; and now they had the Eastern Counties Gas Managers' Association going to Hull for their President in the current year. In these two Presidents the Company had two worthy men; the one had already satisfied in every particular, and the other would do the same, those who had given them their confidence. If it were possible to take exception to a word in the Chairman's address, it would be, on his (Mr. Woodall's) part, to the use of the term "disappointing" with reference to the trading of the half year. Personally, he did not think they had any reason to be disappointed with it. They might regret that the trade of the country was not so good as it was; but the results of the Company's working he thought were, in the circumstances of the times, most gratifying. With reference to the reduction of the balance carried forward, the Chairman had explained this; and they could not expect, and did not wish, that they should always go on piling up still further the large carry-over that had been accumulated. It had been accumulated expressly to provide for reductions in the price of gas, and to equalize dividends during the time the reductions were recouping themselves by increasing the demand for gas. He referred to this because he was sure the officers at the stations were doing their very utmost to maintain the business of the Company.

Mr. R. S. GARDINER seconded the motion, which was cordially passed.

The SECRETARY, on behalf of himself and all his fellow-officers, thanked the Chairman, Directors, and shareholders for their kind expressions of confidence. He added that it would be very gratifying to all the secretarial and book-keeping staff to learn the words of praise that had fallen from the lips of Mr. Cash.

This terminated the proceedings.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices, D'Olier Street, Dublin, last Thursday—Mr. W. F. COTTON, D.L., J.P., in the chair.

The SECRETARY AND MANAGER (Mr. F. T. Cotton) read the notice convening the meeting, and the report of the Directors for the six months ending the 30th of June, given in the "JOURNAL" last week (p. 846), with the accounts for this period, was presented.

The CHAIRMAN, in moving the adoption of the report, said that during the half year there had been expended on capital account £10,536. About half of this sum was spent on meters, stoves, and fittings, principally for the prepayment system; the balance being for new mains and services. On referring to the accounts, it would be found that the income from all sources amounted to £153,656; and the gross expenditure was £114,990—leaving a net profit of £38,666. From this sum, interest on the debenture stock and overdrafts from the bankers had been deducted; leaving a balance of £32,322. In order to pay the same dividend as last year, it would be necessary to have recourse to the reserve fund, and draw therefrom £4034; leaving to the credit of the fund a sum of £39,936. They had used up all the coals purchased at high prices at a time when they were threatened with strikes from all the quarters from which they drew their supplies. However, he was happy to say that coals had come down to very nearly their normal figure. Owing to the general depreciation in trade, there had been a falling off in the receipts for gas compared with the corresponding period of last year. The returns from coke were also somewhat less in consequence of having to dispose of it at a reduced price. In the half year under review, there had been put in 2179 new installations, in each case fitted with cooker, brackets, and pendant, as required. There were also 82 cookers supplied without house fittings, 467 cookers and 168 heating-stoves lent on hire, and 12 cookers and 104 heating-stoves and gas-fires purchased by consumers. The total number of cookers in operation was 81,007; heating stoves on hire, 1485; and 3446 stoves and gas-fires purchased by consumers. On previous occasions, he had referred to the retort-houses in course of construction at the Brunswick Street works. One of the sections was completed, and they expected that by the end of the year the second section would be ready for use. In these houses the modern system of carbonization had been introduced, by which there would be a great saving in coals and coke, and the yield of gas per ton of coal carbonized would be much augmented compared with the present production. He might say he was quite confident that when these new works were brought fully into operation they would be of great advantage to the Company. At the last meeting, he referred to the Bill being promoted in Parliament affecting the supply of gas to the city and out-townships. It passed through the House of Lords without material alteration; but subsequently, when it reached the House of Commons, petitions against its passing into law were lodged by the Corporation of Dublin and some of the townships. In order to avoid costly litigation, and with every desire to meet all opposition in a friendly spirit, the Directors obtained interviews with the members of the Corporation who had charge of the Bill. After these, with one or two exceptions, an arrangement was practically come to. The disputed points were ultimately settled during the Committee stage of the Bill in the House of Commons; and finally clauses carrying out the terms agreed upon were embodied in the Bill, which received the Royal Assent on the 16th of August, and was now an Act of Parliament. The Directors considered it unnecessary on the present occasion to enter into minute details of the Act. There were, however, one or two provisions to which he might call attention, such as the change from 16 to 14 candle gas, to be supplied under the modern mode of testing, at reduced prices, and to come into operation from January next; also the consolidation and conversion of the ordinary share capital into stock, which would make it more convenient for those who were interested in the Company.

Mr. CHARLES LAWLER, J.P., seconded the motion; and it was carried.

The dividends recommended were then declared; and a formal resolution was passed confirming the increase in salary granted to the Secretary and Manager at the preceding meeting.

Mr. MICHAEL MURRAY proposed that a vote of thanks be given to the Chairman, Directors, and officers, for the manner in which they had conducted the affairs of the Company during the half year. He said the vote was very well deserved, for the Company had gone through a very troublesome time. They had to face two or three things of which, perhaps, the general public were not aware. One was that they had to pay 1d. in the pound for losses on the opposition concern—he meant the electric light industry—inasmuch as when they paid £9000 a year in rates it was a serious thing to pay the extra 1d. Then the Insurance Companies wanted to make them responsible for a fire; but the officers were to be congratulated on getting a unanimous verdict at the trial. The third trouble was the Bill, which was got through in a wonderful manner.

Mr. A. REID seconded the motion; and it was carried.

The CHAIRMAN, in acknowledgment, said no body of men could be more careful, or devote more time and energy to the Company, than did the Directors; and he could say the same in regard to the officials.

Mr. F. T. COTTON also replied; and the meeting concluded.

Treatment of Sufferers from Carbon Monoxide Poisoning.—At an inquest held on Monday last week on John Hough, aged 35, employed at the Crewe railway works, it was stated that the man had been asphyxiated by inhaling carbon monoxide fumes while firing a gas-producer. Dr. Lawrence stated that the only real remedy in these cases was a withdrawal of the blood and the injection of fresh blood; and that artificial respiration, which had been tried, was useless, since the body became paralyzed, and would not take oxygen. The Coroner suggested that in future notices should be posted about the works that if ever another case occurred the victim should at once be removed to the hospital, and that no time should be wasted in trying artificial respiration.

SOUTH AUSTRALIAN GAS COMPANY.

In moving the adoption of the report of this Company for the year ended the 30th of June, noticed in the "JOURNAL" last week, at the recent annual general meeting, the Chairman (Mr. A. M. Simpson) remarked that the expenditure had been considerably in excess of that of the previous year. This, however, was made up by increased receipts. The sales of gas and residuals exceeded those of 1907-8 by £14,576, and those of 1906-7 by £26,340; so that the proprietors would see that there had been a steady increase of more than 10 per cent. in the past two years. Good progress had been made with the new plant, and more had been found necessary in order to keep pace with the growing business. During the year, 18 miles of main had been laid, and upwards of 1000 new meters fixed. In order to provide the necessary capital for the various works, £17,600 worth of bonds had been issued. Increased business had been done by the fitting department; and the cooking demonstrations had been well attended. As the result of the business done, they had paid the usual dividend, placed £12,500 to the reserve fund, and carried forward £800 or £900 more than they started the year with. The motion having been seconded, Mr. W. H. Philipps said the Directors had steered through the difficulties attendant on a higher price of coal, and an increased cost of labour, in a most satisfactory manner. The shareholders expressed their perfect confidence in the Directors' management of the Company. The motion was carried.

PROFIT-SHARING AT CHESTER.

Annual Report.

At the Recent Annual Meeting of profit-sharing employees of the Chester United Gaslight Company—which was presided over by the Chairman, Mr. J. G. Frost—the following report of the Committee was submitted.

The total bonus added during the year is £297; and in addition £19 interest has been allowed. Sums have been deposited amounting to £77; and £156 has been withdrawn. But the greater portion of this has been paid to workmen leaving the Company's service and to representatives of deceased employees. The stock purchased by profit-sharers during the year has been £340, at a cost of £382; and the aggregate amount of stock transferred to employees under the scheme since its introduction in 1901 is £740. This is in addition to the balances amounting to £778 standing to the credit of employees. The Trustees have been fortunate in buying stock during the year which will enable them to transfer profit-shares at the same price as before—viz., £11 5s. for each £10 of stock, free of all expenses of transfer deed—and the Committee strongly recommend all their fellow employees to take advantage of the opportunity thus afforded to purchase stock. During the year, the principle of co-partnership has been adopted by a large number of other gas undertakings and large industrial concerns in various parts of the country. This is undoubtedly owing to the success achieved by the pioneers of co-partnership; and we may honourably pride ourselves on being connected with one of these. The bonuses accumulated under our profit-sharing rules have in some cases of illness been of great assistance; while the considerate efforts made by the employees to relieve the anxiety and suffering of ailing workmen have been frequent and liberal, and the development of such good-will and brotherly feeling can only be secured by following the true spirit of co-partnership.

The CHAIRMAN, in proposing the adoption of the report and accounts, heartily congratulated the men on the really substantial amount of their financial interest in the Company, and the large number who were now shareholders and registered in the books. The report was a very good one, and very encouraging. As Chairman of the Company, he took a keen interest in all the minor matters connected with the management, and particularly in those which affected the welfare of the employees, from the man or boy in the humblest position right along to the chief officials. It was most gratifying to the Directors and himself to see the large success achieved by the co-partnership scheme in so short a time. In a small concern like theirs, they were in the proud position of being able to show that there was an amount equivalent in cash to £1592 standing in their names in the books of the Company; and those who were young had thus, by this scheme, a golden opportunity of laying up a substantial provision against adversity or old age. Nor did its beneficial effect end there. Human nature was so formed that effort, and effort only, could develop and improve the possibilities which lay in all. Of course, all were not alike; but if each individual made the personal effort in his individual post to do his work thoroughly, it was quite certain that, in addition to assisting in the success of the concern, he must also be a better man. Speaking a special word of advice to the younger men and boys, the Chairman said the temptations to enjoyment and self-indulgence were never so great as to-day; and he would impress three things upon them. First, that it was only by a little self-denial that they could improve their prospects in life, and he urged them to devote some time—if only one or two nights a week—to self-improvement. There were many opportunities for them to do this. Secondly, let them fight their hardest to keep absolutely and always straight, and not to allow deception in any form to influence them for a moment. They might for a time seem to get along better; but it was fatal to their development as men, and in the long run could not cause anything but sorrow and trouble to themselves and those around them. Thirdly, let them not undervalue the use of money. Let them never allow themselves to attend amusements or form habits which they could not afford; but let them take care of what they had, so that they could hold up their heads, and feel they could pay their way—and perhaps help another not so fortunately placed. Let the spirit of hard, honest effort to help the less fortunate, and the exercise of that temperance which checked extravagance, not only in drink, but in all the temptations of life, be their really constant aim; and certain it would be the present report would be only the forerunner of many to follow, showing continued success. In addition, they must certainly

feel that they grew stronger, and were of more assistance to their fellows; and they would be unwittingly doing their duty to their country and bearing their part in aiding its progress.

Mr. J. R. MACHIN seconded, and referred to the doubts which were expressed when the scheme was started. He said these had all been falsified, and the scheme was of great benefit to them, not only financially, but in a variety of other ways. Their social club room was the outcome of the scheme; and it had established a social feeling among the men which all had enjoyed and benefited by. The scheme had been a good thing for one and all of them.

The motion was heartily carried.

Mr. F. A. PYE (the Secretary and General Manager of the Company) proposed a vote of thanks to the Chairman, referring to the interest displayed in the scheme by Mr. Frost and the other Directors, and also to the spirit of self-dependence which had been shown by the men in furnishing their club room—a spirit which the scheme had done much to foster and encourage.

Mr. J. C. BELTON (the Engineer) seconded, and urged the younger men to efforts at self-improvement; reminding them that to-day there were facilities by which any young man of intelligence could acquire a thorough and efficient knowledge of almost any branch of practical work. There was now every inducement offered to young men to improve themselves.

The CHAIRMAN briefly replied, and the meeting concluded.

MANCHESTER CORPORATION GAS UNDERTAKING.

Criticism by the Ratepayers' Association.

At the Annual Meeting of the Manchester Ratepayers' Association last Wednesday, Mr. J. C. B. Percy, who is in business as a printer, indulged in an exhaustive criticism of the management of the Corporation gas undertaking. Having stated that during the last ten years the illuminating power of the gas had been lowered by 20 per cent., the capital and loans largely increased, the net profit decreased, and the reserve fund of £147,000 wiped out, while the average selling price remained the same, the speaker proceeded to make a comparison between the gas undertakings of Manchester and Birmingham. He stated that not only was the average selling price of gas in Birmingham lower than in Manchester, but the total management expenses were £9784, compared with £22,659. Though there was 25 per cent. less turnover, collectors' salaries in Manchester totalled to £11,924, against £1506 in Birmingham. From these figures Mr. Percy argued that there was extravagance in management at Manchester; and he challenged the statement of the Gas Committee, contained in the last report, that the gas undertaking was "never in a better condition." He said that the poor illumination of an elementary school which he visited recently—a result of the lower quality of the gas now supplied—was quite sufficient to call for all the strictures which had been made upon it in the recent report of the Education Committee.

THE PROPOSED NEW GAS-WORKS FOR BELFAST.

Question of Site—Ormeau Park Rejected.

The Adjourned Special Meeting of the Belfast County Borough Council, to consider the minutes of the Gas Committee relative to the selection of a site for the new gas-works, was held last Tuesday, and occupied the Council from eleven in the morning till nearly seven in the evening, with an interval of two hours. As previously mentioned in the "JOURNAL," six sites had been submitted by the Gas Committee for the consideration of the Council—viz., Ormeau Park, Ormeau Park and Glentoran, Donegall Road, Oranmore, Twin Island, and Brick-Works. At the meeting of the Council on the 23rd ult., the Chairman of the Gas Committee (Mr. Doran), in a long speech, moved the reception of the Committee's minutes. To this motion, an amendment was proposed by the High Sheriff (Mr. F. Curley, J.P.) to adjourn the meeting until the 7th of October, and that in the meantime arrangements should be made for the Surveyor or some of his staff to point out to the members of the Corporation the various sites which had been considered by the Gas Committee. He subsequently, however, altered the date specified in his amendment to the 28th ult.; and this was agreed to. On the re-assembling of the Council, the Chairman of the Parks Committee (Mr. McClure) moved to omit the Ormeau Park site from the list submitted; and the motion was carried by 33 votes to 18. Subsequently, Mr. Riddell moved that the East Twin Island site should be selected; but the proposal was rejected by a small majority. In the result, the meeting was adjourned till yesterday.

Referring to the rejection of the Ormeau Park site, the "Belfast News Letter" last Wednesday made the following remarks: "We venture to say that the Council has seldom done a worse day's work. The decision thus come to is in direct conflict with all the advice which the Gas Committee, on behalf of the Municipality, has sought from those best fitted to give advice and counsel. We refer, of course, to the various experts who have been consulted on the matter. Five gentlemen have thus been called in at different times during the past seventeen years. Three of them—Mr. Foulis, Mr. Woodall, and Sir Alexander Binnie—are undeniable men, whose opinions on such a question are worth the whole weight of the combined wisdom of the City Council. Then there is Mr. Steffox, the late Manager of the gas-works, and Mr. Sharpe, the present Manager. Each of these gentlemen, in addition to his professional repute, is intimately conversant with every requirement of the city in its gas supply and in the practical working out of the problems involved. Each of these experts has in turn recommended the Ormeau Park site as the site above all others upon which the extensions of the gas-works should be carried out. Yet, without going into the merits of the case yesterday, the City Council threw this site aside in the fashion we have stated, on the sole ground that it was part of the Ormeau Park, and the park must not be touched. This is sentiment run mad—nothing short of it."

DEVELOPMENT OF THE GAS INDUSTRY.

By ALEX. WILSON, M.Inst.C.E., Gas Engineer, Glasgow Corporation.

[From the "Glasgow Herald," Sept. 21.]

A considerable amount of surprise and incredulity is often expressed at the reported continued expansion and development of the departments and works for the supply of gas to large towns and cities, in view of the many competitors that are now in the field. Less than thirty years ago, gas consumed through flat-flame burners was the principal agent for illuminating purposes; candles and oil-lamps being practically the only other means available for obtaining artificial light. At the present time, the choice of an artificial illuminant is not so limited. Electricity, petroleum, acetylene, and many forms of oil and carburetted air gas are offered to the public; and many claims are made by their suppliers as to the efficiency and economy of these various illuminants.

SOME STRIKING STATISTICS.

The support given by the public to some of these systems of lighting must, without doubt, encroach materially on the business which at one time belonged almost exclusively to gas companies and the gas departments of corporations. Taking into consideration these encroachments, one need not wonder at the question being asked as to whether the demand for gas in large towns and cities is really increasing. The answer to this question can best be given by quoting a few statistics in relation to gas supply. Taking first figures relating to London and the English Provinces, we find the rate of expansion during the last twenty years to have been as under:—

	1888.	1908.
Total capital employed—		
Three London Companies	£14,224,223	£38,436,874
Twelve London Suburban Companies	2,397,255	7,032,600
Eight English Corporations	7,915,996	12,429,511
Eight English Companies	3,546,363	8,399,077
	£28,083,837	£66,298,062
Gross revenue—		
Three London Companies	£4,351,778	£6,781,953
Twelve London Suburban Companies	736,174	2,086,338
Eight English Corporations	1,808,984	3,337,625
Eight English Companies	976,582	1,943,637
	£7,873,518	£14,149,553
Number of consumers—		
Three London Companies	295,531	988,364
Twelve London Suburban Companies	61,503	357,382
Eight English Corporations	363,871	708,782
Eight English Companies	151,906	394,605
	872,811	2,449,133

The figures for the annual make of gas (in cubic feet) are—

	1888.	1908.
Three London Companies	26,494,173,000	39,903,684,000
Twelve London Suburban Companies	3,984,986,000	12,276,821,000
Eight English Corporations	13,525,797,000	24,752,186,000
Eight English Companies	7,343,333,000	14,810,572,000
	51,348,289,000	91,743,263,000

In the above figures, the same undertakings have, of course, been compared.

Gas lighting commenced in Glasgow in 1818; but there is no record of the quantity of gas manufactured until 1827, when meters were first used. In that year the gas made was a little more than 79 million cubic feet. Since the Corporation acquired the works and business of the Glasgow Gas Companies in 1869, reliable figures have been kept; and the following data have been extracted from the annual accounts of the Gas Department, the financial year of which ends on May 31:

	1870.	1890.	1900.	1909.
Expended on works and plant, less depreciation	£532,317	£637,132	£1,400,921	£2,410,366
Gross revenue	235,701	417,589	770,002	864,210
Price for lighting purposes, per 1000 cubic feet	4s. 7d.	2s. 6d.	2s. 2d.	2s.
Annual make, thousands of cubic feet	1,295,863	3,058,277	5,969,111	6,820,962
Number of consumers	93,349	134,215	201,878	269,322

During the last few years, competition for lighting business has grown much stronger; but the following table shows the continued development of the gas business in the United Kingdom for the period covered by the statistics published for the five years from 1904 to 1909:

	1904.	1909.
Number of undertakings	1,598	1,626
Annual make (thousands of cubic feet)	168,078,931	193,826,797
Number of consumers	4,630,568	6,134,739
Number of penny-in-slot meters in use	1,326,917	2,621,333
Number of cookers on hire	1,329,947	2,396,058

These statistics prove beyond doubt that the gas business, instead of being in a decadent state, is really in a strong and vigorous condition. This fact is fully appreciated and valued at its true worth by investors in gas shares; and their confidence is proved by the published market quotations for gas stocks.

INCANDESCENT LIGHTING.

Before dealing with the factors which are mainly responsible for the continued prosperity of gas undertakings, it is right to mention that, in addition to the encroachments of other illuminants, there is another very important cause tending to reduce the output of gas for lighting purposes. The invention of Welsbach has enabled the users of gas to obtain, by means of the incandescent mantle, greatly improved lighting

value from the same consumption of gas. This important result is arrived at by utilizing the heating properties of the gas by means of the bunsen burner to raise to a state of incandescence certain rare earths which are incorporated in the structure of the mantle.

In the flat-flame burners, which a few years ago were almost universally used, consumers rarely obtained more than 3 candles per cubic foot of gas consumed; and with old or unsuitable burners not more, and often less, than 2 candles per cubic foot, although high-quality gas of 20-candle power was supplied. With the cheap forms of incandescent burner, having ordinary upright mantles, it is now easy to obtain anything from 15 to 20 candles per cubic foot of gas used. By adopting the better makes of the improved inverted burners, specially suited for domestic and artistic lighting, from 20 to 25 candles per cubic foot are obtained; while with the high-power lamps, available for street lighting and the lighting of large areas, supplied with gas at increased pressure, from 50 to 60 candles per cubic foot is no uncommon return for the gas consumed.

Now that householders, shopkeepers, and others are recognizing the value and utility of this system of lighting—giving from six to twenty times the illuminating value compared with the old style of open-burner lighting—there need be little surprise if the quantity of gas used per consumer for lighting purposes is greatly reduced. This reduction is not, of course, to the full extent of the saving of gas that might be obtained under the modern conditions, as more light is now being required and used by all classes compared with what was accepted as sufficient (say) twenty years ago. Nevertheless, the saving of gas made by consumers, even when allowing for much superior illumination, amounts to a large quantity, and is computed to affect the total output of gas more than the encroachments of all other competing illuminants.

COMPETITION THE CAUSE OF DEVELOPMENT.

What, then, are the reasons for this continued expansion and development of the gas industry, in face of the encroachments of other illuminants and the reduced consumption of gas for lighting purposes? To go to the root of the matter, the real credit for the ever-increasing success of gas undertakings should be given to the rivalry between the various illuminants. That "competition is the life of trade" was never better exemplified than in the case of the gas industry.

Before the advent of electric lighting, the gas business, being practically a monopoly, was often conducted in an autocratic and unbusiness-like manner; customers being generally treated in the most off-hand way, and the "take it or leave it" principle being (and, may it be hinted, still is to some degree) the style of nearly all the officials of gas undertakings. As long as gas of fair quality was being supplied in sufficient quantity, the obligations of gas departments to their customers were supposed to be fulfilled. By stress of competition, more businesslike methods had to be adopted; gas officials were compelled to cultivate the rôle of tradesmen eager to do business; and to secure that business they had to study the needs and requirements of their customers in every possible way.

Those who appreciated the true position of affairs understood that the mere selling of gas should not be the sole aim and duty of the gas department; but to maintain the prosperity of their business it was absolutely necessary to advise and help the consumers to use gas for as many purposes as possible, and also, by putting forward the best appliances, enable them to extract the full lighting or heating value from the gas supplied. The public were encouraged to apply to the gas department in all cases of doubt or difficulty in connection with the gas service; and every man in the employment of the department who came in contact with the public was instructed and educated to assist them as far as possible, or direct them as to where they could obtain the information or advice required.

VALUE OF THE INCANDESCENT SYSTEM.

The factor which has been of the greatest service to the gas industry is undoubtedly the valuable invention by Welsbach, of which notice has already been taken. It has caused quite a revolution in gas lighting methods, and placed the use of gas as an illuminant in such a strong position, both as regards efficiency and economy, that it will be difficult for any of its competitors to dislodge it. It has enabled gas to meet the demands for better illumination, while at the same time greatly reducing the cost. With inverted burners suitable for all kinds of home and shop lighting, a light of 20-candle power can now be obtained for 40 hours at the cost of 1d.; and lights of higher candle power at equally low proportionate rates. The illumination given is clear, soft, and perfectly steady—an ideal light either to work or read by. In consequence of the comparatively small quantity of gas used, the amount of heat given off is greatly reduced; and the gas being consumed through the bunsen or atmospheric burner ensures perfect combustion. The growing volume of scientific evidence also shows that the old bogey of the unhealthfulness of gas lighting has now no foundation in fact.

There is also an important advantage with this system of lighting, having a bearing on the price of gas, in that gas of high candle power is no longer a necessity; in fact, gas of lower candle power is preferable for use in incandescent burners. No doubt, while the system reduces the consumption of gas per consumer, it has enabled the gas authorities to strengthen their hold on all kinds of lighting business.

ADVANTAGES OF GAS-COOKERS.

Another factor which has been of immense advantage to the gas authorities as well as to all classes of the community is the adoption of gas appliances for cooking purposes. The advantage to the gas department is that it provides a class of consumption which is not only extensive and growing larger every day, but occurs at a time when much of the plant and many of the staff of the department would be otherwise idle, or at least not fully employed. This means that gas for this service can be manufactured practically without entailing any extra cost for capital or other standing charges; and consequently customers who use gas for cooking purposes are entitled to special consideration from the department, because, the cost of the gas being really only the manufacturing charges, the difference between this cost and the selling price is clear profit.

The development of this outlet for gas is going ahead steadily; but there is room for a large extension of this business in Glasgow, when

the number of stoves hired out by the department is compared with the figures of other large gas companies and corporations. The growth of the hiring out of cooking-stoves, which commenced in 1885 in Glasgow, is shown in the following table:—

	1885.	1895.	1905.	1909.
Stoves on hire	431	12,135	28,044	48,548

The advantages of the use of the gas-stove are so well known that it is scarcely necessary to enumerate them. The remark of the *chef* that "a gas-cooker cooks a dinner properly, but does not cook the cook," conveys a considerable amount of information; but, in addition to its efficiency as a cooking arrangement, the gas cooking-stove materially reduces domestic labour, and does away with most of the heavy, dirty, and hot work connected with cooking under ordinary conditions.

The advantages to the community, including both consumers and non-consumers of gas, as a result of this branch of a gas department's business, are important and far-reaching; but they do not receive the attention they deserve. It is generally admitted by all the smoke abatement authorities that the domestic chimney is by far the greatest sinner in the pollution of the atmosphere of large cities; and any measure which tends to a reduction of this evil assists very materially in improving the health of the people. If this fact were once fully recognized, the use of gas for domestic purposes would receive an immense impetus; the products of the combustion of gas being mainly carbonic acid and water, both innocuous products.

GAS FOR POWER AND MANUFACTURING PURPOSES.

Power gas forms a very important factor in the business of any gas department. The great improvements which have been made in recent years in gas-engines have enabled power users to obtain a better return for the gas used. With modern gas-engines, it is possible to obtain 1 B.H.P. per hour for a consumption of 14 or 15 cubic feet of gas. This means that in Glasgow fully 3 B.H.P. per hour can be had at the cost of 1d. There has been in recent years much competition for this class of business; but the low price of gas (now 1s. 8d. per 1000 cubic feet) and the reliable nature of this kind of power have enabled gas departments to maintain their output in this direction. The following are the figures relating to gas-engines, supplied with Glasgow gas:—

Year.	No. of Engines.	Horse Power.
1890	632	No record.
1900	1,584	7,383
1909	1,690	19,003

Another field for the outlet of gas is its growing use for manufacturing purposes. Makers of gas appliances for industrial uses are now putting on the market a large number of heating arrangements, suitable for all kinds of work, which are meeting with much favour. Gas is one of the cleanliest of fuels, and by its use the exact temperatures required can be obtained with the utmost accuracy. With gas heating, certain classes of work can also be done in shorter time; and thereby a saving in wages and also better results are obtained.

In a manufacturing locality like Glasgow and the Clyde district, there is every prospect of a large development in this class of heating business. The following figures show the quantity of gas sold for manufacturing purposes in Glasgow for the last four years; the selling price for which has now been reduced to the power rate of 1s. 8d. per 1000 cubic feet:—

1906.	1907.	1908.	1909.
86,401,000	166,009,000	206,371,000	222,756,000

PREPAYMENT METERS.

A new source of revenue has within recent years been found among a class of consumers with whom gas departments were afraid, or did not until recently think it worth while, to do business. In many of the smaller houses, the tenants were often quite unable to pay the deposit required; or, because of the uncertainty of their tenancy, they did not think it worth while to have the gas-pipes connected. Now, by means of the prepayment or penny-in-the-slot meter, gas is being supplied to this class of consumer, with advantage to the gas department, and is affording cheap and convenient light and heat to many a home. The gas is paid for on the ready-money principle; this preventing the running up of an account which usually had to be met at an inconvenient time, and the presentation of which was received by many of these householders with as much disfavour as any of the papers relating to rates or taxes.

That this class of business is getting to be an important one is shown by the following figures—showing (a) the number of consumers, and (b) the consumption of gas in thousands of cubic feet—relating to its development in Glasgow during the last five years:—

	1905.	1906.	1907.	1908.	1909.
(a)	721	11,100	27,177	35,466	43,900
(b)	—	40,908	167,946	262,826	297,598

There are also in connection with the above at present over 10,000 small cooking stoves and grills lent, free of charge, as the extra price charged for the gas under this system allows this to be done with profit to the Gas Department.

In addition to the information given regarding the factors which demand the large quantity of gas supplied by the department, it may be of interest here to state that during the last financial year the coals carbonized amounted to 681,071 tons, costing £372,254; the quantity of coke sold was 280,116 tons, of a value amounting to £100,303; the worth of the tar and ammoniacal liquor sold was £119,654; while the total wages bill amounted to £229,323.

PROSPECTIVE DEVELOPMENTS.

Having discussed the question of the development of the gas industry in the past, it may be asked: "Are there in Glasgow any prospects of further developments in the demand for gas in the future in addition to the natural increase due to the expansion of the city and suburbs?" The answer to this question depends a good deal on how the Corporation manage and work the outside department of their gas business. The manufacture of gas in Glasgow is carried on with up-to-date plant and machinery; and the results show that the working costs compare favourably with the costs of manufacture in other large gas-works. There is therefore not much probability in the meantime of any great

reduction in these costs. Besides, the mere fact of reducing the price of gas 1d. per 1000 cubic feet (although in the total it means about £25,000 a year to the consumers) will not produce a large increase in the consumption.

If properly looked after, there ought to be, in addition to the gas used for lighting, further large increases in the demands for gas for power and manufacturing purposes; but there is also, when compared with other cities, a practically undeveloped field in connection with the gas used for household purposes, gas-fires and gas-heating appliances for all kinds of rooms, shops, and places of business, the heating of water for baths, lavatories, and culinary purposes, and the more extended use of gas-cookers. These all offer tempting prizes in the way of increased consumption to the Gas Department, and at the same time would provide a much improved service to the public. To obtain hold of this new consumption, the Gas Department requires to get more in touch with the consumers, and interest and educate them in the capabilities and advantages of gas for lighting, heating, &c.

Progressive gas companies who desire to maintain and increase their business have large and attractive show-rooms in all their principal districts, where consumers can obtain full information regarding the uses of gas, and see for themselves the various kinds of household and other appliances fitted up in working order; separate accommodation being provided for appliances for manufacturing purposes. In addition to this, some have a dwelling-house, furnished and fitted up in all its rooms with gas lighting and heating appliances, to illustrate the most improved methods of utilizing gas to the fullest advantage. Consumers are cordially invited to visit these show places, and they are also kept regularly informed regarding all new and improved appliances and methods of using gas.

IMPROVED PUBLIC LIGHTING IN CAMBERWELL.

The Camberwell Borough Council had before them last Wednesday an exhaustive report from the Works Committee with regard to street lighting. In February last, it was decided to request the South Metropolitan and South Suburban Gas Companies to reconsider their present terms for street lighting, and also to ask the Electric Lighting Companies on what terms they would be prepared to light the whole of the streets in the borough by electricity. Replies had been received from the various Companies named; but the Committee called attention to the fact that electric light mains were only laid in a small portion of the borough. The Secretary of the South Metropolitan Gas Company wrote on June 28 to the effect that, as a result of experiments with a new inverted burner, they were able to make a substantial reduction in their yearly charge—viz., to £2 19s. 6d. As the burner gave a light of 120 candles compared with 80 candles for the No. 4 burner, the reduction in the cost by its use would be considerable, especially as the charge for converting a lamp having the No. 4 burner to the inverted pattern was only 3s. By reason of the lower price for gas which came

into operation at Midsummer, the charges for the No. 2 and No. 3 burner lamps would be reduced by 11d. and 1s. 3d. respectively—i.e., to £2 8s. 3d., and £2 15s. 6d. If some of the No. 3 burners would be converted to the inverted type, the cost would be the same as in the case of the No. 4 burners.

By an arrangement with the Borough Engineer, the Company 11t Shenley Road with the new inverted burner, and the Sub-Committee, having viewed the lighting, considered it a great improvement on the present system. They thereupon instructed the Engineer to negotiate with the Company as to the best terms they would offer for the conversion of the whole of the existing lamps to the new system. He had prepared a table showing that the net increase in illuminating power under the Company's proposals would be 59,940 candles; and the decrease in the cost, £113 7s. 11d. The cost of conversion, excluding the No. 2 burners, would be £216 3s. Mr. Talbot, the Company's Inspector of Lighting, attended a meeting of the Works Committee, and stated that the new inverted burner would take the place of the present No. 3 and No. 4 burners; and that the lighting capacity of the No. 3 burner, which was from 65 to 70 candle power, and the present No. 4 burner 80-candle power, would be increased by the new type of burner to 120-candle power. He also stated that the Company were at present experimenting with an inverted burner to take the place of the No. 2 burner, but that the trials had not yet been completed.

The Committee expressed the opinion that the terms offered by the Gas Company were very favourable, and that it would be an advantage to the borough if the new type of burner were substituted for all the present No. 3 and No. 4 burners; further, that it would not be advisable to wait for the burner which is suggested to take the place of the present No. 2, and that all the main roads at present lighted by No. 3 and No. 4 burners should have the advantage of the new type as early as possible. They were also informed by Mr. Talbot that it would be advantageous to substitute the new burner for the various special lights in use. The Committee were given to understand that the surrounding boroughs had had under consideration the question of the use of the new type of burner, and had come to the following decisions: Deptford, converting No. 3 and No. 4 burners in main roads, and side streets still under consideration. Lewisham, No. 4 Kerns to be changed as new lamps are fixed; Lambeth, converting No. 4 burners only; Southwark, under consideration; Woolwich, experimenting with 15 burners; Wandsworth, converting 12 No. 3 and No. 4 burners at street corners. It was resolved by the Council that all the present No. 3 and No. 4 burners in the area lighted by the South Metropolitan Gas Company be converted to the new type of inverted burner in accordance with the Company's letter of the 28th of June; also that the whole of the special lights be changed to the new type.

For breaking open a gas-meter and stealing 18s. 9d. from it, a single woman named Hannah Broadwith, who pleaded guilty, was recently sentenced by the Thirsk Magistrates to two months' imprisonment with hard labour.

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LIGHTING OF COMMON STAIRS IN EDINBURGH.

Proposed Adoption of Incandescent Gas.

The lighting of common stairs in Edinburgh, of which there are a great number, has for some years been a charge upon the rates. The subject was before the Edinburgh and Leith Gas Commissioners on Monday last week, in a report by Mr. W. R. Herring, the Engineer, in which it was stated that a letter had been received from the Town Clerk of Edinburgh, dated the 6th of September, referring to the experimental lighting of a number of common stairs in the city by the incandescent system, and stating that the Cleaning and Lighting Committee, with a view to converting the flat-flame burners in common stairs to incandescent, had directed the Inspector of Lighting to report on the experiment. They had also instructed him (the Town Clerk) to ask Mr. Herring whether he was in a position to formulate the Gas Commissioners' proposals in regard to the matter. This letter, Mr. Herring reported, was considered by the Commissioners at a meeting of the Works Committee on the 13th ult.; and, in accordance with their instructions, he submitted the following data for their consideration.

For the year ending the 15th of May last, there were in the common stairs of Edinburgh 12,635 jets, each burning $1\frac{1}{2}$ cubic feet of gas per hour. A special burner has been devised that will enable the principle of incandescent gas lighting to be applied to this purpose, and the burner has now been subjected to practical use for more than twelve months. The cost of fitting the incandescent burner to the number of stairs indicated, including the burner and its parts, will amount to £3159, to which must be added the estimated sum of £686 to allow of the alteration of the piping in the stair where the upper jet is not now fixed on the top landing. The total estimated expenditure is therefore £3845. The burner in question is rated to burn 1 cubic foot of gas per hour, and will yield a light of from 16 to 17 candles as compared with the present measure of light. The cost of maintaining the present system of burners is borne by the Gas Commissioners, but is a negligible sum; the other charges being £2317 per annum, borne by the city authorities for the wages of the men who are employed to turn off the gas-taps at the times the burners are extinguished, and £420 charged against stair lighting account under the heading of "management"—the occupants of the stairs being authorized to light up the burners themselves. The gas bill for the present year's lighting, burning six months all night and six months until midnight, with gas at the rate of 2s. 8d. per 1000 cubic feet, will amount to £8232. The gas bill for the proposed method of lighting, burning all night, at the rate of 2s. 4d. per 1000 cubic feet, will amount to £5787; thus showing a saving of £2445 in the value of gas consumed.

The incandescent system of lighting will involve a heavier charge for maintenance, such as the renewal of mantles and glass globes, though,

with regard to the latter, I have been experimenting with wire screens to protect the mantle, and am strongly impressed with their efficiency, and have based my estimate on their use, as I see no reason why screens instead of glass should not be employed throughout. Not only do they obstruct only a negligible quantity of light—some 2 per cent.—but the accumulating dust on the glass will necessitate their being cleaned; whereas the wire screen will require little, if any, cleaning in this respect. I estimate the annual cost for maintenance at £1163. This sum, therefore, deducted from the saving of £2445 in gas consumption, leaving a net amount of £1282, is the amount that will be actually saved, and necessarily available for the liquidation of the capital cost of the installation.

At the present time, the Commissioners are the only authority who are permitted to alter the pipes or fittings in the common stairs; and for this reason they should undertake the fitting-up of the stairs with the proposed incandescent system. In order to facilitate the conversion without imposing upon the Corporation any additional charge to what they at present pay, I have the following proposals to make: During the year ending the 15th of May last, the cost per jet for six months' all-night lighting and six months' lighting only to midnight, worked out at 17s. 4½d. per jet for all charges, including extinguishers' wages, gas, and £420 for management. Had the gas-jets burned all night, it would have amounted to £12,588, or 19s. 11d. per jet. It is proposed that the Corporation should continue to pay a sum of 17s. 6d. per jet for a period of three years for all-night lighting during the entire year, and that the Commissioners should undertake the installation and upkeep, including the extinguishing of the stair lights for at least this period, during which they will have nearly recouped the capital outlay involved in the original installation. At the end of this period, the terms should be subject to reconsideration, when I have no doubt that a substantial reduction per jet could be agreed upon, as the capital cost having been liquidated, and the three-years' experience of the cost of maintenance and supervision being then fully known, a businesslike adjustment between the two authorities could be entered into. It is only right to point out that should it be necessary to increase the price of gas during this period the Corporation would stand to gain. On the other hand, I understand it is the Commissioners' wish, with regard to the stair lights as with the public lighting, to render the service without profit. In the event of the Corporation being desirous of retaining their present staff of extinguishers under their own control, which is represented by a charge of £2313, this sum, amounting to 3s. 8d. per jet, would fall to be deducted from the sum of 17s. 6d.; making the figure 13s. 10d. per jet for each incandescent burner. Substantial reasons could be urged for the staff being under the sole charge of the parties responsible for the maintenance of the burners; but a technical difficulty of this kind should not be allowed to stand in the way of the accomplishment of what undoubtedly promises to be a substantial public improvement.

On the recommendation of the Works Committee, the Commissioners approved of Mr. Herring's proposals, and resolved to submit them to the Corporation.

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WE brought it out last year in our 17-in. Patent "N.V."

WE have since followed it up with our 21-in. Fires.

Like our "Thermo" and "N.V." Inventions, our Wide-Fire principle is now being pirated.

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John Wright & Co.,
Essex Works,
Birmingham.

but

John Wright & Co.,
Essex Works,
Birmingham.

DON'T ENCOURAGE THE PIRATES!

The "Thermo" Firefront

Is **OURS!**

The "N.V." Adjustable Gas Fire principle

Is **OURS!**

BOTH are being pirated.

Every good thing we invent is immediately pirated.

DEVONPORT CORPORATION WATER-WORKS.

The New Reservoir.

On the invitation of the Chairman of the Water Committee (Alderman Blackall), the members of the Devonport Corporation paid a visit to the water-works last Tuesday, with the special object of inspecting the new reservoir in course of construction at Crown Hill, forming part of a scheme of extension and improvement for which parliamentary powers were obtained two years ago. It will be 456 feet long and 431 feet wide; the average depth being 20 feet. Its storage capacity will be over 20 million gallons; and it will be worked in conjunction with another reservoir in the same locality which provides storage for 17½ million gallons. Taken in conjunction with the improvement which has been effected by the substitution of a main for a portion of the open lead, it is anticipated that on the completion of the reservoir Devonport will be freed from anxiety as to the maintenance of the supply of water in times of drought or severe frost. When the reservoir is made, an additional filter-bed will be constructed. The work is being carried out by direct labour, under the supervision of Mr. F. W. Lillicrap, the Corporation Water Engineer, who has found this method entirely satisfactory, and expresses the opinion that it will be more economical than the letting of the work by contract.

The members of the Corporation were conducted over the works by Mr. Lillicrap. Nearly 250,000 cubic yards of ground have still to be excavated, most of it consisting of hard shillet, for which blasting is necessary. As the work was begun last October, the excavation is in a forward state; but it is estimated that nearly two years more will be required for the completion of the reservoir. At the conclusion of the inspection, the members of the Corporation were entertained by the Water Committee. Alderman Blackall expressed the opinion that the Corporation should be highly satisfied with the manner in which the work was being carried out. When the reservoir was finished, they would have no anxiety respecting possible water famines in Devonport. The existing reservoir could only contain about eight days' supply; but with the new one added, they would have water enough to carry them over any reasonable period of drought. In the execution of the work they had the assistance of a good Engineer and an efficient staff. The Mayor (Mr. J. P. Goldsmith) congratulated the Committee and the Engineer on the progress made with the reservoir and on the efficiency with which the work was being carried out. Mr. Grigg, a member of the Committee, and Alderman Hornbrook also spoke of the ability and energy the Engineer brought to the discharge of his duties.

Under the title of John Ruscoe and Co., Limited, a Company has been registered with a capital of £10,000, in £1 shares (3000 preference), to take over the business of mechanical engineers carried on by Messrs. J. Ruscoe and Co., Limited (in liquidation), and the Liquidator thereof, at Hyde, Cheshire.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

At the meeting of the Edinburgh and Leith Gas Commissioners on Monday, a letter from the Clerk to the Water of Leith Purification Commissioners was read, in which it was stated that they had had a discussion on the attitude of the Scottish Office in raising difficulties after an Order had passed the Parliamentary Commissioners; and that it was understood that the Gas Commissioners and the Water Trust had also experienced similar treatment. The Clerk was instructed to write suggesting that a conference might be held, with a view to a joint protest being made in the proper quarter. The Commissioners agreed to enter upon a conference on the subject. Judge Douglas gave notice of motion to the effect that, in view of the number of complaints from consumers who use flat-flame burners, it be remitted to the Engineer to consider and report as to the best and most economical kind of burner to employ with the new quality of gas now being supplied by the Commissioners.

The Finance and Law Committee reported that the Assessors had made up their valuation of the undertaking of the Commissioners at £106,177, and had allocated it in the proportions of £100,406 to Edinburgh, £3282 to Leith, and £2489 to the county of Midlothian. Last year the total valuation fixed by the Assessor for Edinburgh was £99,767, of which £94,393 was allocated to Edinburgh, £3078 to Leith, and £2296 to Midlothian. The valuation was modified by the Court of Session, on appeal, to the extent of reducing the valuation within the city of Edinburgh to £92,166. There is thus a considerable rise in the valuation this year.

The Treasurer—Mr. John S. Gibb—submitted estimates of income and expenditure for the current year, prepared by himself and Mr. W. R. Herring, the Engineer. On the expenditure side, provision is made for the putting through of 187,334 tons of coal, as compared with an actual consumption of 180,620 tons last year; and the price is set down at £93,667, as compared with an actual outlay of £113,056 last year. The total estimate for the manufacture of gas is £145,107, as compared with an outlay of £169,952 last year. Distribution is estimated to cost £28,521, as compared with £27,610. Management is anticipated to cost £11,400, as compared with £11,182; feu-duties are to be £650, as compared with £630; rates and taxes are to be £18,200, as compared with £17,158; pensions and allowances are stated at £1400, as compared with £1473. Contributions to the superannuation fund, under the order of 1908, are new outlays; they amount to £3885. The total expenditure is estimated at £332,603, as compared with £338,981. To meet this, it is assumed that there will be a consumption of gas equal to what was experienced last year—1,882,290,000 cubic feet. Retaining the price at 3s. per 1000 cubic feet till the October-November survey, and thereafter reducing it by 2d. to ordinary consumers and by 6d. to the users of gas-engines, it is estimated that the revenue from the sale of gas will amount to £273,612, against

HYGIENIC WARMING WITH HOT WATER RADIATORS } WATER HEATED BY GAS.

EXTRAORDINARY RESULTS.

See Testimonial Letter printed below.

THE BRITISH GAS LIGHT CO., LTD.,
Engineer's Office, Bishop Bridge,
NORWICH.
May 15th, 1909.

MESSRS. WILSONS & MATHIESONS, LTD.,
LEEDS.

Dear Sirs:—

With reference to the heating of factories by the use of your Hot Water "Circulator" and Radiators, I have much pleasure in sending you the following particulars:

The system was installed last Autumn at the Boot and Shoe Factory of Messrs. Edwards & Holmes, Esdelle Street, Norwich, for the heating of three rooms, viz.:—

Clickers' Room	90 ft. by 25 ft. by 12 ft.
Machine Room	55 ft. by 24 ft. by 12 ft.
Leather Store	30 ft. by 30 ft. by 12 ft.

The installation consists of two Wilson "Circulators" in connection with eleven double column, 8 sections by 32 ins. Radiators with 1½ in. flow pipes, arranged upon what is known as "Flow Only" System, i.e., one pipe only taken from the Circulators, quite round the whole of the radiators, and returning to the Circulators.

Tests made during the winter months showed that in actual use it was found that 121 cu. ft. of gas per hour maintained a temperature of 60 degrees, with an outside temperature of 30 degrees. This is equal to a consumption of 11 cu. ft. per hour per Radiator

(not taking into consideration the piping) and each Radiator at this consumption would maintain 4876 cu. ft. of space at 60 degrees with an outside temperature of 30 degrees;—in other words

1 cu. ft. of gas will maintain at a temperature of 60 degrees 443 cubic feet of space.

The Building is Brick Built with slate roof, plastered ceilings, and the whole of the walls are Outer Walls.

The heat was very evenly distributed and, in all respects, the installation proved a success.

I am, Yours faithfully,

THOS. GLOVER,
Engineer & Manager.

WILSONS & MATHIESONS, LTD., Carlton Works, ARMLEY, LEEDS.

£284,254 received last year. Coke is estimated to realize £25,380, as compared with £30,747; tar, £13,843, as compared with £12,778; and sulphate of ammonia (less working expenses), £18,238, as compared with £18,729. From gas-cookers a revenue of £2677 is expected. The total income is anticipated to be £334,670, as compared with £347,502; and the expected surplus is £2068, as compared with £8520. The Commissioners adopted the estimates, and fixed the price of gas at 2s. 10d. per 1000 feet to ordinary consumers within the city, 3s. 4d. to consumers outside the city, and 2s. 6d. to users of gas-engines. A penny per 1000 cubic feet represents £7843.

The annual meeting of the Banchory Gaslight Company, Limited, was held on Monday. The balance-sheet submitted showed a profit of £104. It was decided to pay the usual dividend of 1s. 3d. per share. No change was made in the price of gas. It was stated that the repairs account had been unusually heavy, owing to renewals of retorts and the purchase of larger purifiers.

We recently recorded, in connection with the proceedings at the inauguration of a new gasholder at Arbroath, the amount of reconstruction work which Mr. A. C. Young, the Manager, has carried through since he went there. He has acted as Engineer in all the work; and it is gratifying to learn that on Wednesday the Gas Committee unanimously resolved to recommend that he be voted an honorarium of one hundred guineas, in recognition of his services to the Corporation.

A meeting of workmen occupying houses belonging to the Fife Coal Company at Auchterdarran was held on the evening of Saturday last, to consider the subject of the use of gas. It was suggested, on behalf of the Company, that the occupants of houses which had been fitted up for gas should pay 1d. per fortnight for the fittings, as is done in other villages where gas has been introduced. The workmen were altogether opposed to the proposal; and it was agreed to ask the Gas Company to put in fittings free. It was resolved to seek power to have the area formed into a special lighting district.

In the Peterhead Town Council on Monday, it was reported that the Auditor had been unable to certify the gas accounts for the year, on account of his not having received all the Treasurer's books. The Town Clerk considered that the incident placed the Council in a somewhat awkward position, because, according to the Act of Parliament, the Auditor's report must be submitted to a meeting of the Council about the end of September. This could not be done now, and the matter would have to stand over till October.

Mr. Andrew Whyte, the Chief Inspector of Weights and Measures in Aberdeen, has submitted his annual report to the Town Council. The number of gas-meters tested during the year, he reports, was 998; and the fees amounted to £31. Of the meters tested, 933 were for the Corporation gas-works, after repair. Of them, 15 were found to be not in accordance with the Sale of Gas Act, and were not stamped, but returned to the works for readjustment. The remaining 65 were tested for consumers; and of them, 24 were found to be correct, while 41 were not. Of the 56 incorrect meters, 40 were fast, six slow, four would not work, three passed gas unregistered, two did not pass the quantity,

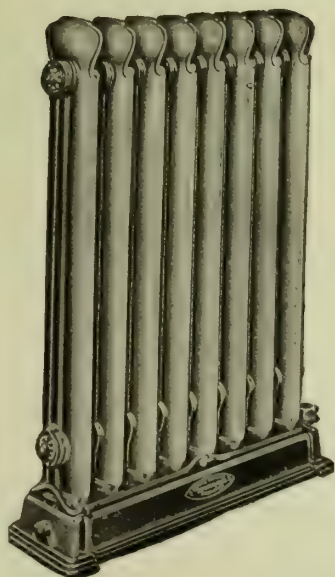
and one was leaking. The percentage of error in the measurement ranged from 20 per cent. fast to 11.11 per cent. slow.

A story which well illustrates how unenlightened the management of public affairs frequently is, is told from Linlithgow to-day. It is stated that at a meeting of the Linlithgow County Road Board, held yesterday, an appeal was heard, at the instance of the Broxburn Oil Company, against a resolution of the Bathgate District Committee of the County Council, refusing to allow them to open the roadway between Broxburn and Uphall for the purpose of laying down gas-mains. There was also read a petition, signed by about 400 householders in the district, in favour of the appeal. Mr. R. S. Horne, advocate, appeared on behalf of the appellants. He pointed out that from 1877 to 1903 the Broxburn Oil Company supplied the streets of Broxburn with gaslight free of charge. In 1903, the Bathgate District Committee formed Broxburn and Uphall into a special lighting district and introduced electric light into these places. Notwithstanding this, as the result of a plebiscite, 1147 voted in favour of gas and only 64 were in favour of electricity. At the present time there were only 35 consumers of electric light; whereas the consumers of gas numbered 177. Colonel Hope explained the position of the Bathgate District Committee in refusing permission to the Oil Company to open the road. Mr. Horne observed that what seemed to weigh with the District Committee in arriving at their decision was a feeling that the introduction of gas would be in opposition to the electric lighting scheme; and he argued that this consideration should not weigh with the Committee. On a vote being taken, the appeal was sustained by seven votes to four. Permission to supply and use gas is thus given.

Forthcoming Gas Exhibition in Belfast.—With the object of bringing more prominently before the public the many developments which have been made in recent years in the utilization of gas for illuminating and power purposes, an exhibition is to be held in the Ulster Hall from the 12th to the 22nd inst., by the Gas Committee of the Council. It is to be formally opened at noon next Tuesday by the Lord Mayor (Sir Robert Anderson, J.P.).

Explosion in a Street-Box at Derby.—An alarming explosion took place in St. Peter's Street, the main thoroughfare of Derby, late last Wednesday night. It blew up the pavement in six places, and a solicitor's clerk was struck, and sustained a compound fracture of the right leg, which necessitated his removal to the Derbyshire Royal Infirmary. A workman was also injured. A leakage of gas had occurred in the vicinity of the street, but the authorities had been unsuccessful in tracing its origin; and it was assumed that the gas accumulated in the channels containing the electric light cables, as the outlets of the explosion were the manhole covers. When a Corporation employee entered an underground chamber at the top of the street to switch off the electric currents supplying certain arc lamps to the smaller lights used during the night, a spark from the switch ignited the gas in the chamber and caused the explosion.

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CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, Oct. 2.

All immediate requirements being apparently filled, the market has become much quieter, and some decline in values from the highest point reached has taken place. The prices quoted to-day are £11 6s. 3d. per ton f.o.b. Hull, £11 7s. 6d. per ton f.o.b. Liverpool, and £11 8s. 9d. to £11 10s. per ton f.o.b. Leith. In the forward position, there is little doing, as, though there are sellers for delivery up to the end of the year at about prompt values, and for the first half of 1910 at a small premium, buyers for the most part prefer to adopt a waiting policy.

Nitrate of Soda.

This article is again easier, and the quotations, on spot, have now been reduced to 9s. 3d. and 9s. 6d. per cwt. for ordinary and refined qualities respectively.

Tar Products.

LONDON, Oct. 4.

The markets for tar products have been quiet during the past week, and pitch in particular is dull—a fair amount of business having been done, but at considerably lower prices than had been ruling a short time before. Creosote is quiet, and orders are difficult to secure, though the majority of manufacturers are well sold and seem content to wait before placing any further quantity; but some business has been done for prompt delivery at low figures. Benzol is steady; and though business is very difficult to do for prompt delivery, buyers being full up, yet for forward there is a fair inquiry. In the majority of cases, however, it is on behalf of French buyers, who will only purchase on the understanding that should the proposed tax on imported benzol come into force in France the contracts shall be cancelled. To this, of course, the makers will not agree, seeing that the price which is offered them, even under these conditions, is such a poor one. Fifty-ninety per cent. benzol is steady owing to the good demand for toluol in the North of England. Solvent naphtha is firm, though prices are unchanged. Carbolic acid is very weak; but Continental consumers refuse to buy in the present state of the crystal market. Refined naphthalene is dull, though there is no alteration in price.

The quotations for naphthalene given in the "JOURNAL" are for the refined article, and the variation in price is according to the form and packages in which it is sold.

The average values during the week were: Tar, 13s. 6d. to 17s. 6d., *ex* works. Pitch, London, 27s. 6d. to 27s. 9d.; east coast, 27s. to 27s. 6d.; west coast, 26s. to 27s. f.a.s. Mersey ports, 27s. to 27s. 6d. f.o.b. others. Benzol, 90 per cent., casks included, London, 6½d. to 6¾d.; North, 5¾d. to 6d.; 50-90 per cent., casks included, London, 7d. to 7½d.; North, 6½d. to 6¾d. Toluol, casks included, London, 9d.; North, 8½d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 11½d. to 11¾d.; North, 10½d. to 10¾d.; heavy naphtha, casks included, London, 10½d. to 11d.; North, 9½d. to 10½d. Creosote, in bulk, London, 2½d. to 2¾d.; North,

2½d. to 2¾d. Heavy oils, in bulk, 2¾d. to 2½d. Carbolic acid, 60 per cent., casks included, east coast, 10½d.; west coast, 10½d. Refined naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been firm throughout the past week, and the principal Gas Companies quote £11 10s. for prompt, and £11 15s. for forward; but it is possible to buy outside makes upon Beckton terms at considerably under these figures. In Hull, £11 5s. is asked; and in Liverpool, £11 6s. 3d. In Leith, the manufacturers ask £11 10s. for prompt, and £11 15s. for forward, but cannot obtain these figures.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a steadier demand for coal, though for one or two classes it is as yet only moderate. In the steam coal trade, the lessened needs of the upper ports of the Baltic influence both the shipments and the prices. East Northumbrian steams are quiet at about 10s. 10d. to 11s. 3d. per ton f.o.b., according to the period of delivery. Second-class steams are from 9s. 9d. to 10s. 3d., and steam smalls are about 5s. to 6s. The output at the collieries is now more regular, but it is still not quite up to that which was normal. In the gas coal trade, the demand is increasing steadily, and so far it is well met. Some users seem disposed to stock more freely, in view of possibilities at the end of the year. Durham gas coal varies in price, according to quality. The usual classes are from 10s. to 11s. 3d. per ton f.o.b., and "Wear" specials are quoted up to 11s. 9d. There is a further demand for gas coals for delivery over next year at some of the Italian ports; but as many colliery owners have sold a considerable part of their output, they are inclined to ask higher prices—at any rate, until the question of the eight hours working at the pits is settled. Coke is steady; and the advance in the price of furnace coke is stiffening the value of gas coke. Good gas coke is now quoted from about 13s. to 13s. 6d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

Trade remains as it was a week ago—the present demand is insufficient to take up the supply, with the consequence that full working time is not being got at some collieries. The brightest outlook is in the forward demand, which is still promising. The prices now quoted are: Ell 9s. to 10s. 6d. per ton f.o.b. Glasgow, splint 9s. 9d. to 10s., and steam 9s. 3d. to 9s. 6d. The shipments for the week amounted to 320,194 tons—a decrease of 7793 tons upon the previous week, and of 3297 tons upon the corresponding week of last year. For the year to date, the total shipments have been 11,334,376 tons—an increase of 751,129 tons upon the corresponding period.

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NOTE

ADDRESSES.

Head Offices: **EXETER.**

London Offices:

18, ADAM STREET, ADELPHI, W.C.

SHOW-ROOMS: LONDON, 18, Adam Street, Adelphi, W.C.; DEVONPORT, 93, Fore Street.

Sales of Shares.—At a recent sale by Messrs. Tootell and Green, 3 per cent. perpetual debenture stock of the Maidstone Gas Company realized from £37 10s. to £37 15s. per £50 lot. Acting under instructions from the Directors of the Skegness Gas Company, Mr. G. G. Dunkley sold by auction on the 27th ult., 600 new ordinary shares of £5 each in the Company at £6 2s. 6d. and £6 3s. apiece. The hundred £5 "C" shares in the Tonbridge Water Company, for which applications were recently invited by the Directors in the "JOURNAL," were subscribed for three times over; and they have all been allotted at £7 17s. each.

Truro Water Supply.—Owing to a suggestion that the water supplied to the city was contaminated by the percolation of surface drainage into the mains through defective hydrants, the Truro City Council decided to have the hydrants replaced by new ones of the spindle type. At the last meeting of the Council, it was reported that the Water Company had offered to supply and fix 45 hydrants for £80, including the necessary alterations in the mains. The Surveyor, in answer to a question, said the Corporation would fill in the ground after the work was done; and the whole cost would be about £105. The Company's offer was accepted.

Ozone Purification of Neva Water.—In view of the unsatisfactory results obtained during the cholera epidemic, which has lasted more than a year, in connection with the purification of the water of the Neva by means of ordinary sand filters, the water distribution system being exposed to constantly renewed cholera infection, the Municipal Duma and City authorities have decided, according to the "Engineer," to adopt the ozone process for the sterilizing of drinking water, and to erect a large ozone water-works. The sanitary authorities both of the City of St. Petersburg and of the State are of opinion that only by the ozone method will effective purification of the drinking water of St. Petersburg be obtained, as their investigations, those of the German Imperial Sanitary Office, and the Pasteur and Koch Institutes, have shown ozone to be the safest means of ensuring the destruction of bacteria in water.

Norwich Town Council and the Gas Undertaking.—By 34 votes to 6, the Norwich Town Council, after some discussion, have adopted a recommendation from the Law and Parliamentary Committee that it is not at the present time expedient to purchase the undertaking of the British Gaslight Company, Limited, for the distribution of gas within the district known as their Norwich station. The mover (Mr. W. G. Stevens) said the Committee had had the matter very carefully under their consideration, and had also had the advantage of a detailed report on the financial aspect from the City Accountant. The Committee thought it was not desirable that this report should be read to the Council in detail; but he was permitted to say that, according to the present state of the Money Market, if the purchase was carried out, it would result in a cost to the city of something approximate to £5000 a year. Under these circumstances, the Law and Parliamentary Committee were almost unanimously of opinion that the gas concern should not be bought at present.

The Proposed Water Board for the Western Valleys.—At a meeting of representatives of the Abertillery, Abercarn, and Risca Urban District Councils at Newport last Wednesday, further consideration was given to the proposal, referred to last week (p. 842), to form a Water Board. It was stated that the Abertillery and Risca authorities had appointed experts to report to them on their present sources of supply. The conference adjourned, so that the Councils mentioned might consider these reports before proceeding to discuss a joint scheme.

Electric Light Failure in Berlin.—According to a telegram which reached London through Reuter's Agency, shortly before seven o'clock on Monday evening last week the electric light suddenly went out in part of the Friedrichstrasse, Berlin, and darkness fell without warning also upon the adjacent streets; the whole centre of the city being affected. Confusion reigned in the numerous business establishments, restaurants, and cafés, and the central telegraph and telephone offices likewise suffered. At ten o'clock darkness still prevailed, and carriages, omnibuses, and motor-cars had to go slowly. Soon after midnight the cause of the trouble was discovered—a defect had developed in a main cable—and light was restored.

Bexhill Water and Gas Company.—The accounts of the Company for the six months ending the 30th of June, which were presented at the ordinary general meeting last Thursday, show a sum of £5175 available for distribution; and the Directors recommend the declaration of dividends at the rates of £7 and £4 18s. per cent. per annum respectively on the two classes of capital, less income-tax. This, with provision for income-tax, will absorb £3769; leaving £1406 to be carried forward. The depression experienced in most seaside resorts was severely felt at Bexhill; and the expansion in revenue, both from gas and water, to which the Directors looked forward was not realized during the half year. Nevertheless, they have decided to reduce the price of gas 3d. per 1000 cubic feet as from June 30.

Chesterfield Water Board's Land Purchase.—It is stated by the "Sheffield Independent" that the Chesterfield Gas and Water Board, an authority comprising representatives of the borough of Chesterfield and the urban districts of Newbold and Whittington, have just emerged from a long and costly litigation. The original question arose as to the value of land taken by the Board from Mr. Bernard Lucas for the purpose of constructing a third reservoir at Linacre. The Board contended that £800 was the highest value Mr. Lucas could put upon the land for his own purposes; but the sum claimed was nearly twice this amount. It was, however, agreed by both parties that something should be paid for its adaptability for reservoir purposes. The Arbitrator of the Board of Trade awarded £1615 as the sum payable by the Board to Mr. Lucas; and on a second hearing, he declined to reduce this sum. The total cost of the proceedings to the Board will probably exceed the amount that has to be paid for the land. The Arbitrator's fees alone for the two awards, which, of course, are payable by the Board, amount to £322 15s. The Board have already paid £130 taxed costs of an appeal against the Arbitrator's original decision; and they will also have to pay the whole of Mr. Lucas's taxed costs.

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GAS FIRE SEASON 1909-10.

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129, High Holborn, W.C.

Water Arrears at Spalding.—Investigations which have just been made by the Spalding Urban District Council have disclosed the fact that about a hundred consumers have either not been paying anything for their water supply or only a portion of the demand. This is particularly the case with regard to baths, for which an additional charge is made, of which many householders are ignorant. The Council have now served a demand for six years' arrears on the parties concerned. Many of the consumers have declined to pay; their contention being that as the Council have made no previous demand, the arrears are irrecoverable.

Extensions at the High Wycombe Water-Works.—The High Wycombe Town Council have decided to carry out a scheme of extension in connection with their water-works. A loan of £7300, repayable in twenty years, has been applied for, and it will not be long before the work is commenced. The extensions will not involve any demand upon the rates; the income from the supply of water being sufficient to meet the repayments of loan and interest. The estimated expenditure includes a well, £560; suction-gas plant, engines, and pumps, £1422; engine-house, £805; rising mains and meters, £2514; and tower, land, and fencing, £1096. Subject to the loan being granted, several tenders have been accepted.

Exmouth Gas Company.—In the course of the report which the Directors of the Exmouth Gas Company presented at the recent half-yearly meeting, it was stated that there had been a steady increase in the sales of gas and residuals, and a marked increase in the amount of profit realized. For some time past the Directors had been considering the question of increasing the storage capacity and plant at the works; and, having taken expert advice, they had resolved to apply for an Act of Parliament to give the Company power to raise the further capital required to meet the outlay which would thereby be occasioned. The total expenditure on revenue account in the half year amounted to £5076; and a balance of £749 was carried to the profit and loss account—the total receipts having amounted to £5825. The balance to be carried forward was £3744. The Chairman (Rev. C. R. Carr), in moving the adoption of the report, said the Company had made 30,000,000 cubic feet of gas, compared with 27,200,000 cubic feet in the corresponding half of last year; and the quantity sold was 26,648,000 cubic feet, against 24,941,000 cubic feet—showing a very satisfactory increase of business. The report was adopted.

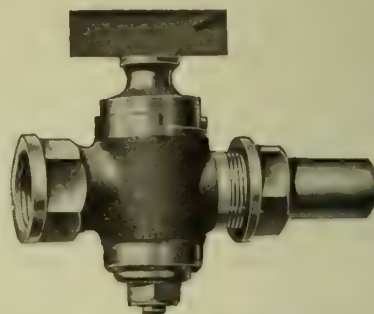
Bridgwater Gas Company.—At the annual general meeting of this Company last Thursday, the Directors reported a net profit of £4609, which was increased to £5458 by interest and the amount carried forward. Interim dividends at the rates of 10 and 5 per cent. per annum had been declared; and there was a balance of £3629 available for distribution. The Directors recommended the payment of final dividends at the above-named rates, which would absorb £1625, and leave a balance of £2004. They proposed to place £487 to the reserve fund and £250 to the insurance fund, and carry the balance of £1267 to the credit of next year's accounts. They expressed their gratification to note that the increased consumption of gas referred to in last year's report had been fully maintained. The works and plant had been kept in an efficient state, and a new sulphate of ammonia apparatus was about to be added. The Company had again secured the contract for the public lighting of the town for a term of five years. The Directors had inaugurated a new scheme for the maintenance of incandescent burners and gas apparatus at nominal charges, which had been largely taken advantage of, and was proving a boon to the consumers. In moving the adoption of the report, the Chairman (Mr. R. Y. Foley, J.P.), congratulated the shareholders on the continued expansion of the business. Referring to the new scheme just alluded to, he said he believed it was a move in the right direction, and would eventually prove of benefit to the Company. The report was adopted. In moving the re-election of Mr. J. Hughes Cornish as Secretary and Manager, the Chairman referred to his careful and zealous work, and that of the staff under him. It was largely due to their loyal service that the position of the Company was so good. Mr. Cornish was asked to convey to the other members of the staff the Directors' appreciation of their services. Mr. Cornish suitably responded on behalf of himself and the staff.

APPLICATIONS FOR LETTERS PATENT.

- 21,404.—ASTON, T. A., "Gas-fittings." Sept. 20.
 21,437.—M'NAB, N. S., and LINK, J. S., "Lighting and extinguishing gas-lamps and operating valves from a distance." Sept. 20.
 21,446.—O'BYRNE, P., "Economizing the consumption of gas." Sept. 20.
 21,487.—COX, F. J., "Air-gas apparatus." Sept. 20.
 21,553.—DUCKHAM, A. M'D., "Discharging and charging of horizontal gas-retorts or coke-ovens." Sept. 21.
 21,554.—WOODALL, H. W., and DUCKHAM, A. M'D., "Settings of vertical retorts." Sept. 21.
 21,570.—FETZER, A. H., "Universal joints." Sept. 21.
 21,582.—PRITCHARD, P. M., and UNITED ALKALI COMPANY, LIMITED, "Utilization of heat from liquors discharged from stills or other apparatus." Sept. 21.
 21,585.—OLTMANS, J., "Air-carburetting apparatus." Sept. 22.
 21,663.—LENNOX, A. H., "Spraying water in chimneys or flues for washing smoke or other gases." Sept. 22.
 21,684.—PLUMER, W., "Union joint." Sept. 23.
 21,688.—CANNON IRON FOUNDRIES, LTD., and HAWTHORNE, H. S., "Gas-heated and other radiators." Sept. 23.
 21,804.—LORING, F. H., "Lighting and ventilating." Sept. 24.
 21,827.—WAGNER, F., "Obviating the vibrations of main-pressure actuated-valves." Sept. 24.
 21,835.—BUISSON, G. A., "Connections for pipes." Sept. 24.
 21,873.—JOURDAIN, P. E. B., "Gas-turbines." Sept. 25.
 21,884.—GILL, J., "Manufacture of ferric oxide." Sept. 25.
 21,939.—SWAN, J. B. R., "Air-gas plants." Sept. 25.
 21,942.—WERBER, I., "Mantles." Sept. 25.
 21,947.—WERBER, I., "Mantles." Sept. 25.

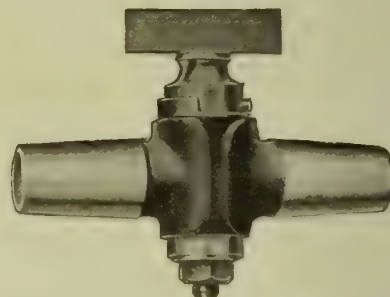
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Feltham Public Lighting.—The Feltham District Council have entered into an agreement for three years with the Sunbury Gas Company for the street lighting of the district. The price is to be £3 5s. per lamp per annum, which is to include supplying gas, maintenance of burners, mantles, and lanterns, and providing labour for lighting, extinguishing, and cleaning. The Company are at their own expense to fit up the existing lamps for incandescent lighting with No. 3 Kern burners, and to lay mains where necessary. The lamps are to be lighted from one hour after sunset to 1 a.m. The Company are to erect and fit up all new lamps free; the Council providing columns and lanterns. Any alteration in the position of the existing lamps is to be charged at 7s. 6d. per lamp. The Company are to take over the lighting immediately upon the signing of the agreement.

At a recent meeting of the Workshop Union Assessment Committee, the assessment of the undertaking of the Dinington and District Gas Company, Limited, was under consideration. The Company had appealed against the assessment, and Mr. J. H. Brearley, of Longwood, was instructed to appear on their behalf. The Committee reduced the assessment in the Dinington and Anston parishes from £228 to £160.

The "Pall Mall Gazette" last Thursday contained a chatty article on "The Evolution of Gas Lighting," in which the advantages of the incandescent system, especially when "Ironclad" mantles and Bray burners are employed, were fully set forth. The writer, however, went a little astray when dealing with the history of the incandescent mantle, as he stated that its invention "is generally credited to Mr. Thomas Edison." Most people give to Dr. Auer von Welsbach the credit for the production of the mantle. The writer is nearer the mark when he states that "this invention may be said to have produced an entire change in the method of utilizing the gas; and incandescent mantles thus become one of the standard products of the commercial world."

We have received from the Bryan Donkin Company, Limited, of Chesterfield, a useful illustrated catalogue of the drilling and tapping machines and high-pressure service clamps, gas-cocks, &c., produced by the Mueller Manufacturing Company, of New York, for whom the Bryan Donkin Company are the sole European and Colonial licensees. The illustrations are accompanied by full explanatory notes of the various machines and appliances, which have a high reputation among gas engineers in the United States.

Messrs. Falk, Stadelman, and Co., of Farringdon Road, E.C., have just issued their gas-fittings catalogue No. 296; and in submitting it, they call attention to the extensive range of patterns in the various types depicted. The endeavour has been to make each collection or group comprehensive, both from the design and price point of view. Special attention is drawn to the ranges of "convertible" fittings (suitable for use with either upright or inverted burners), as being of interest where it is desired to carry only a limited stock, and yet cater for general requirements. Altogether the catalogue covers a very wide range, and is, it may be mentioned, in addition to the firm's incandescent light catalogue, which contains even fuller information relating to goods of that particular class.

The "Ironmongers' Chronicle" says the most effective ironmongery display in Darlington is that of the Corporation Gas Department, whose show-room is situated in Tubwell Row. It fills up an entire corner block, and has been specially built for the purpose. There are seven large windows in addition to those at each side of the handsome entrance, and the show-room itself is effectively arranged. Our contemporary says: "The manager of the establishment not only knows his business well, but he knows also the position he holds regarding the trade of the ironmongers in the town. Except in the hiring department, no direct business is done. In every case sale must go through one of the local ironmongers; and the discount which the department allows the traders is by no means meagre."

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situation Vacant.

GAS STOVE TRADE (EXHIBITIONS). No. 5142.

Situations Wanted.

IN LABORATORY. Hulbert, Westbury, Wilts. MANAGER, &c. No. 5143.

Plant, &c. (Second-Hand), for Sale.

GAS PLANT, ENGINES, BOILERS, MACHINE TOOLS, &c. Firth, Blakeley, Sons, and Co. By auction, Oct. 13. STATION METER. No. 5137. WASHER, CONDENSERS, EXHAUSTERS AND ENGINES, &c. Coventry Gas Department.

Patent Licences.

PREPAYMENT GAS METER ATTACHMENT. "Patentee," Crosby Road, Birkdale.

Meeting.

DANISH GAS COMPANY, London Agency Offices. Oct. 28. 2.30 o'clock.

Stocks and Shares.

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY. Oct. 26. ASCOT GAS AND ELECTRICITY COMPANY. Oct. 12. LOWESTOFT WATER AND GAS COMPANY. Oct. 12. PINNER GAS COMPANY. Oct. 25. SOUTHEAST WATER COMPANY. Oct. 12.

TENDERS FOR

Benzol.

BRIDGEWATER COAL OFFICE. Tenders by Oct. 25.

Fire-Clay Goods.

ROCHESTER, CHATHAM, AND GILLINGHAM GAS COMPANY. Tenders by Oct. 11.

Oxide (Spent).

THE HAGUE GAS-WORKS.

Sulphuric Acid.

LEICESTER CORPORATION. Tenders by Oct. 9.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 18.

Issue	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
500,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	18½-19½	+½	5 2 7	195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
298,955	10	"	7	Do. 7 p.c.	13-13½	+½	5 3 8	561,000	Stk.	"	10	Liverpool United A.	223-225	..	4 8 11
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	96-98	..	4 0 0	718,100	"	"	7	Do. B.	165-167	..	4 3 10
200,000	5	May 27	6½	Bombay, Ltd.	5½-6	..	5 8 4	306,083	"	June 25	4	Do. Deb. Stk.	104-106	..	3 15 6
40,000	5	"	6½	Do. New, £4 paid.	4½-4¾	..	5 9 6	75,000	5	June 11	6	Malta & Mediterranean.	44-51	..	5 17 1
50,000	11	Aug. 26	15	Bourne 10 p.c.	28-28½	..	5 5 3	560,000	100	Oct. 1	5	Met of 15 p.c. Deb.	99-102	-½	4 18 0
311,810	11	"	7	mouth Gas B 7 p.c.	164-16½	..	4 3 7	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
75,000	10	"	6	and Water Pref. 6 p.c.	15½-15¾	..	3 16 8	541,920	20	May 27	3½	Monte Video, Ltd.	12½-13½	..	5 5 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	253-256	+1	4 17 8	1,775,392	Stk.	July 29	4½	Newcastle & Gt. Tesh'd Con.	101-108	..	4 3 4
300,000	"	"	9½	Do. New	190-192	..	4 19 0	518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	93-94	+1	3 14 6
50,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 8	55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13-13½	..	5 3 8
206,250	"	June 11	5	Do. 4 p.c. Deb.	100-102	..	3 18 5	300,000	Stk.	Apl. 20	8	Oriental, Ltd.	130-141	..	5 13 6
220,000	Stk.	Sep. 10	1	Brighton & Hove Orig.	208-213	..	5 3 3	60,000	5	Sep. 10	8	Ottoman, Ltd.	98-101	+½	5 5 6
246,320	"	"	8	Do. A Ord. Stk.	150-152	..	5 5 3	31,830	53	Aug. 26	13	Portsea Island A.	137-139	..	4 19 0
460,000	2½	Apl. 16	10	British	43-43½	..	4 11 11	60,000	50	"	13	Do. B.	120-131	..	4 19 3
100,000	Stk.	Aug. 26	6	Bromley, A 5 p.c.	118-120	..	5 0 0	100,000	50	"	12	Do. C.	120-123	..	4 17 7
165,700	"	"	4½	Do. B 3½ p.c.	83-90	..	5 0 0	114,800	50	"	10	Do. D and E.	101-103	..	4 17 1
82,278	"	"	3½	Do. C 5 p.c.	106-108	..	5 1 10	398,490	5	May 13	7	Primitiva Ord.	71-72	+½	4 14 11
51,000	"	June 25	3½	Do. 3½ p.c. Deb.	88-90	..	3 17 9	796,983	5	July 29	5	Do. 5 p.c. Pref.	51-54	..	4 10 11
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	131-141	..	4 18 3	483,900	100	June 1	4	Do. 4 p.c. Deb.	91-96	..	4 3 4
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	95-97	..	4 2 6	1,700,300	10	Apl. 29	8	River Plate Ord.	163-171	..	4 12 9
100,000	13	"	—	Cape Town & Dis., Ltd.	44-5	..	—	312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	96-98	..	4 1 8
100,000	13	"	—	Do. 4½ p.c. Pref.	51-6	..	—	250,000	10	Sep. 29	8	San Paulo, Ltd.	141-147	+½	5 8 6
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	483-493	..	6 1 3	62,500	10	"	6	Do. 6 p.c. Pref.	111-114	..	4 18 0
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82-84	..	5 7 2	125,000	50	July 1	5	Do. 5 p.c. Deb.	493-503	..	4 19 0
157 15½	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	106½-108½	..	4 12 2	135,000	Stk.	Sep. 10	10	Sheffield A.	230-232	..	4 6 2
1,49 280	Stk.	Aug. 26	5½	Commercial 4 p.c. Stk.	109-111	+1	4 13 8	209,984	"	"	10	Do. B.	220-231	..	4 6 7
560,000	"	"	5	Do. 38 p.c. do.	104-105	..	4 14 4	523,500	"	"	10	Do. C.	220-231	..	4 6 7
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	70,000	10	June 11	10	South African	131-14	..	7 2 10
800,000	Stk.	"	7	Continental Union, Ltd.	95-97	..	5 3 1	6,429,895	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	120-122	+1	4 7 4
200,000	"	"	7	Do.	138-140	..	5 0 0	1,395,415	"	July 11	3	Do. 3 p.c. Deb.	85-87	..	3 8 11
49 1,270	Stk.	"	5	Derby Con. Stk.	121-123	..	4 1 4	209,821	Stk.	Aug. 26	8	South Shields Co. Stk.	151-155	..	5 3 3
55,000	"	"	4	Do. Deb. Stk.	103-105	..	3 16 2	605,000	Stk.	Aug. 12	5½	S'th Suburb'n Ord. 5 p.c.	118-120	..	4 11 8
14 1,995	"	Oct. 2	5	East Hull 5 p.c. Ord.	97-99	-½	5 1 0	60,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
486,097	10	July 14	12	European, Ltd.	243-25	..	4 16 0	117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	102-124	..	4 0 8
351,060	10	"	12	Do. £7 ord. paid.	184-19	..	4 14 9	502,310	Stk.	May 13	5	Southampton Ord.	211-213	..	4 8 6
15,141,545	Stk.	Aug. 12	4½	Gas 4 p.c. Ord.	106-107	+½	4 7 2	120,000	Stk.	Aug. 12	6½	Tottenham A 5 p.c.	131-135	..	5 1 9
2,600,000	"	"	3½	light 3½ p.c. max.	88-90	..	3 17 9	453,940	"	"	5½	Do. B 3½ p.c.	111-113	..	4 15 3
3,797,735	"	"	4	and 4 p.c. Con. Pref.	103-105	..	3 16 2	149,470	"	June 25	4	Edmonton 4 p.c. Deb.	100-102	..	3 18 5
4,191,075	Stk.	June 11	3	Coke 3 p.c. Con. Deb.	85-87	..	3 8 11	182,380	10	June 11	8	Tuscan, Ltd.	9-9½	..	8 8 6
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	92-94	..	5 6 4	149,000	10	July 1	5	Do. 5 p.c. Deb. Red.	90-101	..	4 19 0
62,500	"	"	6½	Do. do. 5 p.c.	117-119	..	5 9 3	236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	100-111	..	4 10 1
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	174-17½	..	6 4 0	255,6 6	Stk.	Aug. 26	6½	Wands-1 B 3½ p.c.	130-141	..	4 14 0
131,0 0	Stk.	Sep. 10	6½	Ilford A and C	138-140	..	4 12 10	79,416	"	June 25	3	worth 1 3 p.c. Deb. Stk.	73-75	..	4 0 0
65,781	"	"	5	Do. B	105-107	..	4 13 6	835,772	"	Aug. 12	5½	West Ham 5 p.c. Ord.	124-126	..	4 5 4
65,500	"	June 25	4	Do. 4 p.c. Deb.	102-104	..	3 16 11	210,000	"	"	5	Do. 5 p.c. Pref.	127-129	..	3 17 6
4,940,000	Stk.	May 13	8	Imperial Continental	179-181	+1	4 8 5	253,300	"	June 25	4	Do. 4 p.c. Deb. Stk.	112-114	..	3 11 2
1,235,030	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	95-97	..	3 12 2								

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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GAS PLANT for Sale—We can always

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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

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Telephone: 841 AVENUE.

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See Advertisement on p. 72.

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Albert Chemical Works, BRADFORD,
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Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Sulphate of Ammonia.

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WET, DRY, ORDINARY and PREPAYMENT,
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SIMULTANEOUS Discharging-Charger.

The one Machine which Discharges and Charge at One Stroke.

See Advertisement, June 22, p. VI. of Centre.

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SPECIALLY prepared for Sulphate of

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Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
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HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.

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SULPHURIC ACID for Sale, specially
suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers,
Works: BIRMINGHAM, LEEDS, WAKEFIELD, and SUNDER-
LAND.

APPLICATIONS for Appointments
arranged effectively. Greatly appreciated by
Recipients. Numerous unsolicited Testimonials. Write
Now for Particulars.
HERBERT GREATORREX, Upper Hackney, MATLOCK.

MR. WM. CRANFIELD, F.C.S., in re-
sponse to requests, has decided to extend the
work he has been carrying on by Gas Classes in various
Yorkshire Towns for the past Ten Years, and to organize
postal courses of Tuition in "Gas Engineering" and
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to the needs of each individual Student, and Expert
Assistance has been engaged. All Inquiries treated
confidentially.

Full Particulars on Application to No. 11, Avondale
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THIS Year, our Students in Honours
Gas Engineering took over one-third places in
First-Class and Silver Medal. Six Medals and 80 Passes
in last Two Years. Courses starting in Gas Engineering
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describing our Special Individual System? No more
Failures.

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COLESHILL GAS COMPANY, LIMITED.

MANAGER.

THIS Post has now been Filled. Ap-
plicants who sent ORIGINAL TESTIMONIALS
please Communicate with the SECRETARY, Church Hill,
Coleshill, near BIRMINGHAM.

LABORATORY—Advertiser desires
Employment in a Gas-Works or other Technical
LABORATORY. Holds distinctions in Science and
Chemistry, and has passed London Matric. Four years
at Hartley University College. Some experience in
Teaching Science.
Address HULBERT, Westbury, WILTS.

GAS Engineer and Expert in Petrol
Light Plants seeks Position as MANAGER or any
Position of Trust. Well up in all the latest Plants.
First Class Demonstrator. Experimenter and Com-
mercial Experience. Age 32.
Address, in first instance, No. 5143, care of Mr. King,
11, Bolt Court, FLEET STREET, E.C.

GAS-STOVE TRADE—Experienced Ex-
hibition Men required at once for Important
Exhibitions.
Apply, by letter, with full Particulars of Qualifications,
including Age and Experience, to No. 5142, care of Mr.
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SMALL Gas Companies desirous of
Purchasing GAS APPARATUS Cheap are re-
quested to Note AUCTION SALE on Wednesday,
Oct. 13, of GAS PLANT STOCK of Firth Blakeley,
Sons, and Co., Ltd., Dewsbury.
Particulars and Catalogues on Application.

FOR SALE—An Important Parcel of
SPENT OXIDE, with full 60 per Cent. Sulphur;
no Cyanogen.
For further Particulars, write to the Gas-Works,
The Hague, HOLLAND.

THE Coventry Corporation have For
SALE, owing to the Dismantlement of their old
Gas-Works, the following GAS APPARATUS:
One Two Million Cubic Feet per diem LIVESY
WASHER, 10 ft. by 8 ft. by 3 ft. 6 in. deep, with
18-inch diameter Connections.
Two Sets of Morris and Cutler's Water-Tube CON-
DENSERS, each of a Capacity of 750,000 Cubic
Feet per diem, with 14-inch diameter Con-
nections and Disc Valves.
Three Batteries of Marshall's Water-Tube CON-
DENSERS, of a Capacity of Two Million Cubic
Feet per diem, with 18-inch diameter Con-
nections and Valves.
Two Dempster's Reciprocating EXHAUSTERS,
with STEAM-ENGINES on Same Bed Plate,
Steam Governors, and Connections, and Disc
Valves. One Set 60,000 Cubic Feet per hour,
and the other 100,000 Cubic Feet per hour
Capacity.
Further Particulars and Prices may be obtained from
the undersigned.
FLETCHER W. STEVENSON,
Engineer and Manager.
Gas-Works, Coventry,
Sept. 23, 1909.

SECOND-HAND Station Meter by
Parkinson FOR SALE. Capacity, 20,000 Cubic
Feet per Hour. Cylindrical Tank, fitted with Clock
and Tell Tale. First-Class Condition. Just thoroughly
Overhauled.
Address No. 5137, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

GASHOLDERS—Splendid, 45 feet dia-
meter, and New STEEL TANK fixed complete,
to Plan and Specification. Also 50 feet Single-Lift
and 50 feet Double-Lift. Cheap, with STEEL TANKS.
Can be seen temporarily erected.
FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

ROCHESTER, CHATHAM, AND GILLINGHAM
GAS COMPANY.

RETORTS, &c.

THE Directors invite Tenders for the
Supply of FIRE-CLAY RETORTS, FIRE-
BRICKS, and CLAY.
Specifications and Forms of Tender may be obtained
from the undersigned, to whom Tenders, endorsed
"Retorts, &c.," must be delivered on or before noon of
Monday, Oct. 11, 1909.

J. M. VEEVERS,
Engineer and General Manager.
Gas Offices, Rochester,
Sept. 30, 1909.

BRIDGEWATER COLLIERIES COKE WORKS.

(THE EARL OF ELLENMERE.)

TENDERS are invited for the Crude
BENZOL produced at the above Works (estimated
at 8000 to 10,000 Gallons per Month) testing 80 per cent.
at 120° C., during the next Three, Six, Nine, or Twelve
months, delivered into Contractor's Tanks at the
Bridgewater Colliery Siding, Wharton Hall, on the
Pendleton and Hindley Branch of the Lancashire and
Yorkshire Railway, or at the Brackley Siding on the
Little Hulton Mineral Branch of the London and North
Western Railway.

Tenders, endorsed "Tender for Crude Benzol," to
be addressed to Mr. Thomas M. Brown, Bridgewater
Coal Offices, 4, Chapel Walks, Manchester, not later
than the 25th inst.
Manchester, Oct. 5, 1909.

CORPORATION OF LEICESTER.

SULPHURIC ACID.

THE Gas and Electric Lighting Com-
mittee of the above Corporation are prepared to
receive TENDERS for the Supply of SULPHURIC
ACID, made from either native Sicilian Brimstone,
recovered Sulphur, or Pyrites. Specific Gravity in each
case to be stated. The Price to include Free Delivery
by Rail into Elevated Tanks, 27 feet high, at the
Chemical Works, Aylestone Road.

Probable Quantity, about 2000 Tons, to be delivered
as required during the ensuing Twelve Months.

Tenders, addressed to Mr. Councillor Jennings,
Chairman, and endorsed "Tender for Acid," to be
delivered at these Offices not later than Eleven o'clock
a.m., on Saturday, Oct. 9, 1909.

The Committee do not bind themselves to accept the
lowest or any Tender.

ALFRED COLSON, M.Inst. C.E.,
Engineer and Manager.
Gas Offices, Millstone Lane,
Leicester, Sept. 28, 1909.

DANISH GAS COMPANY.

NOTICE is Hereby Given, that the
FIFTY-FIFTH ANNUAL ORDINARY
GENERAL MEETING of this Company will be held
at the Offices of the Company's London Agency, Mill-
bank House, Westminster, on Thursday, the 28th day
of October next, at 2.30 p.m., for the following pur-
poses—viz:

- 1—To receive the Report of the Directors and the
Accounts for the Year ended June 30, 1909.
- 2—To Declare a Dividend.
- 3—To consider the re-election of the Director re-
tiring by rotation.
- 4—To elect Auditors for the ensuing Year.

By order of the Board,

H. G. WARREN,
London Agent.

London Agency: Millbank House,
Westminster, S.W., Oct. 1, 1909.

WEDNESDAY, OCTOBER 13, 1909.

TO GAS ENGINEERS, GAS COMPANIES,
MACHINERY DEALERS, AND OTHERS.

WHEATLEY KIRK, PRICE, AND CO.
have received Instructions from Messrs. Firth
Blakeley, Sons, and Co., Limited, whose Lease of
Premises shortly expire, to Offer for SALE BY PUBLIC
AUCTION, piecemeal in the Lots of the Catalogue,
upon the Works Premises, situate in Thornhill, Dewsbury,
Yorks., on Wednesday, October 13, 1909, com-
mencing at Eleven o'clock prompt, the
SURPLUS STOCK OF NEW AND SECOND-HAND
GAS PLANT, ENGINES, BOILERS, MACHINE
TOOLS, &c.

The Catalogue will include:—

Dowson's Gas-Producing Plant for 300 B.H.P. En-
gines; 16 Exhausters, steam-driven and otherwise;
2 Livesey Washers; Pipe and Annular Condensers;
Clapham and Cutler's Condensers; several Sets of
Purifiers; Belt and Steam-Driven Pumps; Station
Governors; Test Meters and Holders, from 16 ft. to
50 ft. diameter; Large Stock of Pipes and Valves, from
2 inches to 18 inches diameter; Shafting and Pulleys;
4 Lathes; Drilling, Planing, Punching, and Shearing,
Plate-Edge Planing, Screwing, &c. Machines; Hor-
izontal and Vertical Steam-Engines, Boilers.

The whole may be viewed on Monday and Tuesday,
October 11 and 12, and Morning of Sale.

Catalogues may be obtained (gratis) from the Auc-
tioneers, Albert Square, MANCHESTER; 46, Watling
Street, LONDON, E.C., and 26, Collingwood Street,
NEWCASTLE-ON-TYNE.

THE Proprietor of Patent No. 7305,
1909, for "IMPROVED PREPAYMENT GAS-
METER ATTACHMENT," is desirous of entering into
Arrangements by way of LICENSE on Reasonable
Terms.
Address "PATENTEE," 29, Crosby Road, BIRDALE.

SALES BY AUCTION OF GAS AND WATER
STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to
notify that their SALES BY AUCTION OF NEW
CAPITAL ISSUED UNDER PARLIAMENTARY
POWERS, and of STOCKS and SHARES belonging to
EXECUTORS and other PRIVATE OWNERS in LON-
DON, SUBURBAN, and PROVINCIAL GAS and
WATER COMPANIES, take place PERIODICALLY
at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing New Capital, and also for including
other Gas and Water Stocks and Shares in these Periodi-
cal Sales, will be forwarded on Application to MESSRS.
A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 750 NEW ORDINARY FIVE PER
CENT. MAXIMUM £10 SHARES.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Oct. 12, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
LOWESTOFT WATER AND GAS COMPANY.

NEW ISSUE OF 400 ADDITIONAL ORDINARY
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AND

£1000 FOUR PER CENT. PERPETUAL
DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will
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Lots.
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By order of the Directors of the
ASCOT DISTRICT GAS AND ELECTRICITY
COMPANY.

NEW ISSUE OF £2520 FOUR-AND-A-HALF PER
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AND

200 £10 NEW ORDINARY SHARES.

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By order of the Directors of the
ALDRSHOT GAS, WATER, AND DISTRICT
LIGHTING COMPANY.

NEW ISSUE OF £5000 FIVE PER CENT. "C"
CONSOLIDATED ORDINARY STOCK,

AND

£5000 FOUR PER CENT. CONSOLIDATED
PREFERENCE STOCK.

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Mart, E.C., on Tuesday, Oct. 26, at Two o'clock, in
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By order of the Directors of the
PINNER GAS COMPANY, LIMITED.

NEW ISSUE OF 400 £5 "B" SHARES

AND

£700 FIVE PER CENT. PERPETUAL
DEBENTURES.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Oct. 26, at Two o'clock, in
Lots.
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Price 8s. (free delivery in United Kingdom).

A HISTORY OF THE INTRODUCTION OF GAS LIGHTING.

By CHARLES HUNT, M.Inst.C.E.,

Past-President of the Institution of Gas Engineers,
Author of "Gas Lighting," which forms the Third Volume
of Groves and Thorpe's "Chemical Technology."

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THE
Sir John Cass Technical Institute,
JEWRY STREET, ALDGATE, E.C.

Principal:
CHARLES A. KEANE, D.Sc., Ph.D., F.I.C.

The following Courses of Evening Lectures and Practical Work on

FUEL
will be given during the Session, 1909-10.
LIQUID, SOLID, AND GASEOUS FUEL.

By **J. S. S. BRAME,**
Lecturer on Chemistry at the Royal Naval College, Greenwich.

A Course of Lectures Monday Evenings 8 to 9 p.m.
Commencing **Monday, Oct. 18.**

FUEL ANALYSIS.

By **C. O. BANNISTER, Assoc.R.S.M., M.I.M.M.**
A Course of Laboratory Work. Summer Term, Monday, 7 to 10 p.m. Commencing **Monday, April 18, 1910.**

TECHNICAL GAS ANALYSIS.

By **CHARLES A. KEANE, D.Sc., Ph.D., F.I.C.**
A Course of Laboratory Work. Summer Term, Wednesday, 7 to 10 p.m. Commencing **Wednesday, April 20, 1910.**

The Courses of Instruction are arranged to meet the requirements of those engaged in Chemical and Engineering Works or who are concerned with the use of Fuel as a Motive Power.

Detailed Syllabus of the Courses may be had upon Application.

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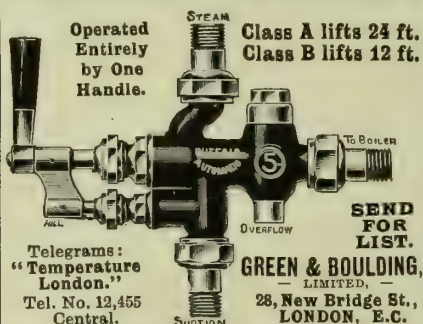
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GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.
Manufacture and keep in Stock at their Works (also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

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Special Pressure and
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For RETORT-HOUSE GOVERNORS.
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For OFFICES AND DISTRICTS.

Fulllest particulars on application to—

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ARTESIAN BORED TUBE WELLS,

Norton's Patent "Abyssinian" Tube Wells,
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Makers of Weldless Steel Spigot and Faucet, Flanged, Screwed and
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HIGH-CLASS STEAM ENGINES. BEAM PUMPING-ENGINES, &c.

One of Podmore's PATENT NEW INVERTED LAMPS

FOR
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Perfection after
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The Latest and Best.

Small Consumption.

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Patentees of the Popular Lamp with Dust
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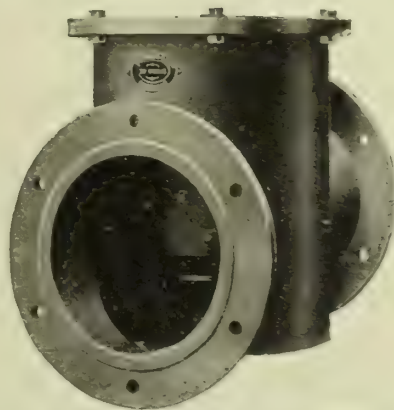
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**PATENT
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FOR
Ordinary or High Pressure.

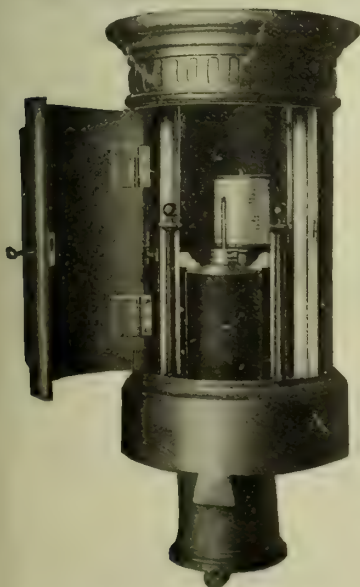
PILLAR BOX contains Air-Pressure Holder
for Loading the Governor from a distance
also Recording Gauge and Inlet and Outlet
Pressure Gauges.



LARGE MERCURIAL GOVERNOR.

From a Photo. of 24 in. Size.

May be Loaded by Weights or Air
Pressure from a Distance.



MAIN LAYING.

Paper by PERCY GRIFFITH, M.Inst.C.E., and BRUCE MCGREGOR GRAY, Assoc.M Inst.C.E., before the Association of Water Engineers.

A. The Authors used *Flanged Pipes* for the Rising Main up the Steep side of the Barff, and their experience proved that this was not an advantage, as the *rigidity of the Joints* involved considerable difficulty in regard to the depth of the Trench, and a good deal of Cutting to make the final Connections at each end of the Pipe-Line.

B. In the case of the Delivery Main, the Joints were *Ordinary Socket Joints*, but made with Lead only. The only difficulty met with here was the necessity for pouring the Lead in at a suitable temperature to prevent it melting the Solid Lead Fillet, and running through into the Pipe.

C. In some of the Smaller Branch Connections, Lead Wool was used, and proved highly successful.

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EVERITT'S Patent TAR-FOG EXTRACTOR AND NAPHTHALENE REMOVER.

SOLE MAKERS:

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"COALEXLD."

Where this Fuel is Manufactured, the strongest evidence of its advantages to the Gas Engineering World is seen by the absence of Stocks of Coke, as the daily Sales of Coalexld clear the Stock as Manufactured.

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Stoking Machinery

HYDRAULIC COKE PUSHERS

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WILL DISCHARGE A RETORT IN ONE OPERATION
LARGE NUMBERS IN USE.

Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.

[See Illustrated Advertisement, Sept. 21, p. 792.]

500 CANDLE POWER

OUTSIDE

LAMPS

Fig. I.586.

4 BURNERS.

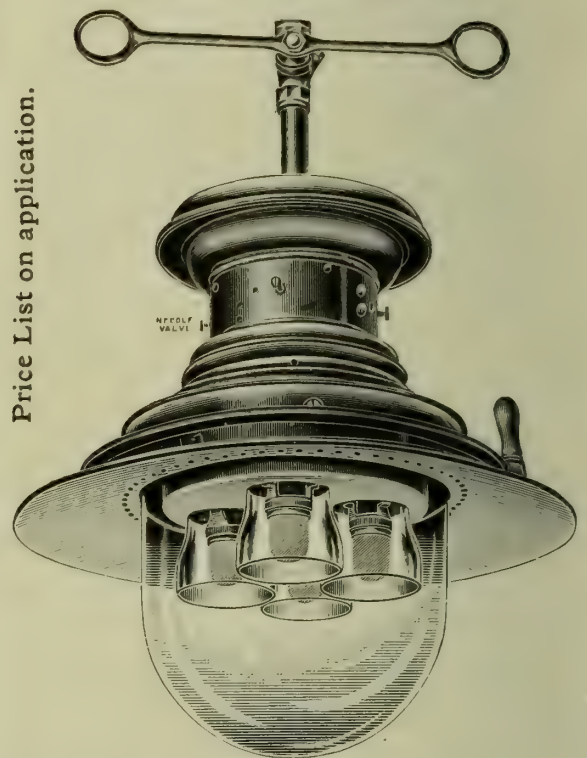
All Copper Case—
natural colour.

Olive Green Vitrified
Enamelled Steel Case.

50/6

47/-

USUAL DISCOUNT.



Price List on application.

Lamp with Hinged Bowl, 17in. Enamelled Reflector, Bye-Pass Lever Cock and Pilots, Inverted Incandescent Gas Burners, Improved Adjustable Gas Regulators, Jena Glass Cylinders, and Mantles. Length over all 27in.

Number of Burners 2 3 4

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28, EAST PARADE, LEEDS.
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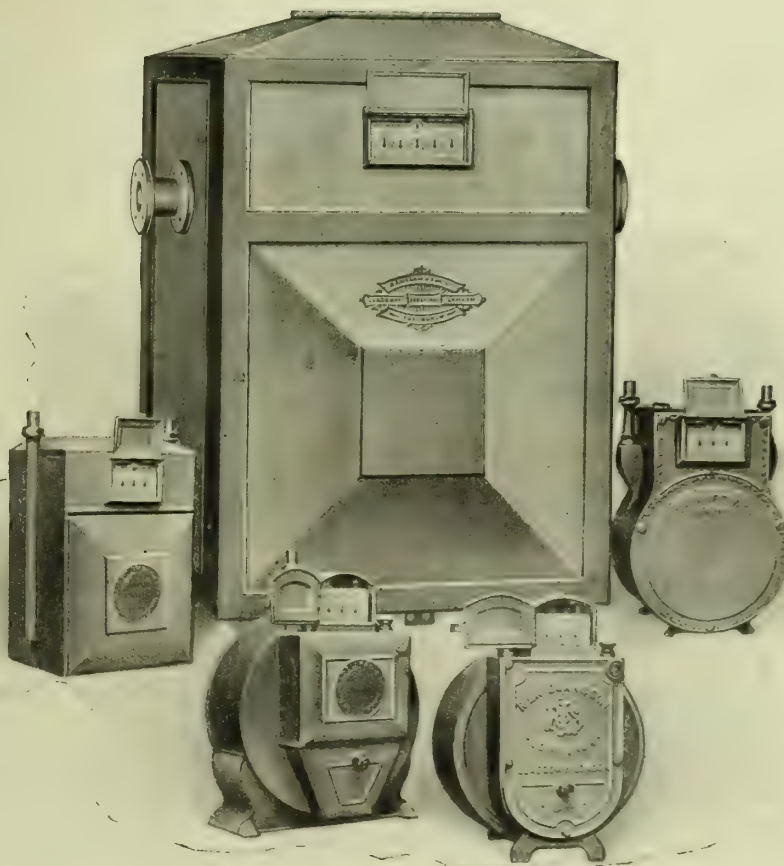
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WITH ORDINARY AND
COMPENSATING DRUMS.

All Materials used in the
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are of the best quality, and
the Workmanship of the
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SPLENDID CARBONIZING RESULTS.

HIGHEST RESULTS in GAS MADE and COKE SOLD per Ton of Coal
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Reference can be given to several Works where Regenerators are still working after a life of 10 to 15 Years.

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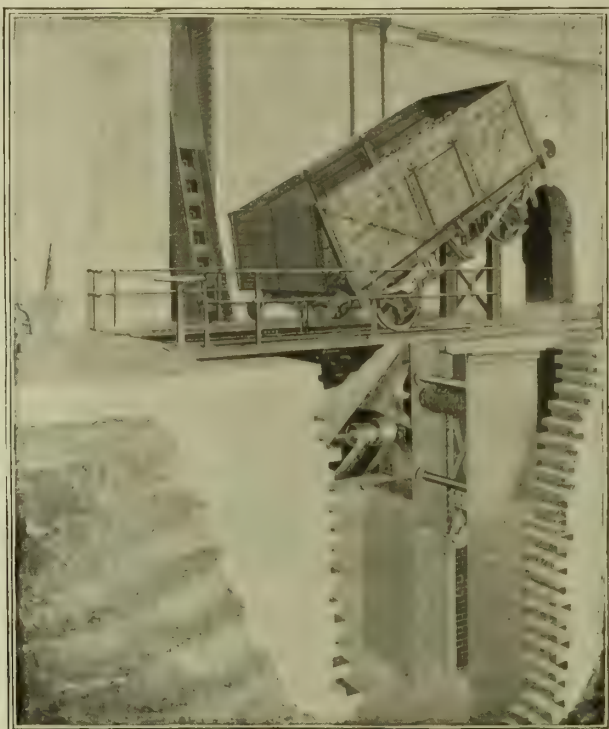
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No. 3 "DARWIN." 3½ in. Fitting.

Have been remodelled, and we now offer you

BETTER BURNERS
AT
REDUCED PRICES

And guarantee the highest finish and Workmanship.

Independent Test by a well-known Gas Manager of
No. 3 Burner.

CONSUMPTION . . . 3.55 ft.
of Gas at 15/10ths Pressure,

CANDLE POWER . . . 122.76

These figures speak for themselves.

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MAINTENANCE CHARGES

Reduced to a minimum.

Made in 3 SIZES and 8 PATTERNS

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IMMEDIATE DELIVERY FROM STOCK.
UNBREAKABLE.
EASILY ERECTED. LIGHT FOR SHIPMENT.



Capacity, 9600 Galls.

Size, 16 x 12 x 8 ft. deep.

PATENT PRESSED STEEL TANKS.

MADE FROM FLANGED PLATES 4 FT. SQUARE.
ANY CAPACITY IN MULTIPLES
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HUMPHREYS & GLASGOW'S CARBURETTED
WATER-GAS PLANTS.

Aggregate capacity of Plants supplied,
224,300,000 cubic feet daily.

ALL PREVIOUS RECORDS BROKEN (See below)

SPENCER'S PATENT HURDLE GRID

The very best Patent Grid on the Market for Holding Oxide Lightly.

IT IS THE FIRST AND THE ORIGINAL DEEP GRID INVENTED.



It is acknowledged by all the leading Gas Managers, that breaking up the Material, and suspending same in the Purifier as it were is the most practical of any system yet made use of.

These Grids are being more extensively used and more successful than ever, not only in this Country, but we are sending a good many Orders abroad. Also we have installed at a certain Works 20 Sets, 5 repeat Orders of 4 Sets each, and at several other places 3 and 4 repeat Orders of 4 Sets each.

And the price of Hurdle Grids is very little more than Flat Grids, and do Three times the work, besides reducing back pressure on the Purifiers more than half.

The Hurdle Grids save their cost in less than 3 Years, and they can be fitted to any kind of Purifier.

The first of a Set of Six Purifiers, 20 feet square, fitted with Spencer's Patent Hurdle Grids. Started Feb. 7, 1906, and run until May 27, 1907, having passed 149,266,000 feet. The Oxide was quite loose and easy to empty. Also over 600 Purifiers have been fitted with these Grids in less than Three-and-a-Half Years. Hundreds of References can be had on Application. Send for Catalogue to—

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Rheinische Chamotte-und Dinas-Werke, Cologne on Rhine.

Construction of

Entire Gas-Works & Coke Oven Plants, Retort Furnaces,

Furnaces for Chamber Settings New Coke Ovens
(Patent), (Patent),

With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia Works, and Cyanogen Extraction Plants.

COAL TAR PRODUCTS.

Benzol, Toluol, Solvent Naphtha, Creosote Oils, Grease Oils, Carbohc Acid, Dark Cresylic Acid, Granulated (Crude) and Sublimed Naphthalene, Anthracene, Refined Tar and Pitch. Sulphate of Ammonia up to 20.75 per cent. Nitrogen.

For Prices apply to the **SOUTH METROPOLITAN GAS COMPANY,**

Works: ORDNANCE WHARF,

709, OLD KENT ROAD, LONDON, S.E.

EAST GREENWICH, LONDON, S.E.

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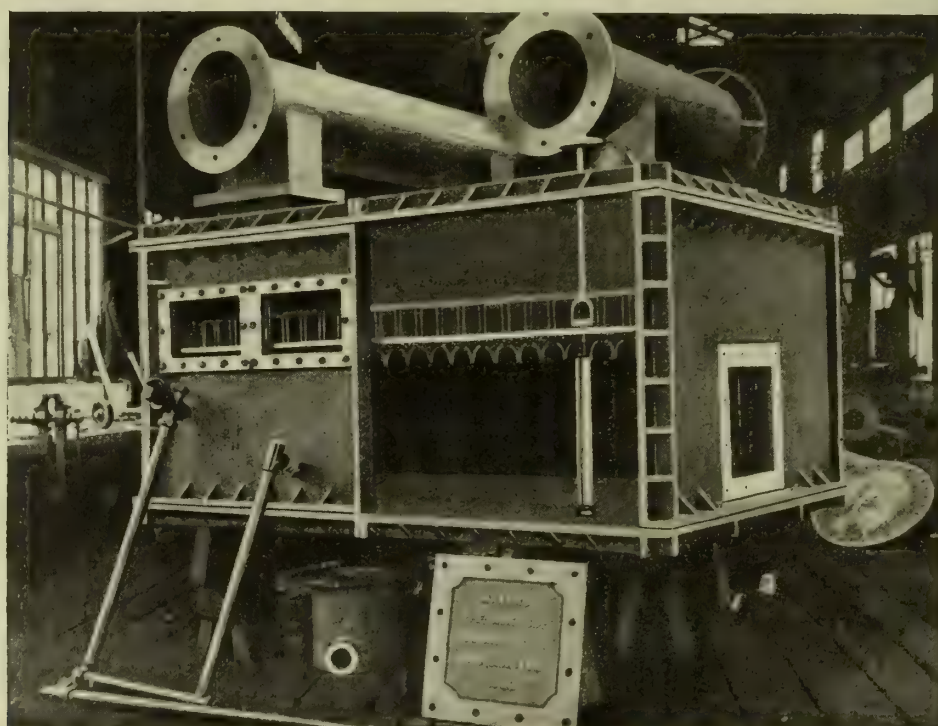
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Washer-
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Livesey Washer, in course of construction in our Works.

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Welsbach

LIGHT

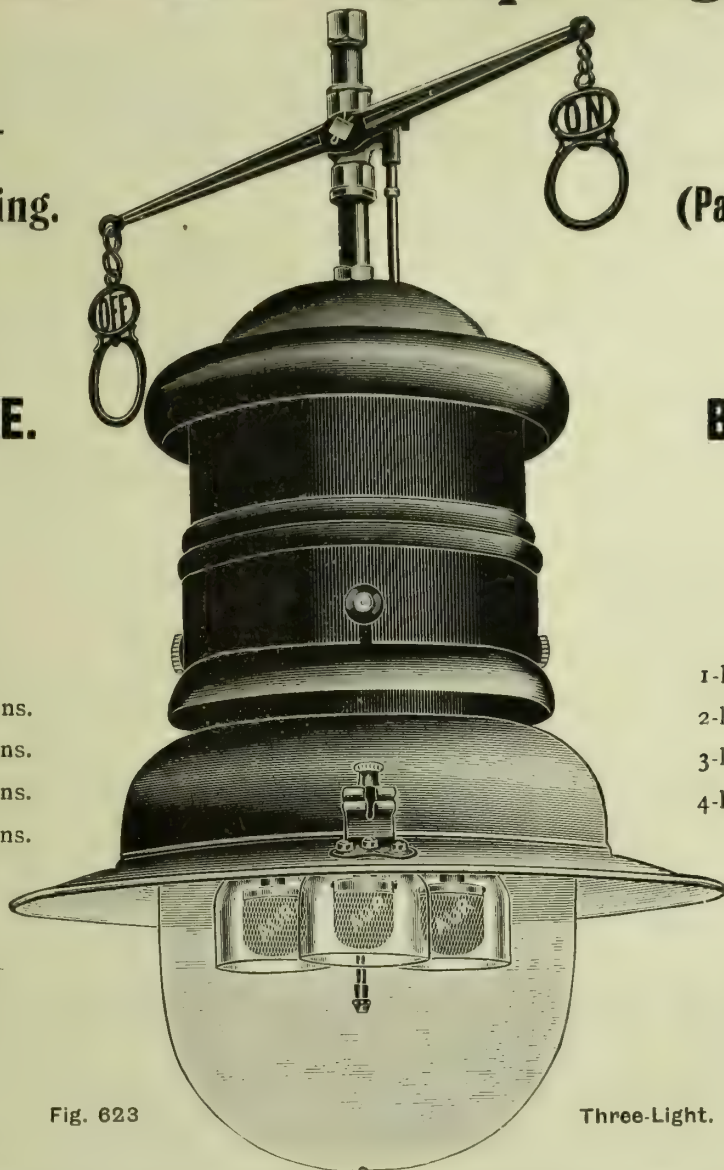
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

Fig. 623

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2/9 3/6
" " " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6
Case contains . . .	80	18	18	12	Welsbach Mantles, each		6d.	subject as usual.	Not made

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,
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Telegrams and Cables: "WELSBACH LONDON."

Telephone 2410 NORTH.

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Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

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Telephone: No. 200.

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GEO. R. LOVE'S INCLINES AT 45 DEGREES.

CARBONIZATION MADE EASY.

A Few Recommendations for this System:—

Simplicity of Design.

No Machinery to get out of order.

Carbonizing charges 40 per cent. less than with Horizontals.

No skilled Stokers necessary.

Yield of Gas per ton guaranteed about 1000 cubic feet more than under present conditions, of guaranteed candle power.

Heats under absolute control throughout the whole length of the Retorts.

Saleable value of Coke greatly increased.

25 per cent. greater yield of Ammonia.

More liquid Tar.

Stopped Pipes unknown.

Naphthalene always in solution. 45 per cent. less ground space required.

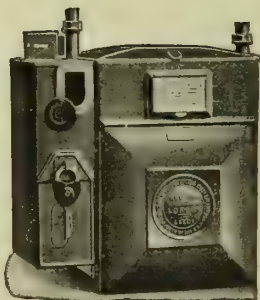
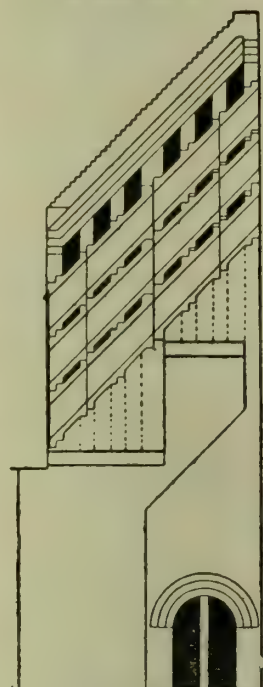
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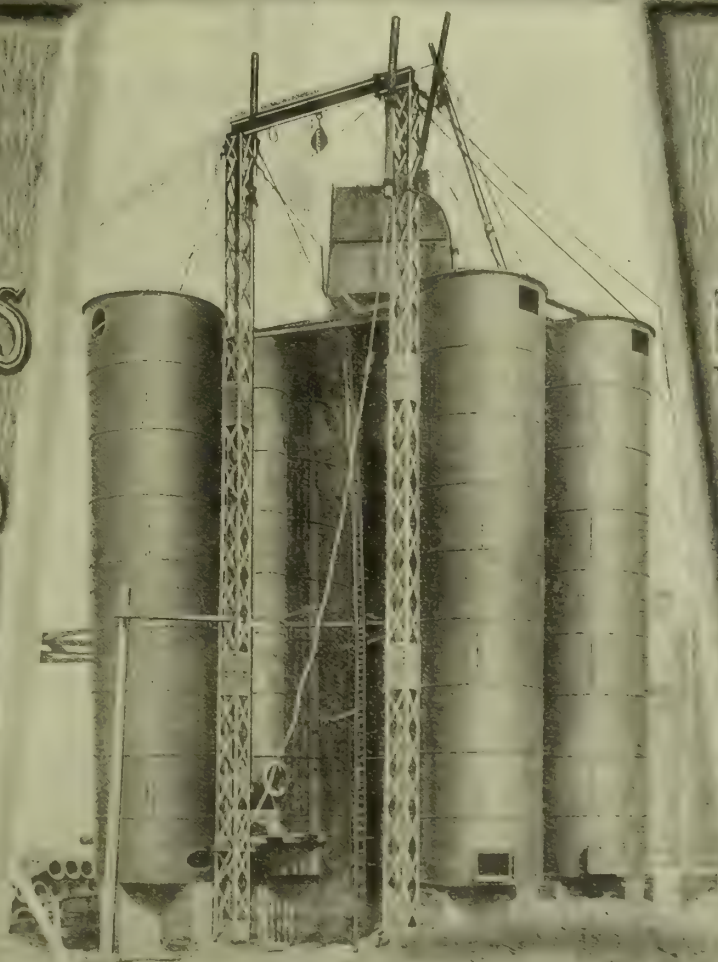
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RETORTS

Extracts from Tests made by

Dr. HAROLD G. COLMAN

at the St. Helens Gas Works.

DURHAM (THORNLEY) COAL.

Gas made per Ton	13,102 cubic feet.
Fuel Consumption	12.3 lbs. per cent.
Illuminating Power	15.56 No. 2 Met. Burner.
Calorific Value	573.6 B.Th.U. (Gross).

YORKSHIRE (SILKSTONE), BARROW COLLIERY.

Gas made per Ton	12,435 cubic feet.
Fuel Consumption	13.4 lbs. per cent.
Illuminating Power	16.19 No. 2 Met. Burner.
Calorific Value	584.9 B.Th.U. (Gross).

LANCASHIRE, WIGAN (ARLEY MINE).

Gas made per Ton	12,145 cubic feet.
Fuel Consumption	12.2 lbs. per cent.
Illuminating Power	15.22 No. 2 Met. Burner.
Calorific Value	576.2 B.Th.U. (Gross).

See "JOURNAL OF GAS LIGHTING," June 8 & July 20, 1909, for description and results.

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THE JOURNAL OF GAS LIGHTING

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 FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS.



GAS-LEAK INDICATORS,
 With all Latest Improvements.
 SHORT'S IMPROVED AND ANSELL CLOCK FORM.
 For Ground Use, Flush Boxes, &c.
 For Purifier Blow-off Valves.
 Highly Sensitive. Long Range.
 For Hard Usage.

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 is now used in many Gas-Works throughout Scotland with gratifying success.

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GAS, WATER, & STEAM.

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Rheinische Chamotte-und Dinas-Werke, Cologne on Rhine.

Construction of Entire Gas-Works & Coke Oven Plants, Retort Furnaces,

Furnaces for Chamber Settings New Coke Ovens (Patent), (Patent),

With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia Works, and Cyanogen Extraction Plants.

COCKEY'S PATENT WASHER SCRUBBER & TAR EXTRACTOR.

August 1st, 1908.

"I am pleased to be able to state that the Scrubber Washer you erected at Harpenden has given every satisfaction. It has Five Chambers, and the Gas is divided into small streams, at each of these Chambers; water flows in at the top and all the Ammonia is eliminated without the aid of any other Plant. . . . The Liquor can be worked up to almost any desired strength. And the Plant has not been cleaned out since you fixed it, and has given us no trouble."

December 2nd, 1908.

"I cannot speak too highly of Cockey's Washers, they are simply invaluable. I gave full Information at the Meeting of an Association of Gas Managers, when President, at Southampton.

If you have plenty of room, I should have an Horizontal one, if short—why then a Vertical one.

The action of the Washer removes every trace of Ammonia."

December 23rd, 1908.

"You asked some time ago as to the working of Tar Extractor. I am pleased to report that it has been working for about six weeks, and is giving great satisfaction.

The whole of the Gas was passed through it for over a month, without the aid of any other Washing Plant (whilst the old Plant was being moved) and I was surprised at its being able to cope with the Gas so well, at this time of the year."

December 2nd, 1908.

"In reply to yours of the 1st inst., we have had Two 'Cockey's' Washers erected here, and if another was required, I should certainly put it down in preference to any other make.

It is absolutely certain in action, easy to control, and visible in working. I am sure you could not put down a better Machine. By paying proper attention to the Water supply not a particle of Ammonia passes the last Chamber.

I shall be pleased to answer any further questions on the matter, and if you like to run over and see the Apparatus in work, I shall be pleased to show you our results."

December 2nd, 1908.

"In reply to yours of the 28th ult., just to hand, I may say that the 'Cockey's' Washer was erected for the purpose of removing the last trace of Tar, and dealing with CO₂ and H₂S in the two Bottom Chambers by means of Ammoniacal Liquor, the three Upper Chambers being used for removing NH₃, intending at a later date to erect a supplementary Scrubber. At the present time the 'Cockey's' Washer is doing the whole of the work, and we have not found any difficulty in removing the last trace of NH₃. We have passed equal to 300,000 cubic feet per diem.

The only trouble we find in working, is a stopping up of the teeth of the Washing Hoods with Naphthalene, but these are easily cleaned by removing a Hand Cover and applying a stiff Brush. The Overflows work well, and a little attention occasionally is all that is required."

December 2nd, 1908.

"Replying to your Letter of yesterday's date, I have very much pleasure in giving you my opinion of Messrs. E. Cockey and Sons' Vertical Washer, one of which I have here (to pass 500,000 cubic feet per day).

I consider the apparatus a most valuable one, very efficient and does all the work that one can wish, leaving very little Ammonia for the Tower Scrubber to deal with.

Should you desire any further Information, please do not hesitate to ask me for it, and I should be very pleased to show you the Washer at any time you might care to pay me a Visit."

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JOSEPH EVANS & SONS, (WOLVERHAMPTON) LTD. CULWELL WORKS, WOLVERHAMPTON.

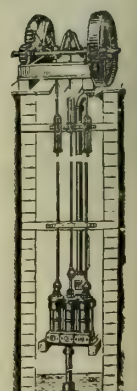
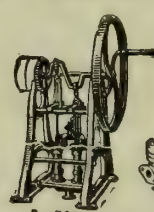
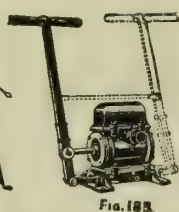
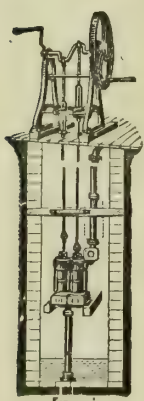
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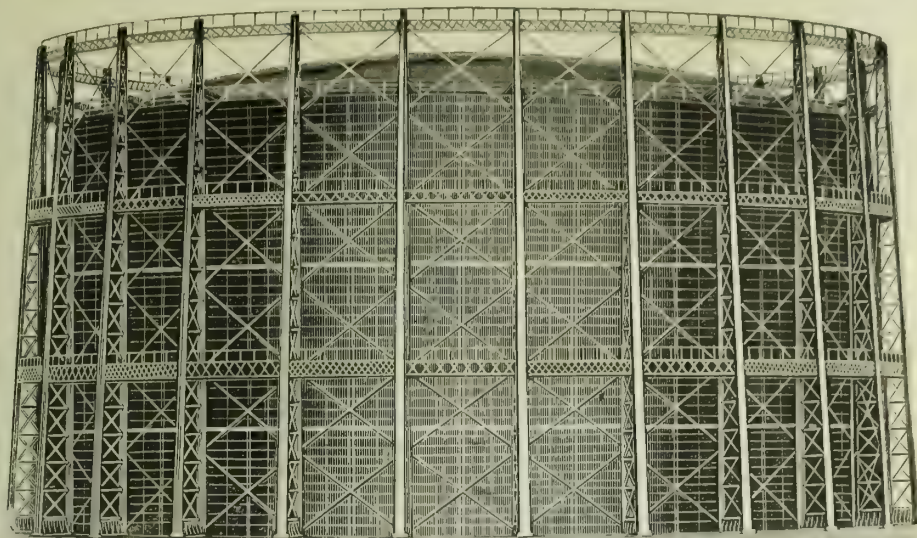
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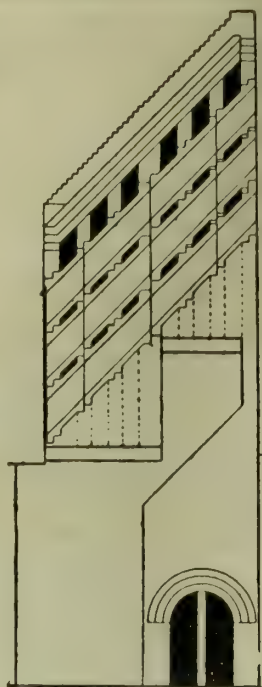
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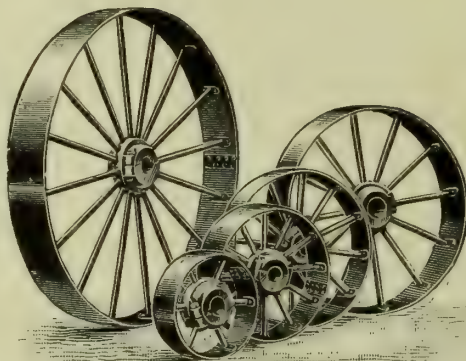
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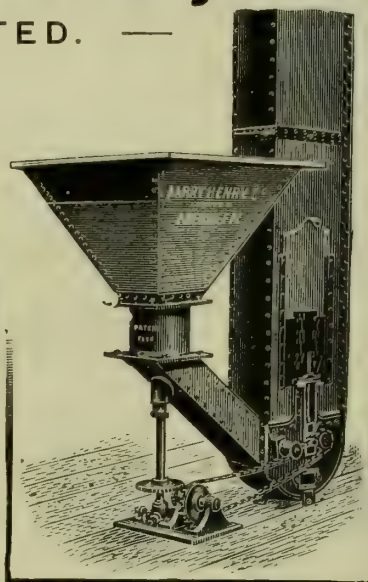
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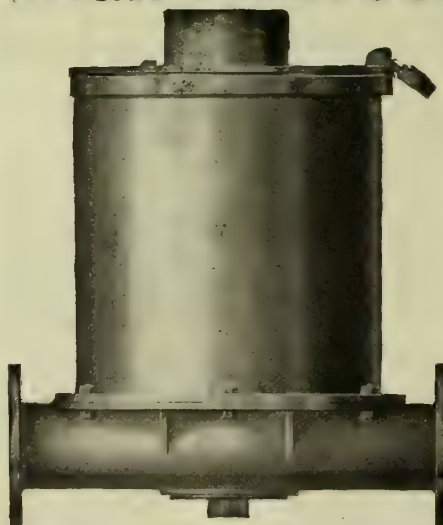
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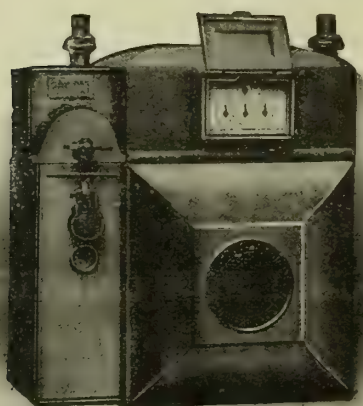
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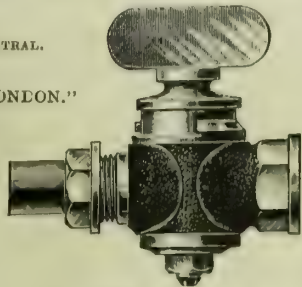
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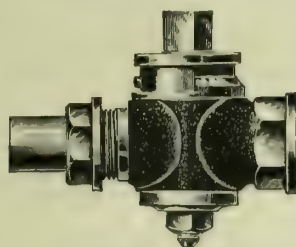
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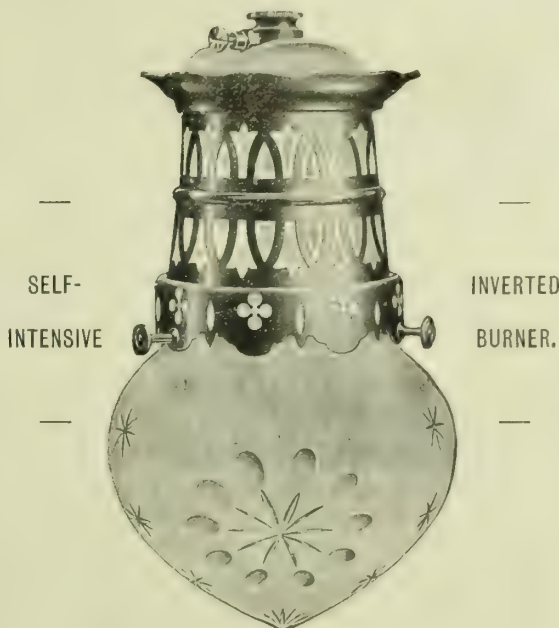
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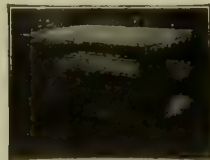


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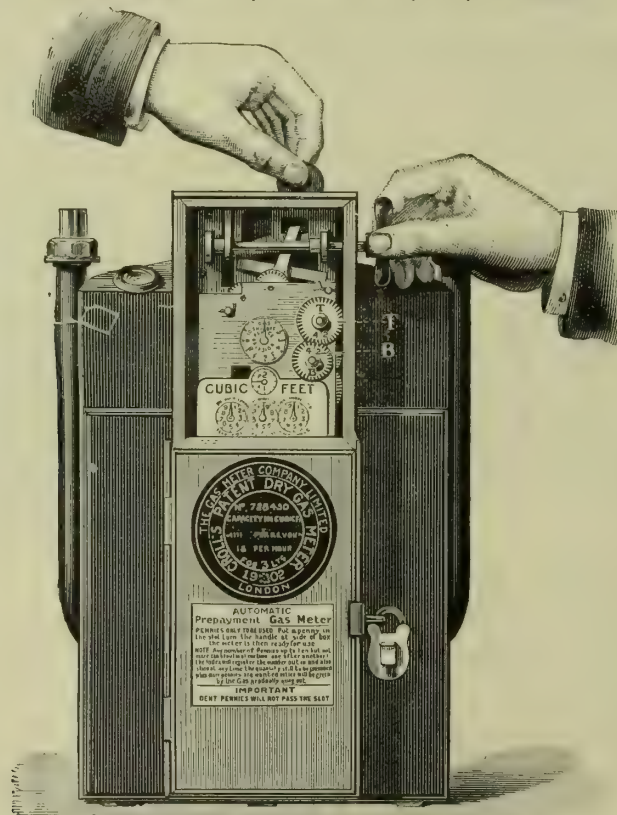
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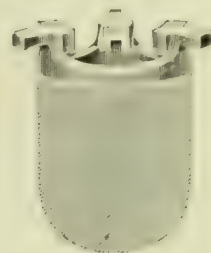
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Dunedin, N.Z. (2nd) . . .	275,000	Nuneaton . . .	125,000	Wexford, Ireland . . .	100,000
Durham . . .	200,000	Oberhausen, Germany . . .	175,000	Wiesbaden, Germany . . .	850,000
Düsseldorf, Germany . . .	1,000,000	Oldenburg, Germany . . .	200,000	Winchester . . .	225,000
Eastbourne . . .	1,250,000	Ostend, Belgium . . .	100,000	Winchester (2nd) . . .	125,000
Edinburgh . . .	2,000,000	Ostend (2nd) . . .	200,000	Wolverhampton . . .	1,500,000
Epsom . . .	225,000	Perth, W.A. . .	125,000	Zwolle, Holland . . .	200,000
Epsom (2nd) . . .	300,000	Poole . . .	1,500,000	Zwolle (2nd) . . .	200,000
Falmouth . . .	150,000				

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EDITORIAL NOTES—GAS, &c.

The "Metropolitan" No. 2 Burner—A Joint Bill.

THE tortoise-like motion of Governmental departments in respect of semi-public matters that are brought to their notice from quarters other than the House of Commons, does not accord with the notions of some of the ardent spirits in the gas industry. Two years ago, Mr. C. E. Botley, at the meeting of the Gas Companies' Protection Association submitted the proposition that some movement should be made in the promotion of a Bill with the object of bringing about the general adoption of the "Metropolitan" No. 2 burner as a standard for general use. On that occasion, Sir George Livesey gave his benison to the idea; and to the last he was a strong advocate—publicly and privately—of something being done in the direction of getting gas testing on to a common basis as early as possible. At the meeting in question, the Committee were instructed to consider the desirability of promoting a Bill making provision for the uniform testing of gas. Deliberation by the Committee resulted in the draft of a Bill being prepared, and in the appointment of a Special Committee to deal with the matter. Then, in conference with the Parliamentary Committee of the Institution of Gas Engineers, various slight amendments were effected in the draft Bill; and the Joint Committee decided that copies should be sent to the Board of Trade, with a request that the President should receive a joint deputation from the Association and the Institution. Many months passed; and, in the spring of this year, the Parliamentary Secretary of the Board of Trade received the deputation. An explanation as to the chaotic position of gas testing in the country was placed before him, together with information as to the modern test-burner and the principles governing its use.

Beyond this there has been no movement—the next step resting with the Board of Trade. The hands of all Government departments are full; and therefore this, with many other matters, has apparently been shunted on to a siding to await a somewhat more convenient time. This has given satisfaction to those who think that this is not a question that should receive the drastic and general treatment proposed—it being considered, even by some who are in favour of the extended use of the "Metropolitan" No. 2 burner, a matter in which the local authorities should have a voice, in view of the (in most things) very proper veneration for parliamentary bargains. In this instance, however, the incandescent gas-burner has rendered null and void all pre-existing justification for this particular *soi-disant* "bargain." But this is a matter that, discussed now, may lead to useless controversy. The opponents, however, of legislation having for its purpose the general application of a uniform system of testing will not—or at any rate the majority of them will not—have any objection to the decision that the Committee of the Gas Companies' Protection Association came to last Thursday, to at once take steps to promote a Joint Bill or Bills—precisely as they did, with excellent effect, in the case of the sulphur clauses—to authorize the substitution, by companies joining in the promotion of a Bill, of the "Metropolitan" No. 2 burner for other test-burners now in use.

There is to be no more dallying with the question. A start is to be made in giving impetus to the bringing about of the reform piecemeal if it cannot be effected in any other manner without unreasonable delay. There will be, in this way, opportunity for any authority having objection to obtain a hearing before the Parliamentary Committees who will be considering the Bill, if opposition be raised. The Committee of the Association are recommending that a sum not exceeding £200 shall be appropriated from the funds of the Association in support of the promotion of the Bill or Bills. It is considerate of, and correct for, the Association to spend money in furthering any common industrial cause; but really we do not see why the funds of the Association should be expended over a matter that is distinctly one for

the participators in the benefits to be conferred through parliamentary sanction to fully share in some proportional manner on an agreed basis. Spread among the number of companies who, it is hoped, will unite in the promotion, £200 would not represent individually a large addition to their part of the expense. The expenditure of their funds, however, is the business of the members of the Association; but in this matter, if the Association undertake the work of promotion, the beneficiaries should not expect, nor allow, them to be also put to expense on their behalf. To facilitate the work that will be associated with the promotion, all gas companies—whether members of the Association or not—who are willing to join in the movement are requested, by the letter appearing in our "Correspondence" columns, to communicate as early as possible with Mr. F. E. Cooper, the Secretary of the Association, and to arrange to be represented at a meeting to be held at the Westminster Palace Hotel on the 28th inst. We wish the movement every success.

The Best Gas.

THE sessional work of the Midland Junior Association was inaugurated on Saturday by an address from the new President (Mr. A. O. Jones, assistant to Mr. H. E. Copp at West Bromwich), in which there was penetration of several subjects and acceptable dicta on many points. There is all the evidence in the address that Mr. Jones has before him a very clear perception as to the goal to which the gas manufacturer has to aim both as producer and seller; and, given the opportunity, Mr. Jones will proceed to that goal as direct as circumstances will permit. The objective of the gas manufacturer must be—if he is not to be reckoned as being more worthy of a place in the past than in the present and the future—the production and sale of as many heat units as possible for a penny. The course to this end is not to be found in certain practices of the past, but in pursuing a now fairly well-defined line of technical policy in the future. We have to accept the pre-eminence of calorific power among the properties of distributed gas. So accepting, we have next to admit that the No. 1 argand burner as a valuator does gross injustice to both gas and consumer; and that the candle power readings obtained by the "Metropolitan" No. 2 burner are far more to the advantage of the user of gas for incandescent lighting, heating, cooking, and power than those by the No. 1 burner.

This simple fact is a matter that not a few gas engineers have failed to appreciate. Mr. Jones presents a diagram in his address which will serve as an aid to better understanding. The higher the percentage of illuminating constituents in the gas, the lower the percentage of the constituents of the marsh gas series. It was Dr. Bone who pointed out, at the 1908 meeting of the Institution of Gas Engineers, the advantage to the calorific value of gas of retaining in it the maximum percentage of marsh gas. Dr. Harold G. Colman, too, at the last meeting of the Institution, remarked that what we have to aim at is to produce a gas which contains the maximum quantity of marsh gas or methane; but our knowledge is distinctly limited as to how to obtain the maximum production of marsh gas. And there is a sentence in the address that once well settled in mind will surely assist in converting the beliefs of the adherents to an obsolete requirement, as it puts in a nutshell the case for the suppression of the illuminating power standard and for the setting up of a calorific power one (if a standard there is to be at all). "From the point of view of calorific power, the illuminants supply about 15 per cent. against 56 per cent. obtained from the marsh gas series; and a variation of 1 per cent. of marsh gas makes a difference of 10 B.Th.U. per cubic foot of gas." Apart from the question of the qualitative standard of gas, there is another moral; and it is that our choice of coal for gas production in the future, if we wish to render the utmost service to the consumers, must be that which will yield the greatest

percentage of its heating power in the form of gas, having regard also to the character of the bye-products.

The address also contained a reasoned examination of carbonization questions, from which the continuous vertical retort process emanates triumphantly. Mr. Jones further takes us from ascertained fact to what may be when he speaks of the production per ton of coal of 30,000 cubic feet of gas of a calorific power of 550 B.Th.U., and of 14 to 15 candle power, by a combination of processes. It is well perhaps to have ambition; it carries one farther. Such visions as this, however, are not new; but they have not carried us far along the road to realization. We are content with the present rate of progress, and can afford to wait and let visions of the kind materialize—if they can. The address concluded with some philosophic words on the importance of a low capital account per unit of output, as to the imprudence of spending wastefully through the ease of drawing money from the revenue account, and as to the effect on working costs of increasing the summer load. These are not matters that are fresh, but they will bear repetition so long as there exist high capitals, imprudent spending, and carelessness over the development of the summer load.

The Work and the Junior Workers.

THERE was a plain directness about the address that Mr. W. R. Herring delivered last Saturday at the meeting inaugurating the winter's work of the Eastern Section of the Scottish Junior Gas Association; and every junior who heard the address, and every junior who reads it in our columns to-day, will feel indebted for many things to its author, who, in his own person, position, and practices, typifies much of the truth to which he gave utterance. The address abounded with apothegms which should be taken to heart; with rules of professional conduct and practice which, followed, will conduce to the record of dignity, esteem, and success, and, it is hoped, material reward. It is somewhat of a coincidence and peculiar, but it is a good omen, that, in the two presidential addresses dealt with in our columns last week—addresses delivered in parts distant from each other, by men working under different conditions, and whose views were put upon paper almost simultaneously—and now again in the address of Mr. Herring (which address was prepared before the others were published), the writers should one and all have directed their thoughts to the expanding responsibilities of the technical officers of the gas industry, to the necessity in the industry for premier abilities and for the application of energies to the accumulation of knowledge on the part of coming officials, and to a reminder that gifts and mental power and capacity adapted to the work of the industry should receive their just reward. The subjects uppermost in men's minds in the general affairs and interests of life are the ones that they will talk about. And therefore we hold, and the juniors will hold with us, that it is a good sign when the senior officials of the industry take advantage of their public opportunities to press home these points and the duties of the administrators of the industry towards those who are seriously moving forward in equipping themselves both for present and for future work. It is to us one of the most pleasant things associated with the junior organizations in the industry from the days of their nascent work onwards, to have had revealed by the members so clearly, yet unexpressly, their consciousness of responsibility and of the need for all possible intellectual attainment, and for the extension of experience. The doubters of benefit from such organization have had their doubts scattered; the selfish (who did not desire the pathway of the junior to be made easier) have been put to shame; the conservatism of the worshipper of tradition has been trampled under foot. But from our own observation there has been no evidence of any injudicious use having been made by juniors of their opportunities, nor has there been any want of loyalty to the interests that they serve, or any assumption of airs that ill-befits the junior and the student. On the contrary, there has everywhere been gratitude for opportunities, an appreciation of conferred benefits, and an exposition of diligence in cultivating those attainments that will be of practical use in work, to the undertakings served, and to the juniors personally.

This is not any laudation; it is as one with disinterested observation finds, and so honestly acknowledges. Not only through organization, and the privileges conferred thereby, but through their very environment the juniors of gas-works staffs, have to-day opportunities transcending greatly any-

thing their predecessors were privileged to have, or could boast of, during their period of training. The juniors of to-day have before them a fully opened door; and in this respect, as Mr. Herring points out, they have much for which to be thankful. But we would not for a moment have the juniors forget that the brains of their chiefs, who had not the opportunities and privileges that they themselves enjoy, have brought about the technical and commercial conditions—giving present opportunity—that are spread so lavishly around. "In contrasting the old conditions with the new, I would ask you," said Mr. Herring, "to contrast the advantages which the junior members of 'the profession now possess as compared with the advantages of twenty or fewer years ago.'" Not only for the giving of encouragement in making the utmost use of their advantages (and which encouragement denotes the degree of sincerity of the seniors who accord it for the future welfare of the industry) are the juniors the debtors of their chiefs, but for what the latter have done in transforming the conditions of the industry—transforming them from simple routine that largely ignored economy, or afforded little room for entertaining hope of achieving a greater value from work and material, to something which has not only placed the industry on a higher plane of economic efficiency, but has brought us to the stage at which there is light that gives encouragement to prosecuting work to the end of realizing still greater successes from the fundamental expenditure. And such times are good ones for the juniors of an industry in which to live. The conditions are educational and stimulating beyond compare in the history of the industry. Although when the responsibility of management comes upon a man, he cannot devote himself to the systematic ingathering of that rudimentary knowledge and those basic principles that must serve as the foundation of his future professional career on the technical side, the gas engineer has never finished learning. Every day brings to him fresh facts, fresh knowledge; every new work put in hand and upon which the accumulated knowledge up to the day is brought to bear, leaves an engineer enriched in knowledge. The designer of Granton was professionally a wiser and better man, through additions to knowledge, when he had finished the construction of the first section of Granton than when he sat down to the task of preparing the ground plans and entered upon the initial work of draining the site. But the fact that the shouldering of responsibilities still keeps open the opportunities for the accumulation of knowledge, must not be used as an excuse by any junior for slackness in garnering knowledge in the present. The knowledge that comes in the nature of things from the responsibilities of trust and daily work, is in an altogether different category from that which must be amassed by diligent application beforehand, and the opportunities for gathering which become all too limited in the after days.

There is warning in Mr. Herring's address against too readily taking things for granted, no matter how elevated in position and reputation the author or creator of those things may be. We need not be Thomases, cynics, egotists, or any of such disagreeable classes of people. We can give every man his due. We can provisionally concede to every man credit for having based, or attempted to base, his work on reason and common sense, and for having brought intelligence to bear upon his methods. But, on the other hand, there is education, and there is safety, in individually seeking for causes and effects, and in making complete investigation before acceptance. There are some who, while not openly disputing this point, would regard as unmannerly the habituating of oneself to adopting a questioning attitude in technical affairs. But it is the only way to personally enable one to get at, or satisfy one as to, the truth. An engineer reads the testimony of a fellow-engineer as to the efficiency of a piece of plant or a method of working. He wants to apply something of the kind himself. Though he has heard the testimony, he must see it. Why? Because he—unconsciously, may be—does not take for granted all he has heard. Mr. Herring has a sentence in his address that gives important support to his advice as to not taking things too readily for granted merely because someone else has adopted them. "One of the most important features of 'the present time,'" he says, "is the fact that the efficiency 'of established practices is not taken for granted.'" The truth of this, from whatever point of view regarded, requires no emphasizing. But it indicates the view of competent judgment throughout the profession that there is not in sight any limit to possibilities in operations—productive, or

otherwise; and, therefore, no piece of gas plant, no particular practice, no gas appliance or fitting, can be taken as representing the pinnacle in its line of effect and utility. This being so—looking to the past, looking to the present questioning of established practices—all that comes up as new should be examined not only in relation to existing circumstances, but to those future ones to which the indicative fingers of the time direct us. The age of originality has come upon us with rapidity in several departments of the industry. In our transport, carbonizing, purifying, and distribution practices, this is seen. Evidence of it is found in the character of the gas that the industry is hastening to supply, and in the means of utilizing that gas. Cheapness, without depreciating efficiency under the new conditions of application, is the order of the day. Thus the outlook for the juniors is an exceedingly bright one; and they are in the midst of, and have before them, unexampled opportunities. The message that Mr. Herring has delivered to them is concentrated in the advice, Make the utmost use of those opportunities if you aspire to benefit the industry in which your lot is cast, your fellow man, and your own honour and material interests.

Competitors in the Bye-Products Markets.

WE have the first-fruits of the Census of Production Act, 1906. There were in the year of the passing of the measure critics who doubted whether the collection of these industrial statistics would be of any material value, or show sufficient veracity to be reliable. There were manufacturers, too, who thought that the compulsory divulging of data affecting their businesses would be detrimental to their interests. The initial part of the work, however, has been accomplished. We suspect it has presented the greatest difficulty that will be experienced in connection with this new method of obtaining a continuous grip on the positions of the industries of the country. It has necessitated almost infinite correspondence, which has had its reward in setting fears at rest, and in educating up to what is required of those who have made the returns. Total figures publicly divulge nothing respecting any individual firm or company; and the Board of Trade and the officials concerned will maintain the most recondite attitude in the matter of individual statements. As to the value of the total figures, there can be no manner of doubt that it will be enhanced as time progresses, when, by comparison, the rise and fall of the industrial barometer can be annually ascertained. Already we have derived considerable interest from the figures contained in Part I. of the returns, which introductory part relates, *inter alia*, to mines working under the Coal Mines Regulation Acts, including coke and shale-oil works in connection with mines. The returns for gas-works are for future publication; and it may be expected that they will be supplemental to the Board of Trade returns relating to statutory gas undertakings, in the extra data afforded as to production—more particularly in regard to secondary products, so that there will be some relation with the aggregate figures from coke-ovens as included in this first part. The figures in the Gas Undertakings Returns are limited; and when the additional ones are obtained as to the bye-products of gas manufacture, enabling comparison with those given from the coke-oven and shale-oil works, the gas industry will be able to gain, and this annually, a better knowledge of the position of their competitors in the various markets.

In the forefront of the present return, we come across a figure which fills a deficiency in the Board of Trade returns as to gas undertakings. The census returns relate to the year 1907, in which 265,134,000 tons of coal were raised in Great Britain, having a value at the pit-mouth of £119,544,000. Of the quantity raised, 63,601,000 tons were exported; leaving 182,914,000 tons as the quantity retained for this country. The amount of gas coal raised is given as 29,039,000 tons, having a value of £12,779,000. Of the quantity, more than one-third (10,445,000 tons) was exported; so that 18,594,000 tons were retained for this country. The last issued Board of Trade gas undertakings returns deal with the statutory company figures for 1907 and those of the local authority concerns for the year ending March, 1908. It may therefore be taken that the year has an approximate relationship with that of the census returns. In the Gas Undertakings Returns, it is shown that the quantity of coal carbonized by the statutory concerns in the year was 15,406,753 tons; so that practically we have 3,187,247 tons

difference between the quantity carbonized by statutory concerns and the quantity of gas coal retained for use in this country. The difference is no doubt accounted for partly by the margin between carbonization and sales and stocks in hand, and by the quantity carbonized by the non-statutory undertakings.

Then, again, there are no figures in the gas undertakings returns corresponding with those now supplied as to coke-ovens and shale works; and there is peculiar interest in learning something more than has been hitherto available as to the values and outputs from these quarters of coke, sulphate of ammonia, tar, &c. We are reminded by the figures of the line of thought (as accentuated by an editorial comment at the time) that ran through a large part of the Presidential Address of Mr. Thomas Glover to the Institution of Gas Engineers last June. It has to be borne in mind, in considering the secondary product outputs of competitors, that their figures are capable of vast expansion; and a consideration is as to what effect this will have in the future on our own returns from bye-products. It is seen that the total quantity of coke made at coke-ovens in the year 1907 was 11,903,000 tons, of the value of £9,516,000. The coal used in making this quantity was 19,524,000 tons, so that the coke product was equal to about 60 per cent. of the coal used, which percentage has an approximate correspondence with the estimated average coke product of gas-works. The figures quoted do not include the 839,000 tons of coke made at iron and other works, mainly for home use. But the figure of 11,903,000 tons of coke for foundry purposes is interesting in relation to the total production of gas coke for domestic and general industrial purposes. Assuming the carbonization of the whole of the 18,594,000 tons of gas coal retained for use in this country in 1907, and taking as an average 60 per cent. as representing the coke production, we find a total yield of 11,126,400 tons of coke arising from the manufacture of gas, which is running close to the amount of the coke-oven product.

In the census return we have confirmation as to the vast capacity these coke-ovens have for launching a big competition against the bye-products of gas manufacture. There were in 1907, only 5203 bye-product recovery ovens in existence, representing merely about one-sixth of the total coke-ovens in Great Britain. To be precise, there were 26,964 non-bye-product ovens in existence; so that, as and when these are converted, the output of sulphate of ammonia and tar will be progressively greatly extended. In 1907, there were only 4846 of the existing bye-product ovens in operation; and from them the quantities and values of the products produced (we have already quoted the figures for coke) were as follows: Sulphate of ammonia 37,000 tons, value £417,000; tar 120,000 tons, £101,000; pitch 5000 tons, £6000; tar oils (creosote, &c.), 3,664,000 gallons, £18,000; benzol and toluol 2,358,000 gallons, £49,000; other bye-products (quantity not stated), £34,000—the total of the values quoted being £625,000. By the shale-oil works, sulphate of ammonia was produced to the value of £590,000, and coke to the value of £12,000. These figures are significant as they stand, and cannot be neglected; and their significance will increase by comparison year by year as the Census of Production Returns come to hand.

The Heavier Charge.

The notes, or "impressions" as they are called, on heavy charges in carbonization, contributed this week to our columns by Mr. G. M. Gill, are of value as being the results of observations from direct experience. To those engineers who have not yet made trial of heavier charges and longer carbonization periods, the notes will be suggestive when contemplating making the change in practice. There is one part of the article in which experience does not universally coincide with Mr. Gill's, though this is not sufficient reason to question in any way the accuracy of his statements and conclusions. In practice, Mr. Gill has found that as the length of the charge has been extended, so has the quantity of coal carbonized per twenty-four hours been increased. It used to be the practice, within his own field of working experience, to carbonize 25 cwt. of coal per retort in twenty-four hours. With 10½-hour charges (which he finds is the longest period in which a filled-up retort will burn off), it is now his practice to use 13 cwt. of coal per 22 in. by 15 in. by 20 ft. □ retort—making a daily quantity of about 30 cwt. per retort. There are engineers who assert that the use of heavier charges of certain coals and

longer carbonization periods have diminished the weight carbonizing capacity per retort, though there has been more than compensation in the productive results and in other directions. In Mr. J. Ferguson Bell's experiences at Derby, as related in his Institution paper, with 22 in. by 16 in. by 18 ft. retorts (retorts of rather larger sectional area than Mr. Gill employs, but 2 feet less in length), he finds the best results, using the lower qualities of Derbyshire coals, are realized by charges corresponding in hundredweights to the hours of carbonization—that is to say, he uses 6 cwt. for six-hour charges, and 12 cwt. for the twelve-hour charges. His weight carbonization capacity is not diminished or increased per twenty-four hours; but his heavier, longer-hour charges give him gain in product and working costs, so that he is realizing more profitable work from his plant. It would be interesting if Mr. Gill would supplement his weight capacity per retort per twenty-four hours by mentioning the class or classes of coal by which his experience as stated was gained, whether he is of opinion it would apply to all coals, the make of gas per ton with the same class coal at the different durations and with the different weights, illuminating power, and those other particulars that have interest in relation to this question of heavier charges.

Miners in Congress.

The annual conference of the Miners' Federation of Great Britain is very much after the style of the Trades Union Congress, which precedes it by a few weeks. Both extend over several days; and each is attended by a large number of delegates. Whereas, however, the Trades Union Congress are free (and take full advantage of the privilege) to touch on all subjects that have the remotest bearing upon the working classes, the Miners' Conference confine themselves more or less to affairs connected with their own particular industry. Mr. Enoch Edwards, M.P., again presided over the gathering held last week in Newcastle, and which consisted of 166 delegates, representing nearly 604,000 Trades Unionists. In the course of his address, he naturally referred at length to the Eight Hours Act, though it is not quite easy to gather from his remarks just what is his opinion of the practical operation of the measure—as distinct from the attractiveness of the theory. The following are his concluding sentences on the subject; and it will be admitted that they are not entirely free from ambiguity: "He did not deny they were a little surprised that the price of coal was so low notwithstanding the passage of the Mines Eight Hours Bill. However, the victory, whatever their children might think of it twenty years from now, was secured to them. It had not been so easy since they got it. Still, they had held their own; and they had proved, at any rate, in that first united battle, what they had never attempted to prove before—what they were capable of doing with that great Union." After the various threats of "national strikes" with which the country has recently been assailed, as the outcome of disputes in the Scottish and Welsh coalfields, it is refreshing to note the President's assertion that the Federation will seek to attain their objects "on the lines of their latest experience—by conciliation, rather than by strike." Throughout his address, he confined himself to matters of practical importance to his hearers; and altogether his remarks were of a moderate character, and not in any way calculated to stir up in any way the discontent of which so much has of late been heard in connection with the coal-mining industry.

Some of the Resolutions.

On the second day, the delegates began the consideration of the various resolutions which were to be submitted to the conference. The first of these emphasized the need for more inspectors of mines, and that the persons appointed should be men who had had five years' practical experience at the coal face. The next two resolutions had a large amount of time devoted to them—too much, considering the present prospects of any practical outcome. They expressed the opinion "that the time has arrived when the land, minerals, mines, and railways should be owned and managed by the State, for the people, to avoid a stoppage of the principal industries of the country." Certainly this idea has nothing in the way of novelty to recommend it; and it is at least doubtful whether it has anything else in its favour, when regarded as a plain work-a-day proposition. One delegate remarked that "if they could get the land nationalized, everything else would follow."

Here, again, there is a little room for misunderstanding; and both those who agree and those who disagree with the nationalization doctrine might feel inclined to assent to the delegate's assertion—though, of course, having a different reading of the phrase in mind. The desirability of getting the Government to appoint a Minister of Mines was unanimously endorsed; and the conference also agreed that an end should be put to the employment of unskilled labour in mines, on account of such men being a source of great danger to themselves and to the skilled workers. A resolution requesting the Members of Parliament to bring in a Bill prohibiting piecework in mines was withdrawn; the idea apparently being that the time was not ripe for such a step. An old friend is the "minimum wage" question—no miners' conference could be considered complete without this subject turning up in some form or other. On the present occasion, the delegates expressed the belief "that the time has come when a special effort should be made to extend and raise the present minimum wage to at least 8s. a day," and remitted to the Executive Committee to devise the best means of raising to this extent the existing minimum in the Federation area. The conference expressed itself in favour of a system of weekly payment of wages being introduced for all workmen employed at collieries; and a resolution was also passed in favour of preventing all men from starting work in coal mines after they had reached the age of eighteen years—this, of course, being another effort to deal with the unskilled labour problem. With this, the conference concluded; the proceedings from beginning to end being carried through practically without a dissentient voice being heard. The unanimity which exists in the Miners' Federation of Great Britain is its greatest source of strength.

Port of London Dues.

There is some misapprehension afloat as to the provisional schedule of rates on goods entering the Port of London that has been issued by the newly-created authority administering the affairs of the Port. To allay fears, paragraphs—probably inspired—have been published, pointing out that the rates are suggested as maximum ones, and therefore must not be taken to imply that they will be imposed, but that they are rather intended to endow the authority with power of adjustment to the needs of the situation. The schedule has not yet been finally settled by the Port authority. It has also to be submitted to the Board of Trade, and will then form the subject of inquiry at which all interested parties will be heard. Coal will bulk largely in that inquiry.

Gas at the Medical Exhibition.

The fifth annual London Medical Exhibition (organized by the "British and Colonial Druggist"), which was held last week at the Horticultural Hall, Westminster, proved, like its predecessors, a great attraction for doctors, &c., and therefore an eminently suitable occasion for drawing attention to the advantages of gas from a hygienic standpoint. This is a fact which was early recognized by the Gaslight and Coke Company; and this year they have followed their previous custom of occupying a portion of the wall space with appropriate quotations of the opinions of eminent authorities. Not satisfied with this good work, however, they have repeated the excellent idea carried into practice last year of having a stall, on which, in addition to quantities of the attractive literature which has become a feature of the commercial branch of the Company, there was displayed a nice little collection of gas appliances. At each end of the stand was placed an ornamental gas-fire, with boiling-ring on top for the provision of a supply of hot water—one being a Richmond "Bavarian," and the other a Wright "Stadium" fitted with the patent "Thermo" fire-front. In the centre were two handsome candle-fittings by Messrs. George Hands and Co., provided with the Benson candle-burner. The first of these was brass gilt, in the Adam style, with two lights; and the other, a modern three-light pattern, in oxidized silver. Together with these were some "Metrolite" burners; and there was in action one of the Best and Lloyd "Surprise" brackets arranged for dental and surgical purposes. As has before been pointed out, this bracket is arranged to move in all possible directions; and an ordinary "C" burner can be used on it, as the counterbalance enables it to withstand vibration. Fitted with a powerful reflector, it is a valuable acquisition to the doctor or the dentist; the light being strong, and exceedingly white.

Among other articles in this month's "Modern Business," is one on the subject of exhibitions. "There is no doubt that the public have been overdone with exhibitions in one form or another," writes the Editor, discussing the conclusions arrived at. "The special awards now issued do not carry the prestige they did twenty years ago; while the increase in attractions taking the form of side-shows prevents the huge crowds from giving serious attention to the commercial side of these enterprises."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 129.)

BUSINESS on the Stock Exchange last week was fairly active on the whole, but movements were very irregular. There was a lot of speculative dealing in the livelier lines; and things swayed first one way and then the other. Investment markets were a good deal neglected; but a little excitement late in the week was got up in Railways, which roused them into attention. On the opening day, business was rather active, but mostly in speculative issues. The higher class departments were dull and disposed to be weak. Americans opened dull, and then sprang up with a bound at a touch from New York. Tuesday was weaker all round. Profit-snatching, where snatchable, depressed even the speculatives; and pretty well all markets were a trifle lower. Wednesday started full of the influence of the previous day, and there was a marked disposition to rein-in, enforced by the aspect of the monetary position under the continuing run upon gold. On Thursday came a rise in the Bank rate for which people were not prepared, though it was bound to come in another week or so. Prices thereupon tended downwards. Consols fell $\frac{1}{16}$. Americans shifted about, but closed with a jump up. In one Home Railway issue there was a startling advance. Friday brought about much of the usual realizing, with a weaker tendency generally; and the remarkable railway issue subsided again. Saturday was quiet and uneventful. Consols were unchanged, and the general tendency was fairly steady except in some speculative lines. The Money Market was tolerably easy at first, but soon began to grow firmer. The Bank rate—fixed on April 1 at $2\frac{1}{2}$ per cent.—was raised on Thursday to 3 per cent. Business in the Gas Market was not up to the level of the week before in point of volume, and there were few changes in quotation; but prices in general were good all round. In Gaslight and Coke issues, the ordinary was quieter but very firm—transactions rising from a minimum of $106\frac{1}{4}$ to a maximum of 107. The secured issues were scarcely touched; one bargain in the $3\frac{1}{2}$ per cent. at $88\frac{1}{2}$ and one in the preference at 105 being all. South Metropolitan was quieter, but disposed to make a further advance, with transactions at from 120 to $121\frac{1}{2}$. The only issue in Commercial dealt in was the 4 per cent., which realized from 109 to $110\frac{1}{2}$. Among the Suburban and Provincial group, Alliance and Dublin old changed hands at $18\frac{7}{8}$, ditto new at 13 and $13\frac{1}{8}$, Brentford old at 255, Ilford "B" at $106\frac{1}{2}$, and West Ham debenture at $112\frac{1}{2}$. In the Continental companies, Imperial advanced a point, with transactions at from 180 to $181\frac{1}{2}$. Union was done at $95\frac{3}{4}$; and Malta at 5. Among the undertakings of the remoter world, Bombay part-paid was $\frac{5}{8}$ better at $4\frac{5}{16}$, Buenos Ayres changed hands at from 14 to $14\frac{1}{8}$, ditto debenture at $96\frac{1}{4}$, Cape Town debenture at 83, Monte Video at from 13 to $13\frac{3}{16}$, Oriental at $140\frac{3}{4}$ and 141, Primitiva preference at $5\frac{15}{16}$, River Plate at from $16\frac{3}{8}$ to $17\frac{1}{16}$, and ditto debenture at 97.

ELECTRICITY SUPPLY MEMORANDA.

The Welsbach Invasion—Novel Methods—Stagnation in the Lighting Business Energizes Electricity Suppliers—Local Knowledge Superior to that of the Local Government Board—A Yarmouth Illustration—With a Supplement from Finchley.

THE sudden incursion of the Welsbach Company into the electrical industry with metallic filament lamps has set the various sections of the latter all agog. The electricity suppliers are asking among themselves, What next are we to expect from the gas people? The metallic filament lamp makers and importers are a bit uneasy over the new competition, from a quarter so formidable through the vast distribution resources the Company have built up on the mantle business. And the electric wiring and fittings contractors and lamp retailers had a temporary nervous breakdown, which, however, has been quickly remedied by an explanation. But there is one unpardonable mistake the electrical press has made, and that is in regarding the Welsbach Company as the gas industry. The Welsbach Company do not aspire to any such honour; but, it seems, there are a few in the electrical industry who would force it upon them. The humorous editorial writer of the "Electrical Contractor" is one of them; and he has got such an exaggerated notion of the import of this event, that he has had an awful dream as to the effect upon the gas industry in general and of the "JOURNAL" in particular, and has placed on record some incoherent remarks, in which beds, explosions, mantles, and metallic filaments are mixed up in frightful confusion. Our friends of the Welsbach Company must feel highly gratified at the exalted position into which they have been hoisted by the more volatile spirits of the electrical industry on this fresh evidence of business enterprise on their part. At first, however, there was some idea that the Company were going to run counter to the contractors; they have, we learn, no such intention. On the contrary, they want them to be their friends, and to work through them; and they are adopting a novel course which will make it imperative on the predecessors of the Welsbach Company in the electric metallic filament lamp field to meet the new conditions that have been so unceremoniously thrust upon them. The Company intend to work solely through the trade, and to show no preference; and retailers will be compelled to sell the lamps

at full list prices, inasmuch as the Company will take the drastic course of declining further business with those caught infringing this condition. The Company are not starting on this business in any effeminate fashion. According to "Installation Topics" in the "Electrical Times," they are going to get introduction to the consumer by giving him new lamps for old, adapting the installation where necessary, and taking a chance of getting some return from the reduction in the quarterly bill for current.

That is where electricity suppliers will feel the effects of the Welsbach Company's new enterprise and campaign. Electricity suppliers are not so keen about hustling their present consumers who are using carbon filament-lamps into a big reduction of their quarterly accounts for electricity; they would rather the metallic filament lamp should be employed to hook fresh fish from the lighting ocean of the gas industry. The work of conversion is to be carried on through the local electrician who usually does the work of the consumer. Those consumers who have already made application to the Company under the terms of this novel offer, have received a reply asking who is the electrical contractor favoured with the consumer's patronage, particulars as to the existing installation (number and especially make of lamp, candle power, and voltage), and a statement as to the amount of the bill for electric current used for the quarter ending December, 1908, and the name of the concern supplying the current. If the consumer is on a high-voltage alternating current supply, the Company intend throwing in a transformer. From which it will be seen that the Company are not entering the new business in any half-hearted sort of way; but, at the same time, they do not intend to relinquish their hold on their big business in the gas industry. That will be prosecuted with as much vigour as ever. One need not look far for a reason for the novel methods that the Company are adopting in stepping into the electrical industry. In the gas industry, they are already strongly entrenched, having come into it (under different auspices, however, from the existing) at the very birth of incandescent gas lighting. In the electrical industry, they start their operations against established interests, and recognize that they will be met by the utmost vigour that those whom they are assailing can command.

While the Welsbach Company are going in for a slice of the business that is to be done in the electric lamp line, by the very goods the Company supply in the old-established section of their business, by other methods at command, and by the vastly superior economy of the new inverted gas-lamps, the gas industry are doing effective work in keeping the adoption of the metallic filament lamp within bounds. On all hands, the suppliers of electricity are looking with rueful countenances upon the depressions in their lighting revenues, and complain that the metallic filament lamp has not stimulated business in the manner expected. With all the affectation obtaining in certain quarters, the hard facts of financial returns cannot be swept away or concealed. Central station engineers, however, are fully alive to the exigent necessity of doing something to bring about a revival in the domestic field of their operations; and it is noticed that here and there arrangements are afoot for the holding of local exhibitions to demonstrate the newest successes of electricity. If anything, this is a compliment to the enterprise and business abilities displayed by the suppliers of gas, who do not fail to recognize that competition necessitates energy. It is the work of the gas supplier to not only secure new business, but to retain that which he has; and the securing and retaining are not to be accomplished by resting solely on reputation and superior advantages in matters of cost and efficiency. Among those central station engineers who have awakened to the fact that the progress of business with them is not satisfactory, and that something more must be done, is Mr. J. D. Knight, the Borough Electrical Engineer of Ealing. He has told his Committee in plain terms that the undertaking has not yet felt the full effects of the metallic filament lamp, and that, unless new methods are evolved for meeting the competition for new business, and new revenues are tapped, the concern is likely to have a trying time in the near future. Last year the new connections only numbered 240, which was a smaller number than in the preceding year. In fact, Mr. Knight admits that the business is beginning to stagnate, and that it needs energetic measures in order to put greater vitality into it. The Gas Company, he points out, get hold of the builders of new property, and, if necessary, assist them by the aid of free piping and fittings, accepting deferred payments. The Company meet the builders, in fact, in every possible way so as to secure new business. Such complimentary recognition is satisfactory, inspiring, and of assistance in maintaining a high level of watchfulness.

There is great indignation in the electrical press and the section of the Yarmouth newspapers that support municipal trading, over a communication that the Local Government Board, in fulfilling the duties entrusted to them, as public protectors, have ventured—perhaps "dared" would be the better word to use—to make to the Corporation. The Local Government Board, however, have grown accustomed to this sort of thing; and the little squibs of local newspapers and the trite gibes of the electrical papers have no effect upon them. They have a duty to perform; and they perform it. The trouble at Yarmouth has arisen in this way: The Corporation recently decided to substitute electricity for gas in the public lamps. This has been carried out in part; but the scheme could not be continued without applying for a loan. Application was made for sanction to borrow the first instalment of the pile of debt the Corporation propose to place on the shoulders of the ratepayers in their one-sided interest of providing still more business for that favoured speculation of theirs—the

electricity undertaking. Council-protected electricity undertakings, under modern unwritten canons of local government, take precedence of the interests of ratepayers; and the Local Government Board know this. The upshot of the application to the Board for this first instalment of money for effecting the conversion of the public lamps, was made public in the following minute of the Electricity Committee:

A letter, dated the 7th of July last, was read from the Secretary to the Local Government Board, with reference to the application of the Town Council for sanction to borrow £2000, in respect of the alteration of the system of public lighting in the borough, from gas to electricity, in such streets as the Corporation may from time to time decide upon, stating that it was not the practice of the Board to sanction loans for undefined expenditure on public lighting, and that the Board saw no reason to make an exception in the present case. *The Board further added that at present they were not satisfied that the substitution of electricity for gas would result in any economy or improved lighting.* The Town Clerk was instructed to communicate further with the Board on the subject.

We will pass by the well-seasoned attacks of the electrical press on the Local Government Board, and turn at once to the comments of two of the Yarmouth papers on the communication of the Board. We see that the knowledge of the central authority on the matter of public lighting is questioned—by whom? Says the "Mercury," "Such an expression [it is not said which particular expression is referred to] coming from a great Government Department seems absolutely absurd." We are glad our friend has protected himself by the use of the word "seems." The "Independent" states that "the Corporation is of opinion that the conversion of the present system will yield considerable economy—the Local Government Board is not satisfied that it will. The Corporation has local knowledge which this superior [mark the sneer!] authority has not." It does not occur to the writer of these words that Yarmouth—Great Yarmouth if he prefers it—is not the only place the Local Government Board have to deal with in regard to loans for public lighting. Their experience has been gathered from the length and breadth of the country, and their experience has convinced them that the money which has been spent on public electric lighting has been a great waste, and to the disadvantage of the ratepayers as a body. Their experience is unique. They are well aware, too, that this £2000 is only the beginning of a heavy expenditure which will require annual sinking fund and interest and provision for depreciation over and above the annual working expense; and they likewise know that, in the result, the efficiency of the lighting will not be that of the modern forms of inverted incandescent gas lighting, which can be adopted at moderate expense. The Corporation have not yet told the ratepayers what the total capital cost of conversion to electric lamps will be. They prefer to divert the attention of the ratepayers from the truth solely in the interests of the electrical undertaking, by applying the instalment system to the change. The Local Government Board know full well from their experience that it is not administrative economy the Corporation have at heart, but the interests of the electricity concern. We are told the Corporation are of opinion that the conversion of the present system will yield "considerable economy." On what grounds have they formed that opinion? We read that they have had the advantage of a well-detailed report—from whom? The Borough Surveyor and the Manager of the Electricity Works! Naturally their report demonstrates, in words, that economy will arise. They would not be worth their salt if it did not. We have not seen the report, but should like to make its acquaintance. Meantime, we do not read of a detailed report from the Gas Company, which might demonstrate how economy might arise, and how greater efficiency might be realized, by the Corporation spending far less on improved gas-burners, than by converting the whole system of public lighting by £2000 steps. The editors of the "Mercury" and the "Independent" may be advised to give the ratepayers of Yarmouth the benefit of the report of the delegates of the Corporation of the City of London who made inquiry into this matter of public lighting. Their well-considered opinion is that, wherever possible, new inverted gas-lamps should be adopted.

The "Mercury" asks why has electricity been adopted by so many authorities for public street lighting if it is not superior to gas. The innocent way in which the question is put almost prompts us to forgive the short-sightedness which allowed its publication. The answer is, because so many municipalities have entered into the speculative business of electricity supply; and the adoption of electricity for public lighting, to the detriment of the ratepayers, has been for no other purpose than to give custom and a better showing in the accounts of the electricity undertakings. And the giving of this custom, and the purchase of the better financial showing, constitute an expensive matter for the ratepayers. That is what has been found by the Local Government Board who are in a position to take a comprehensive view through actual experience, and who are not consequently so easily beguiled as the uninitiated ratepayers. They also know that efficiency as well as reliability (which is an important factor in the public lighting of a holiday and health resort of the character of Yarmouth) are on the side of incandescent gas lighting. If municipal trading and the management of those local affairs that are essential to the well-being of the community were kept quite distinct, there would be much less occasion for complaint. But trading has been allowed to trench so much upon the legitimate grounds of local government in respect of health and good order, that the parliamentary authorities are at length fully awake to the danger that threatens. During the past session, the Local Legis-

lation Committee of the House of Commons have impressed upon local authorities that their duty in dealing with trading undertakings is to treat each one as something having an absolutely separate existence from the ordinary functions of local government. There is not so much absurdity in the position of the Local Government Board as the writers in the Yarmouth press think. The absurdity lies in the attempt to decry the knowledge of the Central Board, and in local journalists posing as superior authorities on this subject, with (through that superiority) the right of admonishing the London Board. Their chief object, of course, is to gain the sympathy of the ratepayers for the Corporation; the motive of the Corporation in committing the ratepayers to the unnecessary expense of converting the street lighting system is to get—no matter the cost—extra business for the electricity supply undertaking. The motive is out of keeping with the rules and customs of good government.

The same question, it will be remembered, arose a short time since, between the Finchley Borough Council and the Local Government Board. The Council requested sanction to a loan of £2200 for arc lamps in the Great North Road and Regent's Park Road; and the Board ventured to ask the Council for an estimate of the cost of lighting the thoroughfares by gas, and for any reports that gave evidence of the Council having considered the interests of the ratepayers by penetrating the matter not from the point of view of the electricity undertaking only, but from that of the economy-with-efficiency principle. The Council were cornered; and, as politely as they could find it within themselves to do so, in effect asked the Board what business it was of theirs what they had considered, and gave instruction to the Board in their duties by telling them that the point for their decision was solely as to whether or not they would grant the loan. Just as was expected, the Board regard this letter as unsatisfactory; and they adhere to their proposal that the Council should take a broader view of their duties, and consider carefully the question of public lighting by both modern gas methods and by electricity. The Council are, on their part, inflexible; and, like silly children, "will not play." They will not satisfy the Board, nor will they do what the Board ask them to do—that is, consider the public lighting disinterestedly. And so there is what the reporter describes as a deadlock. But the Council not to be done are going to make the general body of ratepayers suffer by taking out of the current rate, by way of a beginning, £240 for converting the lamps in the Regent's Park Road—thus imitating Hastings in their method of making the ratepayers give compulsory assistance to their electrical white elephant.

STATISTICS OF PRODUCTION.

It will doubtless be remembered that about three years ago an Act was passed providing for taking a census of production; and it was specified therein that the first was to be taken in the year 1908. As the result of the issue of 444,000 schedules of questions, it has been possible to issue the first of a series of tables summarizing for the more important trades of the country the preliminary results of the returns received. They were published last Friday, accompanied by a report by the Director of the Census (Mr. H. Fountain), and some preliminary observations by Mr. G. R. Askwith. The latter explains that the tables cover the production of mines under the Coal Mines Regulation Acts, of coke-works and shale-oil works carried on in connection with such mines, of cotton factories, woollen and worsted factories, iron and steel factories engaged in the heavy branches of the trade, and tinsplate factories. About 12,000 schedules were issued to firms engaged in these industries, which employed in 1907 an average of nearly 2 million persons, and produced a total output which represented a net addition of nearly £210,000,000 to the value of the materials used. The schedules of questions issued to the mine and factory owners in these industries were drawn up after consultation with special Advisory Committees representing the various trades; and the tables summarize information given in reply, supplemented in certain cases by the answers to additional questions which were issued where the replies on the original schedules suggested that misunderstandings had arisen as to the purport of the questions. Mr. Askwith considers the figures given, though of a preliminary character, are probably sufficiently close to those which it will be possible to issue at a later date to afford a good indication of the quantity and value of the principal products of the industries to which they relate.

The tables are arranged in five groups, the first of which relate to coal mines, and to coke and shale-oil works in connection therewith. Mr. Fountain points out that the total quantity of coal raised by owners of coal mines in 1907, as returned to the Census of Production Office, was 265,134,000 tons, and the selling value at the pit's mouth £119,544,000. He explains that these figures differ somewhat from those published for the same year in Part III. of the General Report on Mines and Quarries; the quantity being less than the total returned to the Home Office by 1 per cent., and the value less by 0·81 per cent. The difference is believed to be accounted for mainly by the exclusion from the returns to the Census of Production Office of a certain quantity of unsaleable coal, which was included by the mineowners in their returns to the Home Office. The returns now presented, however, afford for the first time comprehensive figures with regard to the production of different classes of coal; the output being

classified under the same heads as in recent years. For the United Kingdom as a whole the figures are as follows:—

Kind of Coal.	Tons.	Value.
Anthracite	3,909,000	£2,297,000
Steam	126,802,000	58,703,000
Gas	29,039,000	12,779,000
Household	53,053,000	25,700,000
Other sorts	52,331,000	20,065,000
	265,134,000	£119,544,000

It is interesting to compare the quantities given above with those for the export of the same classes of fuel in the same year. This is done in the following table:—

Kind of Coal.	Quantities Raised. Tons.	Quantities Exported. Tons.	Quantities Retained in the United Kingdom. Tons.
Anthracite	3,909,000	2,128,000	1,781,000
Steam	126,802,000	65,349,000*	61,453,000
Gas	29,039,000	10,445,000	18,594,000
Household	53,053,000	1,510,000	51,543,000
Other sorts	52,331,000	2,788,000	49,543,000
	265,134,000	82,220,000	182,914,000

* Including 18,619,000 tons shipped for use by steamers engaged in foreign trade.

Turning to coke-works, the figures given in the following table relate only to coke made for sale at works connected with coal mines, and they show an output of 11,344,000 tons of coke in the United Kingdom, with a selling value of £9,516,000. In addition, information has been furnished voluntarily by ironmasters and others from which it is estimated that about 839,000 tons of coke were made at iron and other works, and mainly used there. The total output of foundry coke in the United Kingdom in 1907 was about 12,183,000 tons, and the total value about £10,205,000. The coke made at gas-works is not included in these figures, but will be dealt with in a subsequent report. The selling value of the bye-products at coke-works connected with coal mines is returned as £625,000.

	Quantity Produced.	Value.
Coke	11,344,000 tons	£9,516,000
Bye-products—		
Sulphate of ammonia	37,000 "	417,000
Tar	120,000 "	101,000
Pitch	5,000 "	6,000
Tar oils (creosote, &c.)	3,664,000 gallons	18,000
Benzol and toluol	2,358,000 "	49,000
Miscellaneous	[?]	34,000
		£10,141,000

From oil-works in connection with shale-oil mines in Scotland there were produced: Gas oils, 12,259,000 gallons, of the value of £160,000; sulphate of ammonia, 52,000 tons, value £590,000; and coke, 5000 tons, value £12,000.

A voluntary question was addressed to all coke manufacturers, asking for information as to the quantity of coal used in the manufacture of coke, and the number and type of ovens used. Particulars as to the output of coke, the number and type of coke-ovens, &c., had been collected by the Home Office in previous years; but the necessity imposed by the Census of Production Act of not publishing figures which might lead to the identification of individual firms has prevented the publication of results in the same detail as that formerly given by the Home Office. In his report the Director gives a table relating to the production of 11,903,000 tons of coke, valued at £9,999,000, from 19,524,000 tons of coal, in the United Kingdom. The following figures show the total number and type of coke-ovens in 1907:—

	Bye-Products, Ovens.	Non-Bye-Products, Ovens.			Total.
		Beehive,	Others,		
In existence	. . 5203	.. 25,945	.. 1019	..	32,167
In operation	. . 4846	.. 21,080	.. 952	..	26,878

The net output of mines under the Coal Mines Regulation Acts was £106,364,000; from coke-works at such mines, £2,993,000; and from shale-oil works, £777,000. These sums represent the amounts by which the products of these industries, taken as a whole, exceeded the cost of the materials used.

Adhesion of Steel to Concrete.—A report is given in a Vienna technical publication setting forth the results of experiments conducted at the museum with 8-inch cubes of concrete, in which were embedded round steel rods, about $\frac{3}{4}$ -inch diameter, passing through the centre of each block in the direction in which the materials were stamped into the mould. According to some particulars given in "The Times," the concrete was mixed with four different proportions of cement to aggregates, and the rods were drawn out six weeks after the blocks were moulded. The mean adhesive strength of steel to concrete in the four mixtures was as follows: (a) 447.9 lbs. per square inch, (b) 600.2 lbs., (c) 645.7 lbs., and (d) 655.7 lbs. It is stated that not one of the cubes was injured in any way by the extraction of the reinforcement, nor did any cement remain attached to the rods. These tests indicate that the adhesion of steel to concrete is not very greatly influenced by the use of a fat mixture, very rich in cement. Thus by trebling the amount of cement used with the ingredients, the adhesion increased less than 50 per cent.

THE QUALITY OF LONDON GAS.

IN continuation of the series of summaries of the results of the testings made in the testing-places controlled by the London County Council of the gas supplied by the three Metropolitan Companies, we give below some particulars of the results reported for the third quarter of the present year, with, for the sake of comparison, the results for the corresponding periods of 1907 and 1908. The precise dates to which the returns refer are: For 1909, the thirteen weeks ending Sept. 25, and for 1908 and 1907, the thirteen weeks ending Sept. 26 and 28 respectively.

The average results of the testings of illuminating power in the "Metropolitan" argand burner No. 2, with which the gas supplied by the Gaslight and Coke Company is still required to have an illuminating power of 16 candles, whereas the gas supplied by the other two Companies is only required to be of 14-candle power, are shown in Table I.

TABLE I.—*Testings of Illuminating Power (Argand Burner).*
Average Results for Third Quarter.

		1907.	1908.	1909.
Gaslight and Coke Company	candles	16.95	17.09	16.77
South Metropolitan Company	"	16.40	16.79	16.23
Commercial Company	"	15.13	15.36	14.71

The corresponding figures for the testings of illuminating power in the flat-flame burner are shown in Table II.

TABLE II.—*Testings of Illuminating Power (Flat-Flame Burner).*
Average Results for Third Quarter.

		1907.	1908.	1909.
Gaslight and Coke Company	candles	12.37	12.26	11.64
South Metropolitan Company	"	11.00	11.52	10.63
Commercial Company	"	9.25	9.78	8.83

These flat-flame testings, it will be remembered, are made for "information" only; and there is no statutory minimum fixed for the quality of the gas as tested in the flat-flame burner. The burner prescribed for these testings in 1907 was Bray's "No. 7 Economizer" fitted over Bray's "No. 4 regulator;" whereas the burner in use in 1908 and 1909 is Bray's "G 5 feet $\frac{15}{10}$ "

burner. Reviewing these figures, it will be seen that the gas supplied by the Gaslight and Coke Company has changed very little in the course of the three years in its average illuminating power as shown by the statutory argand testings, though, curiously enough, there is an appreciable falling off of something over half-a-candle in the average of the flat-flame results for 1909 as compared with the two preceding years.

With regard to the South Metropolitan Gas Company, the average of the figures for the argand testings for the quarter in 1909 is slightly lower than for the two previous years, and the flat-flame results for the past quarter are also lower than those for the same quarter of 1907 and 1908. Taking the three years together, it will be seen that the gas supplied by the Gaslight and Coke Company has averaged 0.93 candle in illuminating power above the 16-candle power which it is required by the Company's Acts to have; whereas the gas supplied by the South Metropolitan Company has averaged nearly 2½ candles above the 14-candle standard prescribed in the Company's Acts. The high results of the South Metropolitan Gas Company are undoubtedly due to the fact that they supply coal gas unmixed with water gas, and that means have not been forthcoming, or have not commended themselves to the Company, for reducing the quality of the gas obtained directly by the carbonization of the coal below an average of about 16½ candles as tested by the "Metropolitan" argand burner. It is necessary, however, to bear in mind that the Companies have to work so that the gas supplied is not merely above the statutory illuminating power on the average, but that its illuminating power for any one day does not fall below that statutory figure. Hence the minimum results of the testings for the third quarter of the three years are of interest, and are shown in Table III.

TABLE III.—*Testings of Illuminating Power (Argand Burner).*
Minimum Results for Third Quarter.

		1907.	1908.	1909.
Gaslight and Coke Company	candles	14.90	15.81	14.92
South Metropolitan Company	"	14.60	14.90	14.19
Commercial Company	"	14.20	14.03	13.38

In both 1907 and 1909, the Gaslight and Coke Company chanced to have tests giving results considerably below their standard illuminating power of 16 candles. In 1908, the lowest figure was 15.81, which, taking into account the half-candle margin which the Acts allow before a forfeiture is liable to be incurred, complies with the statutory requirements. In 1909, however, in addition to the minimum of 14.92, results below 15½ candles were reported for this Company's in three different weeks. Having

regard, however, to the fact that the Acts allow the Company the benefit of the average of three days' testings in computing the illuminating power for the day, when a deficiency not exceeding one candle is reported on any one day, it is impossible to say from the published data that the Company have not fulfilled their statutory obligations, except on one occasion in the quarter in 1907 and one in 1909. In these and similar cases, also, if the Company can satisfy the Chief Gas Examiner that the deficiency is due to an unavoidable cause or accident, no forfeiture is incurred. It is plain, however, that they have not had much margin in hand on several occasions during the past quarter, and that in their working they have been anticipating to some extent the fall in their standard of illuminating power to 14 candles which is provided for in their new Act, which nominally comes into operation on Jan. 1 next. [In regard to the anticipation of this date, however, see the "JOURNAL," Sept. 28 last, p. 814.] The minimum results of the testings of the South Metropolitan Company's gas are on all occasions well above their standard illuminating power of 14 candles.

The Commercial Gas Company, on the other hand, in the quarter now just ended, had a minimum result of 13.38 candles, which, even taking into consideration the half-candle margin, is below what is required of the Company. Probably, however, the results for the preceding and succeeding days' testings at the same testing-place would be found to raise the average for the three days, which is the figure taken for computing legal illuminating power, above 13½ candles. But it is evident, on a consideration of the results for the Gaslight and Coke Company and the Commercial Company, that the admixture of water gas with coal gas is liable at times to result in sudden falls of illuminating power which may prove very troublesome to the Company. Fortunately, the results of the testings for the day before and the day after that on which a deficiency (not exceeding one candle) is reported have to be taken in conjunction with the return for that day; and the mean of the three days' figures is recorded as the illuminating power for the day on which the deficiency has occurred. This fact prevents the Company being subjected to penalty for a momentary slight fall in illuminating power due to the difficulty of always securing a uniform admixture of water gas and coal gas. Thus, provided the Company work to maintain a mean illuminating power appreciably above the standard prescribed in their Acts, they are not very likely to find an occasional low result at a testing-place a serious matter for them.

It is a curious fact, on which we have commented on previous occasions, that the mixed gas supplied by the Gaslight and Coke Company develops an appreciably higher illuminating duty in the prescribed flat-flame burner than does the coal gas of the South Metropolitan Company. Thus, for the three quarters under review, whereas the average of the argand tests for the Gaslight and Coke Company's gas is only 0.57 of a candle above the average for the South Metropolitan Company's supply, the average of the flat-flame figures for the former Company's gas is 1.04 candles above the average for the latter Company. Apparently, the prescribed flat-flame testing-burner is better adapted for developing the illuminating value of a mixed gas than that of a pure coal gas.

The results of the testings of calorific power, which up to the present have been made for "information" only, are shown in Tables IV. and V.

TABLE IV.—Testings of Calorific Power.
Average Results (Calories per Cubic Foot) for Third Quarter.

—	1907.	1908.	1909.	
	Net.	Net.	Net.	Gross.
Gaslight and Coke Company . . .	133.8	131.5	129.1	144.5
South Metropolitan Company . . .	132.4	134.0	130.5	146.8
Commercial Company	127.4	127.5	125.5	140.5

TABLE V.—Testings of Calorific Power.
Minimum Results (Calories per Cubic Foot) for Third Quarter.

—	1907.	1908.	1909.	
	Net.	Net.	Net.	Gross.
Gaslight and Coke Company . . .	123.5	122.4	120.5	135.4
South Metropolitan Company . . .	123.6	123.1	117.3	130.3
Commercial Company	118.2	117.6	116.7	130.1

These figures are specially interesting in view of the fact that the Gaslight and Coke Company, under their new Act, will, from the 1st of January next, be liable to incur forfeitures if the net calorific value of their gas falls below 112½ calories per cubic foot. As the standard illuminating power enacted for the Company is reduced to 14 candles on the same date, the results now obtained for the testings of calorific power of the gas of the Commercial Company, who supply a mixed gas to a prescribed standard of illuminating power of 14 candles, should indicate broadly what results may be expected for the Gaslight and Coke Company's supply after the provisions of their new Act come into operation. As will be seen, the minimum net calorific value reported for the Commercial Company's gas in the third quarter of any of the three past years has been 116.7 calories, which is 4.2 calories above the figure at which the Gaslight and Coke Company will become liable to incur a penalty.

In regard to the 125 calories net per cubic foot which is mentioned in the new Act as the nominal standard calorific power for

the gas of the Gaslight and Coke Company, it is noteworthy that last quarter the Commercial Company supplied gas averaging 125½ calories net per cubic foot, which is only half-a-calorie higher than the new nominal standard of the Gaslight and Coke Company. It is clear that this standard will become merely an ideal value to which the suppliers of 14-candle power gas will endeavour to work, but that there can and must never be any obligation on them to comply with this figure as a minimum. This is plain from the fact that the 16-candle mixed gas of the Gaslight Company and the 14-candle coal gas of the South Metropolitan Company have in the third quarter of each of the three years under review given some results below 125 calories net. On reference to the average figures, it will be seen that coal gas as supplied by the South Metropolitan Company last quarter to a 14-candle standard averages 146.8 calories gross and 138.5 calories net per cubic foot while the mixed gas supplied to the same standard by the Commercial Company averages only 140.5 calories gross and 125.5 calories net per cubic foot. It thus appears that coal gas made to the same standard illuminating power is 6 calories per cubic foot better than the mixture of coal gas and water gas; but as the coal gas of the South Metropolitan Company is about 2½ candles above their required standard illuminating power, it is fairer to compare its calorific power with that of the nominal 16-candle power mixed gas of the Gaslight and Coke Company. In this comparison, coal gas comes out 1 to 2 calories per cubic foot better than mixed gas.

The results of the testings of the amount of sulphur in the gas, other than in the form of sulphuretted hydrogen, are shown for the third quarter of the three years in Table VI.

TABLE VI.—Testings of Sulphur (Grains per 100 Cubic Feet of Gas).
Third Quarter.

—	1907.		
	Aver.	Max.	Min.
Gaslight and Coke Company	40.0	64.7	11.7
South Metropolitan Company	47.7	92.6	20.6
Commercial Company	27.2	52.2	17.8
—	1908.		
	Aver.	Max.	Min.
Gaslight and Coke Company	39.9	72.9	14.1
South Metropolitan Company	48.3	76.2	20.4
Commercial Company	22.0	45.3	4.7
—	1909.		
	Aver.	Max.	Min.
Gaslight and Coke Company	34.7	57.5	10.2
South Metropolitan Company	41.0	61.3	19.9
Commercial Company	35.5	49.2	23.3

It will be seen that this year the average figures for both the Gaslight and Coke Company and the South Metropolitan Company are considerably lower than those for the previous two years. The average of the Commercial Company on the other hand, is considerably higher than the exceptionally low averages they previously maintained. As things stand now, there is not very much difference in the average amount of sulphur in the gas supplied by the three Companies, and the 35 to 40 grains figure, which was mentioned as probable in the evidence given by the late Sir George Livesey and others before the Parliamentary Committees on the London Gas Act of 1905, is now practically being attained. Moreover, the maximum results for the past quarter in no case show the extremely high figures which have been reported in earlier years. Naturally, the coal gas supplied by the South Metropolitan Gas Company has a somewhat higher sulphur content than the mixed gas supplied by the other two Companies; but there is a very distinct reduction shown by it during the past quarter.

The Status of the Engineering Profession.—At the meeting of the Society of Engineers on Monday last week, a paper on the above subject was read by Mr. G. Allan Thomas. The author indicated the chief hindrances to the advancement of the profession, and then proceeded to outline a scheme for their removal. In the first place, he advocated the election of a "Central Organizing Body," from members of the three most important Institutions—those of the Civil, Mechanical, and Electrical Engineers respectively. The "Central Body," when complete, should endeavour to obtain recognition as a legalized corporation by Act of Parliament, and should have supreme organizing and judicial powers in all matters relating to the profession. They should also have power to appoint committees to deal with special subjects. The points to which they should first apply their energies should be registration, education, minimum fees, and organizing funds to aid invention and research. An effort should then be made to formulate schemes for the establishment of an information bureau for engineers, and the institution of a benevolent fund. In conclusion, the author remarked that every effort should be made to arouse interest in this important question of reform, because delay would only tend to make the problem more complex. As already announced, Mr. Thomas has been awarded the Status Prize for 1909, offered by the Society for the best paper submitted on the above subject.

FIRST IMPRESSIONS OF HEAVY CHARGES.

By G. M. GILL.

THE adoption of large charges in horizontal retorts appears likely to become a general practice in all up-to-date works of large and moderate size. It is, however, obvious that the use of heavy charges is only possible in retort-houses operated by coke-pushers and charging machinery of a certain type. Where drawing-machines are used, it is the usual practice to work under a six-hour system; and, indeed, the discharging of the retorts would be a matter of great difficulty were the duration of the charge lengthened. With large retorts and small rake-heads, it might be possible to work eight-hour charges; but the work would undoubtedly be attended with a good deal of difficulty. Again, with charging machinery of the scoop type, an eight-hour system is probably the longest possible.

PUSHERS AND OLD RETORTS.

It is well known that any of the coke-pushers in use at the present time will easily discharge a filled-up retort provided only that the charge is properly burnt off and the mouthpiece is free from half-carbonized coal. Some difficulty is experienced with a newly-scurfed retort, and also with old retorts, which will obviously be uneven and out of shape; but only in very exceptional cases should this prevent the charge from being expelled after a few attempts. The writer has seen scores of eight-hour charges pushed out of a setting nearly five years old without any difficulty. In this instance, the setting had been in actual use the whole time except for short periods when the furnaces required renewing. Some trouble will also be experienced on first using pushers in retorts previously operated by drawing rakes. In these cases, there is undoubtedly a natural tendency for retorts to assume a waist-like shape, tapering from the centre to the mouthpiece on each side; and for this reason it is advisable to scurf the retorts and get them as parallel as possible before using the pusher. With regard to charging, several machines now in common use are not adapted for completely filling retorts. The projector type of machine would appear to be an ideal one for this purpose. It is, further, quite evident that no charging-machine in which the operating parts have to be withdrawn over the top of the charge can possibly fill a retort; and for a machine of this type, an eight-hour charge would probably be the maximum.

ARROL-FOULIS CHARGING MACHINE FOR FILLING RETORTS.

The Arrol-Foulis machine can be made to fill a retort, though it can hardly be said to be well-suited for the purpose. In the first place, the capacity of the coal drum, which measures the coal for each shot, is limited to about $\frac{3}{4}$ cwt.; and so it is necessary to increase the number of shots from six for an eight-hour to nine or more for a twelve-hour charge. To do this, it is imperative to put the stopper bar out of action and force each shot of coal as far into the retort as it will go. Even then, it is often impossible to introduce the full number of shots with the consequent reduction in the quantity carbonized. For this arrangement of charging it is essential that the retorts are kept as free from scurf as possible, in order to maintain them at their maximum carbonizing capacity; and it is further important that the charging-machine should have ample hydraulic pressure. This is required owing to the necessity of compressing the charge as closely together as possible, and forcing the coal close up to the top of the retort. If this is not done, it is quite impossible to insert a charge of $13\frac{1}{2}$ or 14 cwt. in a 22 in. by 15 in. by 20 feet retort. Again, there is a tendency, when large charges are being used, to drop part of the last shot on the mouthpiece, causing a waste of coal and difficulty in discharging the retort unless it is well pricked up. It is advisable to make a firm rule that, should any coal be left on the mouthpiece, it must be removed before shutting the door. This will effectually prevent this trouble. Failure is certain to be the result of attempting to discharge retorts where partially carbonized coal is left on the mouthpiece. It has also been found advantageous to back-up the charge with the machine itself by driving it in on the back of the charge after the last shot has been charged. One more point with regard to the Arrol-Foulis charging-machine is that, with heavy charges, it is important the pusher-head should be made as large as possible; otherwise it will drop part of the coal along the retort, causing an uneven charge. If these precautions are properly carried out, it is possible to use the machines for filling retorts with a moderate amount of success.

WEIGHT OF CHARGES.

It is quite evident that, if twelve-hour charges are to be used, the retort must be large enough to take the full quantity of coal that will carbonize during that length of time. If 7-cwt. charges were used for six-hour work, it is obvious that the retorts must be large enough to contain 14 cwt. and more for a twelve-hour system. In practice, however, the writer has found that as the length of the charge has been extended so has the quantity of coal carbonized per retort per twenty-four hours increased. In the writer's experience, it used to be the practice with six-hour charges to carbonize 25 cwt. of coal per retort in twenty-four hours. On extending the charges to eight hours, it was quite unexpectedly found possible to increase the quantity to something between 27 and 28 cwt., with a corresponding increase in the make per mouthpiece. This was not the experience of a single day or week, but was continued uninterruptedly for a

period of about six months. On again extending the duration of the charges to twelve hours, the same effect was experienced, with the result that the length of the charge had to be reduced owing to the maximum quantity of coal which could be forced into the retort being carbonized at least one hour before the twelve hours had elapsed. In this case, 50 per cent. more coal was charged up in each retort for the 50 per cent. longer period; and yet the larger charge was completely carbonized in a little over 37 per cent. longer time. Finally, it was decided to adopt a system of $10\frac{1}{2}$ -hour charges as being the longest period in which a filled-up retort would burn off. Even 11 hours was found to be rather too long, owing to the difficulty of filling the retort sufficiently to last that period.

With $10\frac{1}{2}$ -hour charges, it is now the practice to use 13 cwt. of coal per 22 in. by 15 in. by 20 ft. Δ retort; making a daily quantity of about 30 cwt. per retort. Comparing six-hour with $10\frac{1}{2}$ -hour charges, it is found in actual working that with the latter 20 per cent. more coal may be carbonized in the same time. Some of the improvement may possibly be due to extraneous circumstances; but these could at the most only partially account for the increased output. The explanation would seem rather to lie in the better method by which the heating surface of the retort is utilized in the case of large, as compared with small, charges. With small charges, fully one-third, if not more, of the heating surface of the retort is partially, and to some extent completely, wasted. With a full charge heat from this part of the retort is completely utilized, with the natural result that extra coal may be carbonized. This may, or may not, be the correct solution of this curious fact; but it at least appears feasible, though it seems a matter for surprise that the advantages of heavy charges in horizontal retorts have for so long remained undiscovered.

REGULAR SCURFING.

The use of any retort less in size than 22 in. by 15 in. Δ or oval would appear likely to limit the charge to one of ten hours duration; and even with the size mentioned, it is more than probable that, unless the retorts were kept free from scurf, it would be impossible to charge up the desired quantity. To ensure this work being done regularly and when required, the writer has found it advisable to use a scurfing gauge of the same shape as the retorts in use, but proportionately smaller, to allow for the minimum amount of scurf that will enable the work to be satisfactorily carried out. It is anticipated that the use of full charges should tend to prevent the adhesion of scurf by scraping it off when the charge is expelled; but this point has not been as yet clearly demonstrated. The scurfing gauge is simply a piece of $\frac{1}{4}$ -inch plate cut to shape, and bolted on the end of a $\frac{3}{4}$ -inch tube long enough to be pushed half way through the retort.

FLOW OF GAS.

With regard to the flow of gas from a filled-up retort, it is found that, if the coal is too closely packed at any point in the retort, the gas will blow at one end unless two ascension pipes are provided. The remedy has been to force in a bar over the top of the charge and clear a passage for the gas. That this has been necessary has been shown by the fact that, on the bar being introduced, the gas has spurted out from the blocked end through the passage cleared in much the same way as when the mouthpiece of a stopped pipe is opened.

Double Ascension Pipes.—These undoubtedly ease matters in the direction of a free passage for the gas as produced. With a retort completely filled with coal, there is, generally speaking, ample room for the gas to escape without throwing any more pressure on the retort than in an eight-hour charge. On the coke being expelled, there may be seen a small space of (say) $\frac{1}{2}$ -inch or a little more round the sides and the top of the charge, and there are well-defined lines in the mass of the coke through which the gas may pass.

Single Ascension Pipes.—For eight-hour charges of 9 or $9\frac{1}{2}$ cwt. single ascension pipes of $5\frac{1}{2}$ inches internal diameter may be used quite satisfactorily, provided, of course, they are properly cleared every eight hours with a 5-inch auger. Even with twelve-hour charges of 14 cwt., the single pipe of this size is large enough were it possible to ensure against the charge being too closely packed in any part of the retort. There are one or two indisputable advantages about single ascension pipes; and their use is always advisable wherever possible. For one reason it ensures an equal passage of gas through each hydraulic main where two are provided to each setting. Without a continuous flow of gas throughout its entire length, a hydraulic main will much more easily become choked in the part not working. Besides, with single pipes there is the advantage of a continuous supply of hot and liquid tar condensing in the hydraulic main. With double ascension pipes, however, it is frequently noticed that only one is working, and, what is worse, in some cases only one hydraulic is seen at work, with the inevitable result that in the one at rest a slow tar distillation process is taking place with most troublesome consequences. It is a matter of common knowledge that, of the two, the ascension pipe which has not been working gives more trouble to clear.

The writer is quite aware that it is the usual practice to provide "single" ascension pipes of 7 or 8 inches diameter; but having thoroughly tried the smaller $5\frac{1}{2}$ -inch single pipes, he is at a loss to understand the necessity for so large a pipe. A $5\frac{1}{2}$ -inch pipe is fully large enough to take the maximum quantity of gas evolved from the largest charge. A free flow of gas heavily laden with

tar through a small pipe greatly assists in keeping the pipe clear of hard pitchy matter. It certainly keeps the pipe moist, and for this reason is conducive towards the maintenance of a clear passage. With a stopped pipe, it is always noticed that the block is caused by a hard and dry substance; so that anything which tends to introduce a quantity of moisture into the pipe should help to keep it clear of stoppages.

BYE-PRODUCTS.

The writer having no comparative figures of the relative advantages of large and small charges, does not propose to discuss the question of bye-products, beyond remarking that the quality of the coke is greatly improved. It is so much larger and denser, and so free from the tendency to crumble into breeze, that this advantage is alone sufficient to warrant a change from six or eight hour charges to the longer period of ten or twelve hours. It will certainly be found that the production of breeze will be greatly reduced, and the quantity of coke correspondingly increased.

LABOUR.

In this respect, heavy-hour charges have great advantages over those of eight or six hours. The augering of pipes, which has always been an expensive matter with small charges, is lessened by at least one half, if not appreciably more, comparing 10½-hour with 6-hour charges. There is, too, considerably less likelihood of stopped pipes, owing to the thinner tar produced. The work of opening and shutting doors is, of course, reduced in the same ratio as the increase in the duration of the charge. Charging is not so long an operation by at least 25 per cent., though the same amount of coal is handled. Several items remain unaltered—such as coal and coke handling and attending to furnaces.

CAPACITY OF MACHINERY.

One satisfactory effect of heavy charges is that machinery may be used to much greater advantage. For instance, machines which will operate 200 retorts working on six-hour charges should have no difficulty in operating 300 retorts on twelve-hour charges, provided that the arrangements of coal and coke handling are adequate to deal with the larger quantity. This is a great consideration, and opens up possibilities in the more economical working of retort-houses of very large capacity.

GAS ACTS FOR 1909.

[FOURTH ARTICLE.]

THE Acts that are brought under notice this week are those of local authorities; and the major part of them are of the omnibus type. Since the Bills were noticed, four of them have succumbed to the adverse chances of parliamentary promotion. The Bradford, Fermoy, Salford, and Sheringham Bills have left nothing behind them but certain influences generated by the brief life of the measures. Regarding the nine Acts that have to be reviewed, the notices of two of them will have to be deferred, seeing that, though the year is far spent, the Bury Bill has yet to receive the Royal Assent, and the printing of the Mountain Ash Bill has not yet been completed.

Under the circumstances, we have first to notice the provisions of the Act obtained by the Conway Corporation. The limits of the gas-supply area have been extended by including the portions of the parishes of Llangystenin and Llechwedd in the county of Carnarvon. In connection with the provision regarding the supply of fittings, the new clause appears restricting a local authority to the expenditure of money for this purpose through a contractor only, and compelling the adjustment of the charges so as to meet all expenditure occasioned by this branch business. Independently of other possessed borrowing power, the Corporation may borrow for the extension of mains the sum of £5000, for providing gas stoves and meters £2500, and, with the approval of the Local Government Board, any further sums that may be required. The period allowed for the repayment of the £5000 is thirty years, and for the £2500 ten years. A new clause has been inserted since the introduction of the Bill providing for the sale of plant situated in outside districts to the local authorities, upon their giving the Corporation six months' notice, and upon their obtaining the necessary power. In a set of provisions protecting the County Council of Carnarvon, it is stipulated that mains, pipes, and other works in roads or over main road bridges are to be constructed at such a depth that not less than 2 ft. 6 in. shall intervene between the surface of road or bridge and the upper surface of the mains, pipes or works. [Parliamentary Agent: Mr. A. Rhys Roberts.]

In the Heywood Corporation Act we have the prepayment gas clauses (after the prescription of 10d. excess for meter and fittings and 1s. if cooker is included in the fittings) varied from the model terms by the following:

The maximum charge for the hire of a prepayment meter without fittings shall be at the rate of 8d. per 1000 cubic feet of gas supplied through such meter.

The Corporation shall be entitled, if they think fit, to require a deposit of 1s. per quarter for a prepayment meter provided that the amount collected from the prepayment meter during such quarter shall be applied in the first place in refunding the said deposit to the person who has paid the same, and subject thereto the deposit shall belong to

the Corporation. Notice of the effect of this sub-section shall be printed on a card to be attached to every prepayment meter.

The prescribed standard illuminating power of the gas is 14 candles, tested by the "Metropolitan" No. 2 burner. The clauses that appeared in the Bill as to a supply where consumers have separate gas installations, and as to the minimum charge for gas laid on to premises having a supply of electricity, have been modified and, as they form precedents, they may also be quoted *in extenso*

Where any person has a supply of gas laid on by the Corporation to any premises for which he has at the same time a supply of gas from an installation other than that of the Corporation, the Corporation shall be entitled to receive from him as a standing charge, in addition to the price of the gas actually supplied to him, a fixed sum to be determined by them not exceeding £5 per annum. Provided always that, in determining such fixed sum, the Corporation shall have regard to the probable maximum supply of gas which might at any time be required for such premises, and provided also that the Corporation shall not be entitled to any such standing charge as aforesaid in respect of premises for which the whole supply of gas afforded by them is taken through a meter having a nominal capacity of less than ten lights.

Where any person has a supply of gas laid on by the Corporation to any premises for which he has at the same time a supply of electricity either from the Corporation or from an installation other than that of the Corporation, the Corporation shall be entitled to charge and receive from him in respect of the supply of gas so laid on such minimum sum as shall be fixed by them not exceeding 25s. for any one quarter of a year, notwithstanding that the ordinary charge for the gas actually consumed in such quarter would amount to a lower sum. Provided always that, in fixing the amount of such minimum charge, the Corporation shall have regard to the probable maximum supply of gas which might at any time be required for such premises; provided also that, in respect of any premises for which the whole supply of gas afforded by the Corporation is taken through a meter having a nominal capacity of less than ten lights, and the supply of electricity is taken from the Corporation, no such minimum charge shall be made; and provided also that, in respect of any premises for which the whole supply of gas afforded by the Corporation is taken through such meter as aforesaid, and the supply of electricity is obtained from an installation other than that of the Corporation, the amount of the minimum charge shall not exceed 5s. for any one quarter of a year.

The Corporation obtain power to borrow £10,000 in respect of the gas undertaking, and, of course, there is the usual provision regarding additional borrowing with the consent of the Local Government Board. The clauses as to the redemption of perpetual annuities (the text of which was given in the "JOURNAL" for Dec. 22 last, p. 841) has only been modified by the inclusion of the words "with the sanction of the Local Government Board" in the part of the clause giving power to borrow the amounts payable. The words that originally appeared at the end of the clause have also been deleted—viz., "all moneys borrowed under the provisions of this section shall be repaid within such term not exceeding sixty years as the Local Government Board may prescribe." [Parliamentary Agents: Messrs. Baker and Co.]

In the Lisburn District Council Act, the purchase of the local gas undertaking is authorized; there having been an agreement effected during the passing of the measure through Parliament. The limits of the area of gas supply are specifically defined. Then follows the clauses giving the Council power, within six months of the passing of the Act, to purchase the concern by agreement or arbitration. There is a clause providing for compensation to officers in the regular and exclusive employ of the Company, who may not be retained by the Council. Compensation is to be on the basis of the salary paid on Jan. 1, 1909; and in the event of failure to make an agreement, there is to be settlement by a single arbitrator. All the customary clauses affecting purchase and the carrying on of the concern appear in the Act. Fittings work is to be carried out through a contractor; and the charges are to be adjusted so as to meet expenditure. The ordinary prepayment clauses have been adopted. The maximum price to be charged for gas by the Council is 4s.; while the standard illuminating power is to be 14 candles, using the "Metropolitan" No. 2 burner. The Council receive authority to borrow the money required for the purchase of the undertaking, and for discharging any other sums payable to the Company, their officers or servants; as well as £20,000 for extension and improvement of the gas undertaking, and £2000 as working capital. For repayment of money for purchase and extensions, a period of forty years is allowed, and for the working capital ten years. [Parliamentary Agents: Messrs. Lees and Co.]

In the Oldham Corporation Act, land is scheduled for works extensions. For the testing of the illuminating power of the gas, the "Metropolitan" No. 2 burner is prescribed. In view of the limitation of profits, it will not be out of place to quote *in extenso* the provisions as to the application of the gas revenue:

(1) As from the commencement of the financial year next after the passing of this Act, the Corporation shall keep accounts in respect of their gas undertaking separate from all their other accounts (distinguishing therein capital from income), and shall apply the revenue of such undertaking as follows, that is to say:

(Firstly) In payment of the costs, charges, and expenses of, and incidental to, the collecting and recovering of the revenue of the gas undertaking.

(Secondly) In payment of the working and establishment expenses and costs of management and maintenance of the gas undertaking.

(Thirdly) In providing the moneys required to pay the annual sum for the time being payable by way of annuities created for the purchase of the gas and water undertakings, and

apportioned to the gas undertaking and the interest on the moneys borrowed or reborrowed by them in respect of their gas undertaking.

(Fourthly) In providing such portion of the annuity redemption fund provided in pursuance of the provisions of the Oldham Corporation Gas and Water Act, 1853, as is applicable to the annuities apportioned to the gas undertaking, and the requisite appropriations, instalments, or sinking funds for the repayment of the moneys borrowed for the purposes of the gas undertaking.

(Fifthly) In payment to the borough fund of an annual sum of £7500.

(Sixthly) In making good to the borough fund any deficiency in the revenues of the Corporation in respect of the gas undertaking which may at any time hereafter have been provided out of the borough rate or borough fund.

(Sevently) In providing a reserve fund for the gas undertaking if they think fit by setting aside in any one year such sum not exceeding an amount equal to 1 per cent. of the aggregate capital expenditure on the undertaking, or, if the amount standing to the credit of the fund shall be not less than £50,000, such sum not exceeding £1000 as they shall think reasonable, and (subject as in this section hereinafter provided) investing the same together with the sum hereinafter in this section directed to be transferred to the said fund and the resulting income thereof in statutory securities, and accumulating the same at compound interest, until the fund so formed shall amount to a sum equal to one-tenth of the said aggregate capital expenditure, which fund shall be applicable as the Corporation think fit in meeting expenses caused by accidents and other contingencies, or to answer any deficiency at any time happening in the income of the Corporation from the gas undertaking or to meet any extraordinary claim, demand, or expenditure in respect of the gas undertaking, or to the renewal of works or mains, and so that if that fund shall at any time be reduced, it may thereafter be again restored to the limit hereinbefore prescribed, and so often as such reduction shall happen.

Provided that the Corporation may resort to the said reserve fund for the above purposes notwithstanding that the same may not at any time amount to the limit hereinbefore prescribed.

Provided also that the Corporation may use any moneys for the time being standing to the credit of the said reserve fund for, and in the management and general purposes of, the gas undertaking, and in such event they shall pay to the credit of the fund out of the revenue of the gas undertaking interest at the rate of 3 per cent. per annum during the period of use on so much of the fund as shall be so utilized.

And any balance remaining in any year shall be carried forward to the revenue account of such undertaking for the next succeeding year, and shall whenever, and so soon as, there shall be an amount sufficient for the purpose be applied to the reduction of the gas charges equally throughout the limits of supply.

(2) Any sum standing to the credit of the gas-works reserve fund formed in pursuance of the powers contained in section 55 (Reserve Funds to be Set Apart for Gas and Water Purposes) of the Act of 1880 after deducting therefrom any payments in respect of liabilities incurred before the 25th day of March, 1910, and which, but for the repeal by this Act of such section, might have been, and which the Corporation shall direct to be, made therefrom, shall be transferred to the reserve fund by this section authorized.

(3) The annual proceeds of such portion of the annuity sinking fund provided in pursuance of the provisions of the Oldham Corporation Gas and Water Act, 1853, as is applicable to the annuities apportioned to the gas undertaking (notwithstanding anything to the contrary in section 48 of that Act contained) in any year in which the same annual proceeds shall amount to a sum equal to, or greater than, the annual sum for the time being payable by way of annuities apportioned to the gas undertaking, and the annual proceeds of the reserve fund by this section authorized when such fund shall for the time being amount to the limit in this section hereinbefore prescribed for such fund, shall be carried to the credit of the revenue of the gas undertaking.

(4) Each of the local authorities within the limits of supply of the Corporation may once in each year, after giving reasonable notice to the Corporation, inspect such separate accounts by a person appointed by such local authority for that purpose, provided that any such inspection shall be limited to the accounts for the three complete years last preceding the inspection.

Regarding finance, the Corporation are empowered to borrow for the construction of holders and other works, and the storage of gas and extensions of mains, £114,200 (repayable in thirty years); for retorts, purifiers, and sulphate and tar plants £49,000 (repayable in twenty years); and for stoves and prepayment meters £35,000 (repayable in ten years). [*Parliamentary Agents: Messrs. Lewin, Gregory, and Anderson.*]

"Coalexld" Process.—Attention is called in another column to a patent taken out by Mr. James Jowett for a machine for measuring quantities of chemicals used in the manufacture of "Coalexld." One machine will weigh $1\frac{3}{4}$ oz., 2 oz., $2\frac{1}{2}$ oz., and $2\frac{3}{4}$ oz.; and by a very slight adjustment, it can be changed from one weight to the other. The machine will weigh from 800 to 1000 packets per hour with one operator; and it can be adapted for measuring any other article. For instance, a larger size of this machine could be employed for the weighing or measuring of broken coke. It would for this purpose weigh or measure from 14 lbs. to 56 lbs., and fill the bags at the same time as quickly as a man could change the bags. Such an arrangement would be of great use to the large works where broken "Coalexld" or coke is being sold and bagged in quantities.

PERSONAL.

The Gas Committee of the Carlisle Corporation met on Friday at the Town Hall in reference to the vacant gas managership. Having interviewed the six selected candidates for the post, the Committee decided to recommend the Council to appoint Mr. HAROLD E. BLOOR, B.Sc., B. Eng., Assistant Gas Engineer to the Birkenhead Corporation.

Alderman W. J. BURGESS, whose name has been frequently mentioned in the "JOURNAL" in connection with the water undertaking of the Liverpool Corporation, has forwarded to the Town Clerk his resignation as a member of the City Council, which he entered in 1890. Nine years later he was appointed an Alderman, and was also elected Chairman of the Water Committee. In this office he found a sphere in which the city gained his greatest public usefulness. He came to the position after four years' occupancy of the deputy chair; and during the time he has controlled the important body which manages the water estate great progress has been made. The storage capacity at the Prescott reservoir has been doubled; the line of pipes connecting Wallasey with the Vyrnwy supply has been laid; and the Rivington watershed has been acquired, after the now historic lawsuit with Mr. W. H. Lever, in order to protect the purity of the water. The largest undertaking of the Committee has, however, been the laying of a second line of pipes from Lake Vyrnwy to Liverpool—an engineering feat which cost about £700,000, and put Liverpool in an absolutely secure position as regards its water supply for at least fifteen years, without, it is estimated, the need of further capital expenditure. Though Alderman Burgess finds it necessary to retire from the Council, the hope is expressed that in the other departments of the public life of Liverpool in which he is interested, he may continue his much-appreciated labours on behalf of the public.

OBITUARY.

MATTHEW LEAF.

WE much regret to record the rather sudden death, as the result of bronchitis, last Friday morning, at his residence in York, of Mr. Matthew Leaf, formerly the Secretary and Manager, and of late years a Director, of the York Gas Company. Mr. Leaf, who was in his 70th year, had spent all his business life in its service. His connection with the Company began as a junior clerk, and he afterwards became draughtsman and subsequently, under the late Mr. Charles Sellers, practically the Engineer; and from 1879 to 1882, new works and a railway were carried out under his supervision. On the retirement of Mr. Sellers in 1901, Mr. Leaf was appointed Secretary and Manager, which position he vacated in May, 1906, and was elected a member of the Board, and made Consulting Engineer. He joined the North of England Gas Managers' Association just eight years ago, and was chosen to fill the presidential chair in 1905, when the Association met for the second time in York. His interest in the work of the Association was keen till the last, as testified by the fact that less than a week before his death he was attending the meeting at South Shields, where he met with a very cordial reception from many of his old friends. Mr. Leaf was succeeded by Mr. S. E. Stevenson, whose connection with the Company ceased about two years ago, when Mr. J. H. Hill, who has been for some time with the Company, was chosen by the Directors to undertake the relinquished duties. Mr. Leaf leaves a widow, two sons, and a daughter.

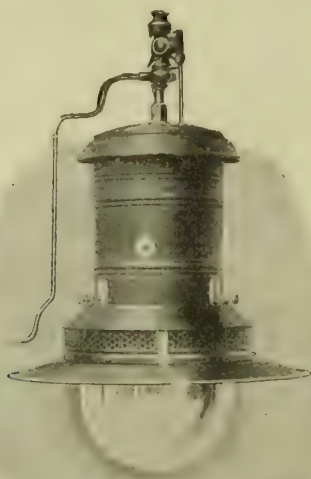
The death is announced as having taken place on the 14th ult., of Herr EMIL BAUMERT, for many years Manager of the Gas and Water Works at Osnabrück. Deceased had attained the age of 72 years.

The death is announced as having taken place at Hessle, on Monday of last week, of Mrs. ISABELLA DOUGALL, the widow of Mr. Andrew Dougall, formerly Engineer of the Hull works of the British Gaslight Company. Mrs. Dougall, who was 74 years old, and who had survived her husband rather more than four years, was buried last Thursday at Hull.

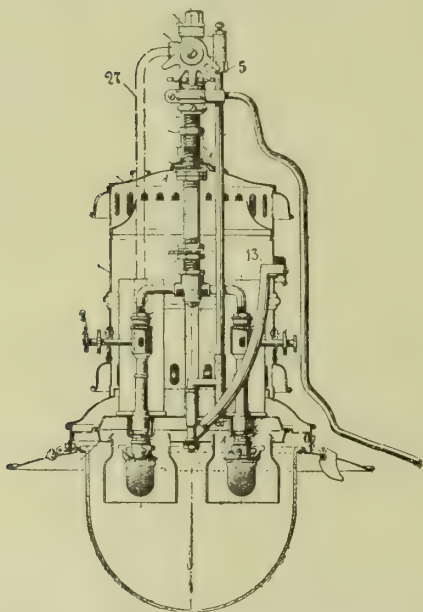
A short time ago, a new wing of the Leicester Technical and Art Schools, erected at a cost of £14,000, was opened by Professor Silvanus Thompson, the Principal of the Finsbury Technical College. In the course of his address, Professor Thompson said the conclusion he had come to, after a tour of the industrial centres of Europe, was that the most successful technical schools were those which carefully studied the needs of their own special industries. Success in commerce clearly did not depend only upon the application of scientific principles; but how important science was to that success was only realized when things came to a pitch. The disastrous tale of the manufacture of dyes from coal-tar products was not without its warning to this country. The trained brains sent out by German universities and technical colleges profited by the inventions of English chemists, and we paid £2,000,000 a year for dyes manufactured abroad from coal-tar products.

THE "DEGEA" OUTSIDE LAMP.

THERE are two points which make for efficiency in inverted lamps, which cannot be neglected. One is the facility afforded for cleaning and maintenance; the other the means provided for proportioning the gas and air supplies so as to obtain the most appropriate combustible mixture. What is true of indoor lamps which are usually fixed in accessible positions, is even more applicable to outside lamps, which have to be protected by strongly made casings. This very fact, and the conditions under which the lamps are used, render it necessary for every provision to be made, not only for the purposes named, but for quick repair or renewal of parts without necessitating the lamp being rendered unavailable for any length of time, by having to make a journey to the makers for specialist restoration to proper working condition. In an outside lamp that is being introduced by Julius Norden, Limited, of 44, Farringdon Street, E.C., and known as the "Degea" (Model 1910), the facility with which it can be taken to pieces by anyone on the spot, and the interchangeability of the parts, are among the claims put forward for favourable consideration. The refitting of the lamp is quite as simple as the disconnection. Screws and nuts are largely employed in the construction; so that anyone accustomed to the use of gas-pliers can start on the outside casing and quickly dismantle the entire lamp without doing it any harm.



The "Degea" Outside Lamp.

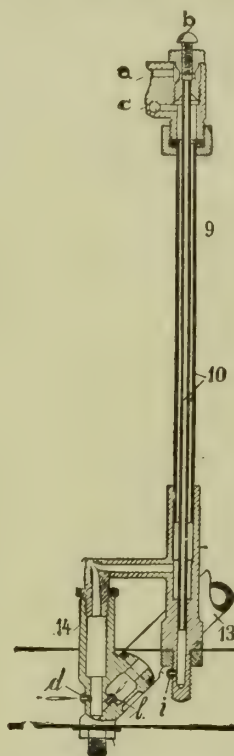


Section of the "Degea" Outside Lamp.

To run generally over the structural features of the lamp, before specifically referring to distinctive features. The lamp is manufactured in various sizes, containing one up to three and more inverted burners. There is type "A," with double-lever tap; type "E," with sliding lever and Berlin cog-wheel tap (5) for bye-pass ignition, as well as outside ignition (13); type "F," as type "E," but with "midnight flame;" as well as other varieties. The casing to all these lamps is strongly made, and so designed and fitted as to give full protection to the inner parts. The burners have each their separate chambers, as shown in the sectional drawing of the lamp, so that the gas and air mixture is not contaminated by products of combustion. This is a fact which greatly increases the illuminating power of the lamp. A

dust-trap is also provided, so that there shall be no deterioration or stoppage from this cause. The burners themselves are made of cast brass; and they take into several parts. The injector is removable; midway in the centre of the bunsen tube, there is a joint; and the nozzle and mantle support screw on. The gas and air adjustment is a novelty. The means of operation are on one shaft, which is made to protrude a sufficient length through the lamp casing for outside operation. The gas-adjuster is connected to a strong central shaft; and this serves to operate the regulating needle by a screw arrangement, giving a long range of adjustment. The air-regulator—the cylindrical spindle operating which serves as the cover to the shaft of the gas-adjuster—is merely a collar round the air-inlets. Both regulators can be operated by hand at any time from outside the casing by two discs made of non-heat-conducting fibre composition—red for the gas-regulator, and black for the air-regulator. Around the mantles of the lamps small glass cylinders are suspended, as shown in the sectional illustration.

The lamps can be had with a variety of means of flame ignition and extinction. They can be had with double lever, and permanent bye-pass flame and intermediate ignition; with sliding lever and cog wheel (Berlin) tap, shown at 5 in the section, with permanent bye-pass flame and intermediate ignition, as well as with outside ignition, in which case (should it always be desired to light from outside) the permanent bye-pass flame can be put



Ignition Arrangements.

out of action by means of a small screw. The means of outside ignition is by the tube (13) running from the base of the bye-pass tube, and capped on the outside of the casing. This tube is supplied with gas from the bye-pass tube, and ignition at the capped end will cause the flame to travel down to the bye-pass jet, and so lighting is effected without opening the lamp. A further consideration in connection with the lighting is what is termed the "midnight flame"—in other words the whole of the gas-burners but one can be extinguished by the movement of the lever; the one remaining alight being supplied with gas by a separate tube (27). The general method of supplying gas to the burners and bye-pass flames is as follows: The flow of gas is divided in the tap, for the burners of the lamp and for the bye-pass flames. The gas for the burners passes through the centre tube and its branches. The bye-pass tubing consists of two tubes, one inside the other. The gas is constantly passing through the inner tube (10) by way of the channel (a) to the permanent bye-pass flame (i), the size of which can be regulated by means of a screw (b). On opening the tap, the gas first of all flows through the channel (c), through the outside tube (9), to the igniter (14), where it issues through the openings (d). Here it is lit by the permanent bye-pass flame (i), which lights the other bye-pass flames, which, on opening the tap further, lights the gas issuing from the burners. One opening (l) is opposite the outside ignition-tube (13). When the permanent bye-pass flame is not burning, the gas issuing from this opening draws in air, forming a mixture of gas and air in the tube, which (as already mentioned) can be lit from the outside through the white cap on the casing of the lamp. The flame lights-back to the igniter (14), and ignites the bye-pass flames. On opening the tap completely, the bye-pass flames go out, and the permanent bye-pass flame only remains alight. The use of a single bye-pass flame in this way for a cluster of burners is, of course, an economical proceeding, as the gas that would be consumed by having a continuous bye-pass to each burner is saved, and what this would amount to in the course of a year is easily calculable.

Southern District Association.—We hear from the Hon. Secretary (Mr. A. F. Browne, of Vauxhall) that the autumn meeting of the Association has been fixed for Thursday, the 4th prox., at three o'clock, at the Hotel Cecil.

Yorkshire Junior Gas Association.—We learn from the Hon. Secretary (Mr. Charles Roper) that the seventh annual general meeting of the Association will be held on Saturday, at the University, Leeds. At the close of the business meeting, Mr. W. R. Herring will give an address to members and friends.

American Gas Institute.—We learn from the "American Gas-light Journal" that there will be three good papers on commercial subjects (one on "Accounting," and another on "Illuminating Engineering in Practical Applications") among the sixteen to be submitted at the forthcoming meeting of the American Gas Institute, which will be held at Detroit from the 20th to the 22nd inst., under the presidency of Mr. Charles F. Prichard, of Lynn (Mass.). There will also be a lecture by Dr. Hyde on "Illuminating Engineering." An informal "smoker" will take the place of the usual banquet; and there will be a steam-boat trip to Lake St. Clair, down the river to Bois Blanc.

EAST HULL GAS COMPANY'S UNDERTAKING.

At the close of the report of the proceedings at the recent meeting of the Eastern Counties Gas Managers' Association at Hull, published in the "JOURNAL" for Sept. 25, it was mentioned that the members visited the works of the British Gaslight Company and the East Hull Gas Company. Some particulars of the former were given in the report; and we are now in a position, through the courtesy of Mr. John Holliday, the General Manager and Engineer of the East Hull Company, to supplement them with others in regard to the undertaking of which he has the technical direction. These will come very opportunely in conjunction with the paper, given elsewhere to-day, describing his four-lift gas-holder, which, owing to the crowded state of our columns, we were unable to include in our report of the meeting.

THE COMPANY'S AREA AND OPERATIONS.

The works of the East Hull Gas Company (known prior to the year 1906 as the Sutton, Southcoates, and Drypool Gas Company) are situated within the municipal boundary of Hull, on the east side of the Hull River, in the midst of a commercial and industrial centre. The district at present supplied has an area of some 7500 acres, and a population, in round numbers, of about 80,000. The largest consumers are composed of commercial and

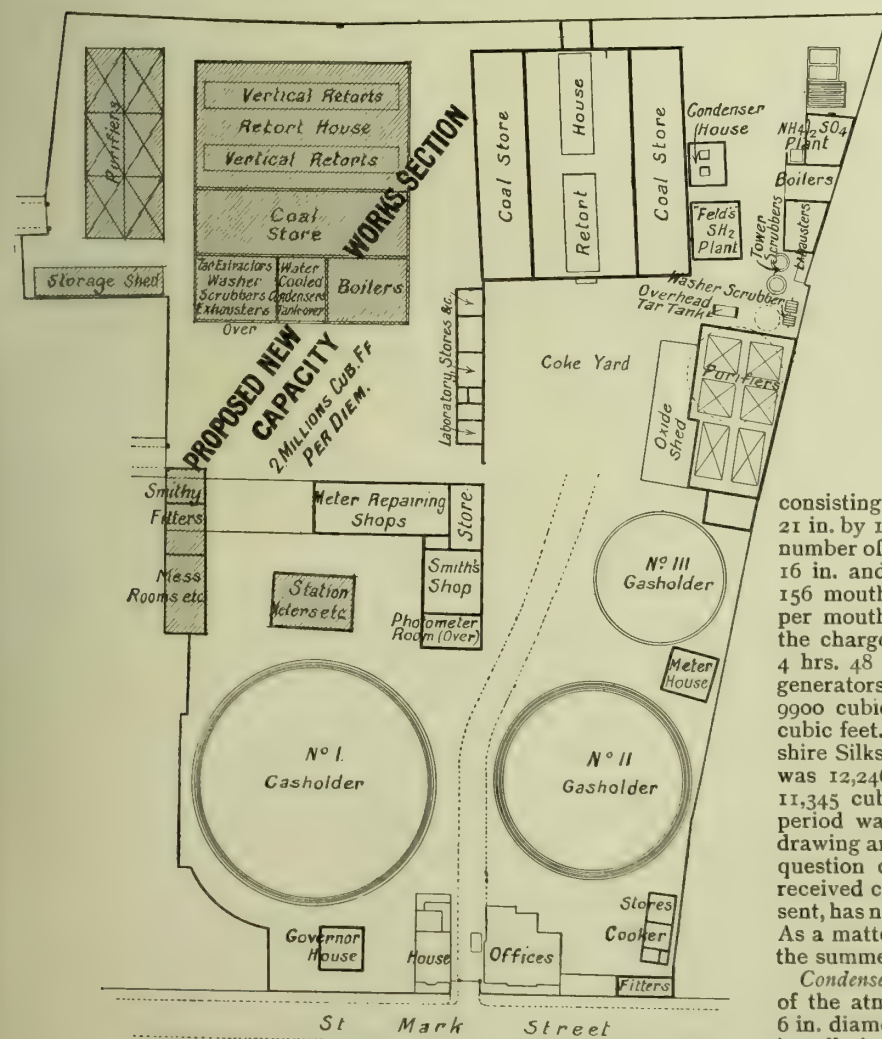
manufacturing industries, seed, flour, oil, starch, blue, &c., mills, and vast shipbuilding and engineering works; while the two largest docks in Hull—the Alexandra and Victoria—are also supplied with gas by the Company for lighting and motive purposes. The new Joint Dock of the North-Eastern and the Hull and Barnsley Railway Companies is also situated within the Company's area; and special high-pressure mains have already been laid to meet the prospective demand for gas to this dock and to the rapidly developing district of Marfleet. H.M. Prison for the East Riding of Yorkshire, and other public properties, are also supplied with gas by the Company for lighting purposes.

The bulk of the private consumers are of the artisan class; and, as will be seen from the accompanying table of statistics, the development of the coin-meter system for the past nine years has been considerably above the normal for Provincial gas undertakings. The supply of gas to the Hull Garden Village, to consist of about 1000 houses—promoted by Sir James Reckitt, Bart., and other Directors of Messrs. Reckitt and Co., Limited, starch, blue, &c., manufacturers (whose extensive works are in the Company's area)—is now being carried out by the Company. This is one of the most unique developments of the problem of housing, as it is a residential and picturesque village situate practically within the heart of a large city. The increase in the sale of gas for the year ending Dec. 31, 1907, was 26 million cubic feet, equal to 13 per cent.; and for the year ending Dec. 31, 1908, it was 16 millions, equal to 7½ per cent. The following table shows the increases in the Company's business since the year 1900.

Statistics Covering Nine Years from 31st December, 1900, to 31st December, 1908, inclusive.

Year.	Total Quantity of Gas Sold.*	Gas Sold by Ordinary Meters.	Gas Sold by Coin Meters.	Increase Per Cent. by Coin Meters.	No. of Consumers Using Ordinary Meters.	Increase Per Cent.	No. of Consumers Using Coin Meters.	Increase Per Cent.	No. of Cooking-Stoves.	Increase Per Cent.	Price of Gas Per 1000 Cubic Feet.†
1900	159,382,800	130,625,800	7,754,700	..	2352	1'77	738	..	48	..	2/3 & 2/6
1901	164,976,200	134,684,800	8,978,600	15'78	2371	0'81	943	27'77	53	..	2 6
1902	170,703,000	135,328,100	13,240,900	47'47	2391	0'84	1305	38'38	432	..	2 6
1903	168,358,500	127,186,800	18,495,500	39'68	2425	1'42	1784	36'70	496	14'81	2 6
1904	173,880,200	130,298,900	22,718,100	22'83	2449	0'99	2266	27'02	533	7'45	2 6
1905	177,021,000	127,577,700	25,584,200	25'82	2507	2'37	2964	30'83	696	30'58	2 6
1906	187,851,000	132,177,700	35,469,200	24'08	2600	3'71	3663	23'58	898	29'02	2/6 & 2/4
1907	213,533,700	148,078,900	46,139,800	30'08	2666	2'53	4343	18'56	1067	18'82	2 0
1908	229,378,600	154,641,300	55,902,200	21'15	2790	4'65	5020	15'58	1180	10'59	2/0 & 2/3

* Excluding gas sold to the Corporation of Hull for public lighting, averaging some 20 million cubic feet per annum. † The maximum price to be charged for gas is fixed by the Company's Act of 1867 at 4s. per 1000 cubic feet inside, and 4s. 6d. per 1000 cubic feet outside, the municipal boundary; but since 1883, a uniform price has been charged throughout the Company's area. The price now charged is 2s. 3d. per 1000 cubic feet, less discounts of 5 and 7½ per cent., according to consumption.



Plan of the East Hull Gas-Works.

DESCRIPTION OF THE WORKS AND PLANT.

[See Plan.]

Coal Depôts, Stores, &c.—The coal depôts are situated at a distance of some 500 yards from the works, and are connected with the North-Eastern Railway Company's Hull to Withernsea branch line by a private high-level siding. From the cells the coal is carted by contractors to the works, and deposited in the coal-stores, which stand parallel on either side of the retort-houses, and hold for winter stocks from 1400 to 1500 tons of coal, or about 14 days' present requirements. Owing to the rapid development of the Company's business, various schemes for simplifying the means of depositing the raw material and loading coke, sulphate of ammonia, &c., on the works have been, and are at the present time, under consideration.

Carbonizing Plant.—The retort-house is a brick building running due north and south. It contains two benches of horizontal retorts, consisting of six beds of generators of seven retorts, each 21 in. by 15 in. and 20 ft. long, or 84 mouthpieces, and a like number of beds of regenerators of six retorts, each 24 in. by 16 in. and 20 ft. long, or 72 mouthpieces; making in all 156 mouthpieces. In both cases the charges are 3½ cwt. per mouthpiece; but with the generators the duration of the charge is six hours, while with the regenerators it is 4 hrs. 48 min. The make of gas per mouthpiece for the generators averages 7800 cubic feet, and for the regenerators 9900 cubic feet; and the make per man over all is 27,000 cubic feet. The make per ton of coal (mostly South Yorkshire Silkstone) carbonized for the six months to June 30 last was 12,246 cubic feet; and the quantity of gas sold was 11,345 cubic feet per ton. The fuel account for the same period was 19'76 per cent. At present the whole of the drawing and charging is done by manual labour, though the question of mechanical stoking has on several occasions received consideration. The time, however, up to the present, has not been considered opportune for its introduction. As a matter of fact, decision has remained in abeyance till the summer consumption reaches a higher load-line.

Condensers.—Up to the year 1907, the condensers were of the atmospheric type, consisting of annular tubes 3 ft. 6 in. diameter and 30 feet high, outside dimensions. This installation, however, was of insufficient area to allow of the quantity of gas passing being dealt with efficiently; and as the ground occupied was to be shortly required for other

purposes, it was decided to erect a battery of water-cooled condensers—of Messrs. R. & J. Dempster's make—in the position shown on the plan. This installation consists of two sections capable of dealing jointly with $1\frac{1}{2}$ million cubic feet of gas per 24 hours; and it has proved very satisfactory for the complete temperature control given by its alternative method of reversing the flow of gas. This plant is enclosed in a brick building; the object in view being to provide an overhead water storage supply for works purposes, and also warmed water, from the condensers, for the boilers, men's bath-rooms, lavatories, &c.

Exhausters and Engines.—These are two of Waller's four-blade type of 45,000 cubic feet per hour capacity, coupled direct to 6 H.P. horizontal steam-engines.

Ammonia Plant.—Two tower scrubbers, 55 feet high and 8 feet diameter, fitted with cross-cut boards, are used as "rough" scrubbers—i.e., the gas is treated with ammoniacal liquor from the washer-scrubber and from the liquor well of an average strength of 5° Twaddell, and the final washing process completed in a Holmes scrubber-washer of $1\frac{1}{2}$ million cubic feet capacity. At the outlet of this scrubber-washer the ammonia contained in the gas averages on test 1·5 grains per 100 cubic feet.

Purifying Plant.—The purifiers consist of six boxes—a set of four, 20 feet square, and two 32 ft. by 16 ft. Two boxes of the first set are fitted with Jäger grids; and the other two with Spencer grids for the purpose of pressure reduction, and worked by an eight-way Weck valve. The large boxes are fitted with the ordinary type of wooden grids. The method of working the first four purifier boxes is as follows: Nos. 1, 2, 3, 4; 4, 1, 2, 3; 3, 4, 1, 2; 2, 3, 4, 1. The purifiers are worked in rotation "clockwise;" but the valve is changed "contra-clockwise." Nothing very novel is claimed for this procedure; but its adoption has secured efficiency and a considerable reduction in labour charges. The capacity of the purifiers is considerably under a safe limit; and other means of supplementing it are being adopted. Details respecting the Feld plant for the elimination of sulphuretted hydrogen and the recovery of sulphur—the first plant of the kind to be erected in England—were given in the "JOURNAL" last week (p. 816); and Mr. Holliday hopes to publish at a later date a record of his experience with it, and of the work it has done. It will be seen from the plan that it stands on a piece of vacant ground adjoining the condenser-house. The trial section has been put down to deal with $1\frac{1}{2}$ million cubic feet of gas per diem; and it occupies an area of only 35 ft. by 30 ft. Economy of ground space was the leading factor determining its adoption.

Station Meter.—This is placed between No. 2 and No. 3 gas-holders, as shown on the plan, and is of 45,000 cubic feet per hour capacity. It is by Braddock, and stands in a brick building having tiled floor and dado. In this building there is also fixed a "safety governor," placed in the ordinary manner to prevent accident or breakdown occurring in the district supply through misadventure with the gasholder valves. It was originally used as the station governor for the whole of the area of supply.

Gasholders.—The general details and capacities of these are given in the paper already referred to (see p. 114).

Station Governors.—The governor-house faces St. Mark Street, and stands on a piece of land surrounded by grass plots, &c. The building was erected in 1907. The interior is fitted in modern fashion with tiled floors, dado, &c., and is lighted by electricity. There are two governors, of Braddock's equilibrium alternative water or weight working type. Owing to the level nature of the district, they work together; the trunk mains running east and west—joining at points on the outskirts of the district. It may be noticed that the 24-inch inlet trunk main discharges into a distributing-box, 2 ft. 6 in. by 2 ft. internal cross section, placed immediately under the stage floor carrying the governors, and that all the connections with the inlet, outlet, and bye-pass valves are above ground, and therefore capable of easy access and inspection at any moment.

Laboratory, Stores, &c.—The positions respectively of the drawing office, chemical laboratory, photometer-room (fitted with the latest type of table photometer, under a special Provisional Order of 1907), smith's and joiner's shops, fitting shops, general stores, mess and bath rooms, employee's social club room, and lavatories, &c., are all shown on the plan.

Future Extensions.—Owing to the rapid growth of the city of Hull eastward, and the consequent great increase in consumption of gas, additional lands, some 2 acres in extent, have within the past year been purchased; and the preliminary work for laying down new plant, as shown by the shaded parts of the plan, to produce 2 million cubic feet of gas per diem, in sections, as required, is at present being proceeded with.

General Offices and Board Room.—These are in St. Mark's Road; and here is to be met the Secretary, Mr. David Wood, who has been considerably over a quarter of a century in the Company's service.

The Lighting Committee of the Corporation of Dublin have adopted a report notifying the death of Mr. Thomas J. Cotton, the City Gas Examiner, &c., and recommending the appointment of his son, Mr. Henry F. Cotton, in his place.

Alderman Aaron Edwards, Mayor of Longton, and a member of the Staffordshire County Council, whose death on the 8th of July, in his 77th year, was noticed in the "JOURNAL" at the time, left estate valued at £41,179 gross, with net personality £23,799.

TENBY GAS COMPANY AND THEIR WORKS.

By Mr. A. H. BROOKMAN.

[A Paper prepared for the Meeting of the Wales and Monmouthshire Institution, Sept. 29.]

A Government Commission which visited Tenby in 1834 and inquired into the municipal affairs of the town, reported that no method of street lighting had been adopted, though the town was a fashionable watering-place. In December, 1835, under the Municipal Corporations Act, the first election of a Town Council took place; and one of the earliest acts of the new body was to consider the question of lighting. In March, 1836, they accepted the tender of Mr. George Rayner for, and on behalf of, Mr. Henry Stothert, of Bath, to light the borough with gas. The amount of the contract does not appear; but we learn from the specification (of which I have a copy) that the works were to include five of John Brunton's patent retorts, with ascension pipes, hydraulic mains, and condensing cisterns, three circular dry lime purifiers, two hydraulic valves, a gasholder, 29 feet in diameter and 12 feet deep, with guide-framing of three 6-inch iron columns and wood girders, together with pumps, water cisterns, tar-cisterns, &c. About 3000 yards of mains, varying from 4 inches to 1 inch, were laid, and 17 pillar lamps and 37 bracket lamps were erected in the streets of the town.

In May of the same year, the tender of Messrs. William Lewis and Griffith Rowlands "for building the gas-house" was accepted; the contract price being £400. The work seems to have been completed early in the autumn of 1836; and in September the Council proceeded to appoint a clerk, whose multifarious duties, including a "daily visit to the gas-station," the collection of rents, "visits to houses taking private lights," and "all other duties attaching to the said office," were to receive the handsome remuneration of £15 per annum. The fortunate official who was appointed was Mr. James Hungerford Morgan, the Borough Treasurer. A little later in the year, it was ordered that the public-lamps should not be lighted "four days before full moon, on the full, and two days after." One of the earliest buildings to instal the new illuminant was the Parish Church; and the Corporation, in January, 1837, generously authorized the Mayor to draw upon their funds to the extent of £30 to provide a chandelier and brackets as a present from the Council to the parish to complete the lighting of the church.

What the initial cost of the gas-works amounted to does not appear; but the money was provided by mortgage of the Corporation Estate, on a portion of which the works had been erected. Still imbued with the spirit of progress, the Council, in 1837, resolved that an "ornamental cottage" should be provided for the accommodation of the attendant at the gas-station; and the resolution was duly carried into effect, at a cost of £90.

What charge was made for gas at this early period of the history of the works I have not ascertained; but twenty years later it was retailed at 6s. per 1000 cubic feet—a subject of much complaint to the consumer, who then, as now, occasionally gave voice to his feelings in the Public Press. Financially, the works were not a success. In the "fifties," there appears to have been a loss of about £90 per annum on the working of the concern, and in 1866—thirty years after their construction—the Council leased them to Mr. Edward Compton. In January, 1867, the lease was assigned to Mr. George Wilson Stevenson, of Westminster; and during the time they were held by this gentleman the construction of an additional holder and other improvements were taken in hand. A new lease for twenty-one years was granted by the Corporation in 1875; and in the following year the Tenby Gas Consumers' Company was formed for the purchase of the undertaking—the lease being assigned to them.

The Corporation retained an interest in the concern to the value of £1189 3s. 1d., and received a rent of £150 per annum. This position, I believe, is nearly unique, as there is only one other town similarly situated—namely, Sudbury, in Suffolk. The capital of the Company was £10,000, in £10 shares, of which £7250 was called up in the first year.

In 1876, the writer was appointed Manager of the Company. At that time the annual output of gas was about 7 million cubic feet. Progress during the first few years of the Company's existence was rather slow, chiefly due to the high price charged for gas—viz., 5s. per 1000 cubic feet—which confined its use to lighting purposes only. In the year 1881, the Directors were able to reduce the price to 4s. 6d. per 1000 cubic feet, and they also started a system of allowing discounts on large accounts, which did not meet with general favour, and was abandoned. In 1882, with a view of increasing the consumption, the Company commenced letting stoves on hire, and adopted a differential rate for cooking purposes—viz., 3s. 6d. per 1000 cubic feet—fixing a separate meter free of charge for this purpose. This experiment was a success, and the gas consumption for cooking purposes grew rapidly; the increase being nearly 50 per cent. in two years.

The Directors considered the advisability of manufacturing sulphate of ammonia; but in consequence of their finding that it could not be produced without creating a nuisance, they decided not to undertake it, as the works are situated in one of the best parts of the town, and in the vicinity of residences.

In May, 1886, the first gas exhibition was held, and led to the more general adoption of gas for heating and cooking purposes. In 1894, automatic meters were introduced.

Year by year the consumption of gas steadily increased, and good dividends were paid until the expiration of the first lease in June, 1896, when the output stood at 15,500,000 cubic feet, with a capital of £11,250 and a reserve fund of £1150. The Corporation then approached the Company with a view to purchase. The Company made them an offer to sell the undertaking for £15,000; but the Corporation, after a great deal of correspondence and many meetings, decided to lease the works for a further term of 32 years—the Company paying an increased rent and a fine of £1200. The price of gas was to be regulated by a sliding-scale, dependent upon the price of coal delivered at the works.

Shortly after the renewal of the lease, the Company erected a new purifying plant—using oxide of iron exclusively for purification. Regenerator furnaces have been adopted, which have greatly improved the working and increased the make of gas and coke per ton of coal carbonized; while the public-lamps have been converted to the incandescent system. These improvements add materially to the economical working of the concern.

Nearly thirteen years of the new lease have elapsed; and during this time the Company's business has steadily increased. The capital employed is £14,450, with a reserve fund of £1052; the profit for the past year being £1432, after putting aside £215 for depreciation. At present, the annual output of gas is 27 million cubic feet; and the Company's income last year from all sources was about £8000.

The population of Tenby is about 4500. At the present time there are 850 ordinary and slot-meter consumers supplied by the Company; the number of public lamps is 175; and the length of mains is about seven miles.

DESCRIPTION OF THE WORKS.

The retort-house is a building 61 ft. long by 28 ft. wide and 20 ft. high. The roof is of iron, and covered with slates. The louvre ventilator extends the full length of the house. The retort-bench consists of five beds of Winstanley's patent regenerator furnaces, having four settings of sixes and one of fives. The subway is 9 ft. 3 in. wide by 7 ft. 2 in. deep, floor to floor, and is approached by a stairway outside the building. The retorts are of \square section, 22 in. by 20 in. by 9 ft. long over all, and are fitted with self-sealing mouthpieces and 6-inch ascension-pipes.

The hydraulic main, which is of mild steel plates, is 21 inches by 21 inches of U section, in five lengths, with separate 6-inch weir valves and connections to each bed. The bench bracing consists of steel joists, H section; the hydraulic main being supported by the cross girders attached to the front and back buckstays.

The foul main consists of about 138 feet run of 10-inch steel pipes, and is carried round the retort-house on cast-iron brackets to the condensers.

The coal-stores comprise two buildings, and are capable of storing 800 tons of coal.

The condensers are of the annular type, and consist of two columns, each 23 feet high; the diameter of the inner and outer tubes being 20 inches and 23 inches respectively. The 10-inch connections are continued through to the gasholders.

The underground tar and liquor storage tank is 30 feet diameter by 12 feet deep, with a storage capacity of 90 tons.

In the engine-room, there are two exhausters, by Messrs. Gwynne and Beale, of the two-blade type, of 10,000 and 5000 cubic feet per hour capacity. The 10,000 per hour one is coupled direct to a horizontal steam-engine on the same bedplate, and fitted with Gwynne's patent hydraulic steam-governor. Steam is employed for running the exhausters and pumps. The boiler-house is 23 feet long by 16 ft. 3 in. wide and 13 feet high, and contains one horizontal Cornish boiler and one egg-ended boiler.

Scrubber No. 1 is 30 feet high and 8 feet diameter, filled with boards and fitted with a Livesey patent washer at the base. A suitable distributor is fixed on the top, through which a constant stream of liquor is supplied. Scrubber No. 2 is 23 feet high and 3 feet diameter, filled with boards; the distributor being supplied with clean water.

The pumps are by Messrs. Joseph Evans and Co., of Wolverhampton. They have 2-inch connections, are double acting, and fixed outside the retort-house.

A feed pump for the boilers is fixed in the engine-room. It may be interesting to note that the whole of the connections to the outlet of the scrubber are above the ground level; cleaning caps being provided at all angles and bends throughout the works.

The purifier building is 75 ft. long and 23 ft. wide, and contains four 12 feet square water-lute boxes fixed on the stage floor, with revivifying floor below. The purifiers are worked by a Weck's patent centre-valve, and have 10-inch connections. The house is covered with an iron roof, and is open at the front. Oxide of iron is exclusively used for purifying purposes.

The station meter is of the cylindrical type, by the Gas-Meter Company, and is capable of passing 5000 cubic feet per hour. In the same room is fixed a meter-testing apparatus.

Gasholder No. 1 is a two-lift telescopic one with cast-iron tank, 50 feet diameter and 22 feet deep. The guide-framing consists of six cast-iron standards, connected with lattice girders. The capacity is about 85,000 cubic feet. Gasholder No. 2 is a single-lift, with brick and puddle tank, 30 feet diameter and 12 feet deep. The guide-framing consists of five cast-iron standards connected together by girders, and the capacity is about 7000 cubic feet.

The station governor is by Messrs. J. & J. Braddock, of Oldham; the connections being 8-inch.

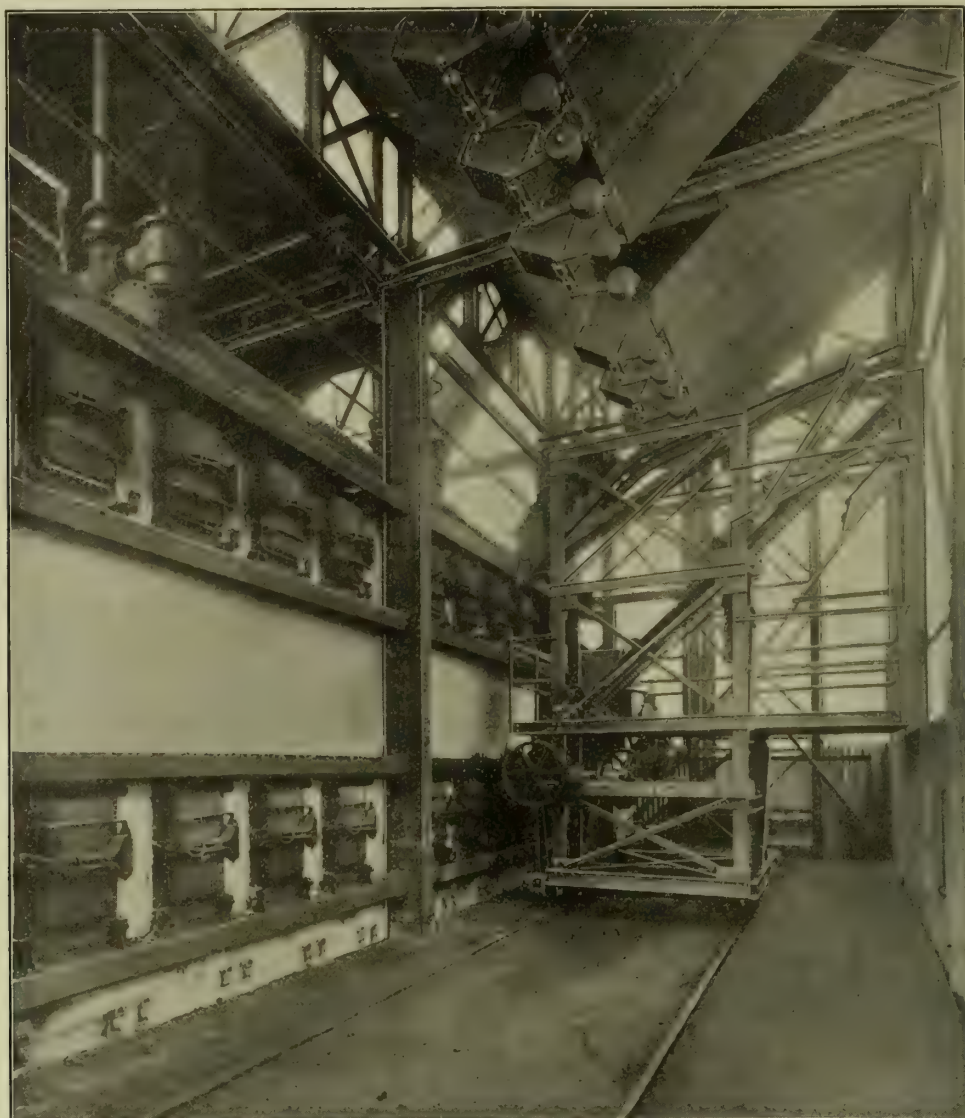
INCLINED CHAMBER SETTINGS AT KÖNIGSBERG

It has now been definitely settled by the Council of the German Association of Gas and Water Engineers that next year's meeting of the Association shall be held at Königsberg. That the choice is well made will not be questioned by those who have followed the development of the gas-works and of the gas supply in that city under the able management of Herr Kobbert, the Engineer of its Municipal gas undertaking. One of the many items of interest at the gas-works is found in the inclined chamber settings, of which three illustrations were given in the "JOURNAL" of June 22 last (p. 837), and of the working of which Dr. R. Lessing gave a few brief particulars in his paper on "Carbonization in Chamber Settings," which was read before this year's meeting of the Institution of Gas Engineers ("JOURNAL," Vol. CVI., p. 832). It will be opportune, however, to give further details of these interesting settings (of which an extension is now in hand) from a full report of them which has been published in the "Zeitschrift des Vereines der Gas- und Wasser-fachmänner in Oesterreich-Ungarn" (formerly known as "Der Gastechniker") of Sept. 15.

An extension of the carbonizing plant at the Königsberg gas-works having been rendered imperatively necessary by the great growth of gas consumption, and the re-modelling of the old inclined retort-settings into more modern types of carbonizers appearing to be an unprofitable course to adopt, it was decided, after examination of various systems, to erect two settings, each containing four inclined carbonizing chambers, according to the design of the firm of August Klönne, of Dortmund, who were entrusted with the work of construction. This type of setting appeared best suited to the local conditions; but in the first instance only two units were erected, so that the system might be exhaustively tested before the cost of erecting a large installation had been incurred. The foundation of a former bench of inclined retorts was strengthened and enlarged, and the chamber settings were erected upon it. Each setting had a separate producer; and the settings were independent, so that their working could be observed separately and repairs effected to one without interference with the working of the others. It seemed at first that early opportunity would arise for taking advantage of this independent construction, as one chamber of one setting almost immediately after firing-up was seen to have distorted walls. The other chambers of the setting were not, however, involved; and on consideration it was decided to keep it in operation in order to observe the effect of continuous work with it. The other chambers have remained in good condition for the seven months during which the settings have been in action; and hence neither setting has yet been let down for repairs.

The settings are arranged in pairs, as shown in the illustrations already given (*vide* "JOURNAL" Vol. CVI., p. 837), also on p. 110, from which likewise the general construction of the framework by which the roof, coal-bunkers, machinery, and stages are supported can be seen. The vertical members by which the framing is anchored to the foundations are of stout I iron; and these members are held together by two rows of lateral girders encompassing the masonry of the setting, with diagonal ties in each bay. One row of girders is at the level of the charging stage, and the other at the producer stage. At the front and back of the settings there are also attached to the vertical columns horizontal girders for supporting the masonry and the doors of the chambers. The charges are worked off in 24 hours instead of 36 hours customary with coke-ovens. Hence higher heats are required than for the latter; and the fire-brick used must be of a more refractory nature. That used at Königsberg was of a quality to withstand the same heat as a No. 34 Seger cone; whereas the fire-brick material that is ordinarily used in coke-ovens rarely resists a greater heat than No. 30 Seger cone.

Each setting has an independent recuperator as well as the producer. The recuperator is arranged in the upper part of the bed and extends to its full depth, and is on the same system as the Klönne recuperators for retort-settings. The producers are also of the Klönne pattern; and as charging with hot coke, or with coke direct from the sloping quenching stage, could not be arranged for, they were placed at the back of the settings and above the ground level. Coke for them was raised by means of machinery to the producer floor, which served also in these two first settings as a storage space for the coke required for the producer. When the installation is extended, however, an elevated coke-bunker capable of holding a 24 hours' supply of coke for all the producers will be provided, and they will be charged from it by an overhead suspension railway. There are two contiguous grates to each producer; and these may be clinkered independently. Evaporators are placed in the main flue for the regular supply of steam to the grates, which are clinkered once in 24 hours. The clinkering occupies twenty minutes. The triangle between the sloping bottoms of the chambers and the horizontal producer floor is taken up by the distributing passages for the producer gas and inlet passages for the secondary air. Two exits from each producer lead into a cross passage from which separate vertical channels (which can be controlled from outside) lead to the chambers. The supplies of heating gas and of secondary air are regulated so that points of flame and overheating of the bottoms of the chambers are avoided. The bottoms of the chambers are of very heavy construction and inclined at an angle between 40 and 45 degrees. This angle was chosen with regard



The Inclined Carbonizing Chambers at Königsberg.

to the description of coal carbonized at these works (English coal, *vide infra*). The chambers are $9\frac{1}{2}$ metres (31 feet) in length, and will hold upwards of 7 metric tons of coal. The average weight of the charges is, however, 6.6 metric tons ($6\frac{1}{2}$ English tons). The side walls of the chambers are heated by vertical flues terminating in a cross passage below the top of the settings, which passage is connected by downward flues with the recuperator. Each vertical flue can be regulated by a damper. The system of heating has proved satisfactory in practice. The best proof of this statement lies in the fact that the slab of coke when carbonization is finished is of the same colour all over. Many improvements, which cannot be disclosed until after the patent specifications have been published, are being introduced in the new settings. The chambers are constructed of separate shaped fire-blocks in the same way as coke-ovens, and special care is taken that the tenon joints are sound. As the chambers are worked with a positive pressure within them, the high gas yields obtained (*vide infra*) show that the joints are tight.

Each chamber has two doors on the charging side; the upper one being for inserting the charge of coal, and the lower one for thrusting out the slab of coke. The discharging side of the chamber is closed by one massive door, suspended so that it can be raised and lowered in a frame. There are two eccentric fastenings to the door; but in later settings a third fastening will be used so as to avoid all need for luting the door. There is an insulating screen inside each door, which also relieves the pressure on the latter. The different parts are made interchangeable. The coal-bunkers are placed above the settings, supported partly on the rear columns and partly on special pillars. Each chamber has a separate bunker holding one charge of coal. The bunkers are covered with corrugated roofing. It takes about three-quarters of a minute to charge a chamber; but this time will be reduced by about half by a small alteration to the outlets. The coal is raised by a bucket-elevator supplied from the existing rope conveyors. It is broken before being put into store. The elevator delivers the coal on to a band conveyor above the bunkers. Very dusty coal is damped in the bunkers. As a reserve elevating plant, there is a lift, which also serves to raise the coke for charging the producers. The coke is discharged on to an inclined quenching stage, which gradually eases off to the horizontal. It is there quenched through hose in the manner usual at coke-oven works. The stage is raised sufficiently for the loading of railway waggons which pass underneath it. When

the plant is extended, an electrically-driven suspension line will be provided to convey the coke direct from the quenching floor to the sorting plant.

The gas-outlet is fixed in the middle of each chamber; and the ascension pipe is 300 m.m. (11.8 inches) internal diameter. It is intended, however, to introduce a second ascension pipe in the new settings, and to enlarge considerably the wrought-iron receiving main so as to admit of the pressure within the latter being maintained constant during charging. Openings are provided for cleaning this main, and the tar is run off from time to time into a special tar-main. Each receiving main has a special gas-outlet, and an overflow, the height of which may be altered at will. It is well flushed and cooled by means of gas liquor. There is a protecting roof over the whole plant, which, while it will not prevent the free escape of gas when an ascension pipe is being cleared or the escape of vapours during charging, will protect the workmen, and the settings and their equipment, from the weather. The charging stages also have screening walls $6\frac{1}{2}$ feet high. The protecting roof has proved satisfactory in both summer and winter. Something of the kind is essential for the protection of the settings, especially when they are out of action.

The Königsberg settings, after gradual drying and warming up, had charges put into the chambers for the first time on Dec. 30 last. About eight days later, regular working off of the charges in 24 hours was begun. The official trial of the settings over a period of four weeks (which had been stipulated for in the agreement with the constructing engineers) was begun in February, after the settings had been properly regulated and the staff trained in the working of them. In this trial, the coal and coke were weighed each day, the amounts of moisture and ash in both coal and coke determined, and estimations were made of the calorific power of the gas. The average make of gas during this trial was 12,247 cubic feet (at 60° Fahr. and 30 inches) per ton of coal. The gross calorific power of the gas averaged 611 B.Th.U. per cubic foot. The make of coke, reckoned in the dry state, averaged 76.04 per cent. of the weight of coal carbonized, and the coke (reckoned dry) consumed in the producers averaged 15.21 per cent. This coke contained in the mean 11.12 per cent. of ash. These results were so satisfactory that, after inspecting other types of chambers at Vienna and Weimar, the City Gas Committee decided to order four more settings of the same capacity of Messrs. Klönne.

In regard to the working of the settings, it may be mentioned that the temperature of the chamber walls, measured with the

Wanner pyrometer, ranged between 1000° and 1100° C., and that the fluctuations in one chamber were quite inappreciable. The system of heating has thus proved satisfactory. The English coal carbonized was at times so dusty that it had to be wetted, in order to avoid enormous evolution of dust during charging and to produce a good coherent block of coke. Higher heats were needed for the carbonization of this small English coal than for Silesian and Bohemian coals. The tar from the English coal gave rise to many troubles in retort-settings when worked at high heats, but little difficulty was experienced with the tar from the chambers. There have been no blocked ascension pipes, and the central disposition of the ascension pipe has answered well. No appreciable deposits of scurf have been experienced. After about five months' working, there occurred a remarkable series of blockages of tar, though there was no change in the working conditions, except that the coal being carbonized at the time was unusually dusty. It is now believed that the cause of this trouble has been discovered, and that it and other small defects will, as a result of the experience already gained, be rectified in the new settings. There was not any previous experience of the carbonization of English coal in such long chambers to guide the designers; but now it is not doubted that the new settings in course of erection at Königsberg will carbonize the most trying English coals quite satisfactorily. The length of the chamber has great influence on its smooth working; and the standard coke-oven 33 feet in length appeared to be too long for English coals, at any rate if it were of the inclined type. There is no difficulty in heating long chambers uniformly by the Königsberg system; but it is difficult to get the charges in and out quickly with English coal. If the coke does not slide out cleanly, a long chamber becomes very troublesome to discharge. Coals which carbonize more readily, however, give no trouble in long chambers. The gasification of English coal has been carried out in chambers as long as 31 feet for the first time at Königsberg, and, except for the difficulty already referred to with the tar, entirely satisfactorily. The consumption of fuel for heating the settings has fallen from the time they were first put in action (in January it was 22.38 per cent. of undried coke), and is now regularly less than the 15.21 per cent. found in the official trial. It has not been possible since the latter to determine exactly the make of gas, because retort-settings have also been in operation; but the chambers give about 13 per cent. more gas per ton of coal than the retorts. The yield of ammonia has also increased; but by exactly how much cannot be stated until next spring when the new settings are brought into action. Wages, however, have fallen from about 0.85d. per 1000 cubic feet of gas made with inclined retorts to about 0.22d. per 1000 with the chambers.

The article in our Austrian contemporary concludes with a remark that time will show whether the horizontal or the inclined chamber is to be the carbonizer of the future. A number of settings of both are under construction, and will come into operation this winter, and comparative figures for the two types, using the same classes of coal, will be obtained by next spring. The horizontal chamber is simpler in construction, more readily heated, and more susceptible of supervision, while the size of the coal carbonized in it is immaterial. On the other hand, it requires a larger staff of attendants and occupies a bigger ground area. Probably also more power is needed with it, although the power requirements are small with both types. The width of the chambers and the thickness of the side walls are the factors which affect the proper and uniform carbonization of the coal; and the dimensions chosen at Königsberg have answered quite well. The bottom of the chamber, whether horizontal or inclined, must not be overheated. It is claimed for the Klönne type of chamber that it dispenses with night work, affords great independence of the workmen, yields better coke, thinner tar, and more gas and ammonia, while the gas is of good calorific power, and stopped ascension pipes and deposits of scurf do not occur. The settings are said to be durable, to entail only small charges for repairs, and not to require costly retort-houses, so that the capital outlay scarcely exceeds that for retort-settings with mechanical stoking.

Bye-Products Statistics in the United States.

According to an advance chapter in the report by Mr. E. W. Parker on the "Mineral Resources of the United States" in the past year, which has just been issued by the Geological Survey, the quantity of coke produced at gas-works and bye-product coke-ovens was 6,253,125 short tons, which is a marked decrease from the figures for 1907 (8,093,144 tons). The business depression caused a heavy falling off in the demand; the value dropping from \$30,332,644 to \$21,507,045, or by nearly \$9,000,000. Gas showed a slight increase in value; the quantity sold being 53,561,811,000 cubic feet, valued at \$37,227,901, in 1908, compared with 54,819,685,000 cubic feet, valued at \$36,462,304, in 1907. Tar and ammonia decreased slightly—the figures being 101,261,829 gallons of tar, valued at \$2,537,118, in 1908, against 103,577,760 gallons, valued at \$2,651,527 in 1907; 30,615,835 lbs. of ammonia, valued at \$2,065,169, in 1908, against 37,560,858 lbs., valued at \$2,601,057, in 1907; and 44,093,437 lbs. of sulphate, valued at \$1,322,807, in 1908, against 48,882,237 lbs., valued at \$1,525,472, in 1907. The coal carbonized in this production amounted to 9,252,978 short tons, against 11,490,661 short tons in 1907. The increasing popularity of gas for cooking and heating purposes is shown by the fact that the proportion of the total production used for these purposes in 1908 was double that of 1902.

NEW DESIGNS IN LAMPS AND FITTINGS.

Messrs. Evered and Co., Limited.

FASHION changes in gas-fittings as in most other things; and what was once the vogue in this particular line hardly pays to make now, though there are still a few customers of the fittings' manufacturer who still demand the types of a bygone day—for instance, there are some people who retain an affection for the old-fashioned, square hall lanterns with lead and coloured glass (cathedral) glazing. This demand has to be met, though those who make such demand are of the few; the many call for new designs and greater ornamentation. In producing what is called for, the manufacturers show unremitting energy. The clamour is for art in design; and art the manufacturers give.

Go into the London show-rooms of Messrs. Evered and Co. to-day, and compare what is now seen with what was on view quite recently. The range from which selection could be made a few years since was somewhat limited; and the designs ran in much the same groove. Now one can wander in the show-rooms amid a perfect forest of fittings, finding no two designs alike; and so attractive are one and all that it is a matter of some perplexity as to the design in pendant, bracket, pillar, or otherwise, that takes one's fancy most. The designs are all light and graceful; there is no request now for the heavy patterns of fittings. In the new fittings, there are graceful curves, artistic loops and bends, little straight tubular work, pieces forming



Evered and Co.'s Up-to-Date Fittings.

ornament are flattened and made of tasteful section, cast leaves and medallions are brought into the designs, and there are festooned chains. In some of the pendants, there are circular, or flat multisided, bands, forming (as it were) the body, from which project the arms for the burners; the bands being supported by chains or curved ornamental work, and being embellished by cast medallions or leaves, or otherwise. The hideous plain down-tube without ornament is no longer the correct thing; chain work or ornate sprays or arms ending in loops or leaves being the order of the day. With such profusion of types, we cannot select any one for special mention; but two illustrations are given as examples from many hundreds of designs. Not only in design but in finish the taste to-day is diametrically opposed to the fancy of other times. The popular fancy is out of touch somewhat with the polished brass finishes; but silver antique or copper antique are the favourites, together with wrought-iron work. It is a sign of the times that all the new fittings are for inverted lights.

In pendants there are choice designs for drawing and dining rooms and halls, made for one to three burners (large or small), or any other number desired. For drawing-room use, all are quite light and fanciful. For the dining-room, every taste can be complied with; but we must say that wrought-iron pendants for dining-rooms, with antiquated appearance and silk flounces, appeal to the eye as being very effective. Passing from these to the hall pendants, in polished brass, ormolu, or silver antique, there are some handsome models; and we especially like those with the expanded shallow globes, with curved bottoms. The long

cylindrical globes, with parallel sides or slightly bulbed, fitted to small inverted burners also look very fanciful. In conjunction with these, it may be mentioned that there is a steady demand now for the ancient looking watchman's lantern for entrance-door lights. Turning to the wall brackets, there is a myriad of choice designs in this department—designs applicable to all situations, and for single or cluster lighting. The supporting bracket at the back, gives a big field to artistic work in figures, floral, and other subjects; and the graceful overhanging branches also allow scope for decorative effect. French styles and the upright imitation candle fittings are very popular as drawing-room fixtures; and for dining-rooms there is no doubt a preference at the present time for the wrought-iron types.

Many of the fittings are shown fitted with the "Viva" inverted burner, which the firm have introduced, and which is made in the large and bijou form. The illustration shows it with a plain glass; but it is suitable for all the forms of decorative glassware of which there is such an extensive range from which to make selection. The large size consumes 3 cubic feet of gas per hour. The main advantage of this burner lies in the fact that the metal hood is entirely lined with a china covering made of the best heat-resisting material, which keeps all parts of the burner from deteriorating and also from blackening. The china lining has three openings so arranged that the products of combustion are led away as much as possible from the fitting, and more particularly from the bunsen tube, so that the primary air and the gas supply are uncontaminated by the products of combustion, and the lighting efficiency is maintained unimpaired from that cause. The china lining is fitted loosely to the brass cover, and can easily be taken apart for cleaning by simply unscrewing the lock nut. The burner is provided with an injection tube, and the mixing chamber with a gauze—thereby ensuring a perfect mixture of the air and gas and preventing lighting-back. A double cone gas-regulator is provided, fitted with an insulated ebonite screw. Protection and efficiency are the two chief characteristics of the burner.

Messrs. Best and Lloyd, Limited.

IN the London show-rooms of Messrs. Best and Lloyd, Limited, nothing that is cheap and ill-finished is to be found. Standing in the midst of the display, one is at once conscious of the elegance of design of, and the high-class workmanship in, the gas-fittings



Types of Messrs. Best and Lloyd's New Gas-Fittings.

burners; and the same excellence in design and work that we have endeavoured to convey in respect of the other fittings is seen in these. The primary object of the "Metrolite" burner is to prevent damage to the fittings. There is a pendant in the show-room that has been in use, as and when required, for now some eighteen months; but there is not the slightest sign of injury to the metal work. This is good testimony. The firm's "Surprise" pendants will, from their very convenience, never suffer in attractiveness. There is in daily use now within our own observation one of the very first of these pendants the firm made (that is many years ago now), which speaks well for both the material and the workmanship. Since those days the range of both design and means to convenience in them has been greatly extended.

Messrs. Guest and Chrimes, Limited.

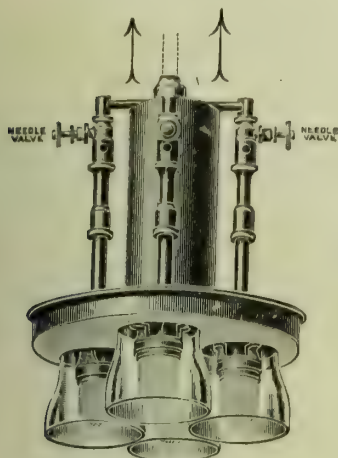
By Messrs. Guest and Chrimes, Ltd., of Rotherham, a speciality is being made of an absolutely shadowless outside lamp, with which,

surrounding. One is also immediately struck with the fact that there is nothing new among the designs of fittings—pendants, brackets, &c.—for the upright burner. The demand nowadays is entirely for fittings made for inverted burners. What has this brought us to? We see the answer exemplified in the fittings on view for both gas and electric lighting. The inverted gas-burners have so broadened the field of design that, between the fittings suitable for them and those for electric incandescents, there is a remarkable kinship in style.

Of the fittings to be seen, we can only write generally, as the designs are so varied and numerous in the brackets, pendants, &c. The days of plainness and ugliness in gas-fittings for residential houses have passed away, never we hope to return. The heart of the artist is now seen in the designs about us; and their adoption means the beautifying of the home. Here are the light and graceful Adam and Sheraton styles; there the heavier but handsome style of the Georgian period; and there again is the Louis XV. style, graceful in its bold irregularity. Recourse is now largely had to the antique in the fresh conceptions that are materialized by the metal worker in this line; and the finishes match. Oxidized brass, copper, and silver, steel bronzed, lacquer gilt, matt bronze, and mercurial bronze are noticed. Wrought-iron work is also seen. The range for brackets and pendants on view comprise suitability for all purposes—for drawing-rooms, dining-rooms, libraries (or apartments with designation less pretentious), and bedrooms—and for single and cluster lighting, as well as for the large, intermediate, and bijou inverted burners. We illustrate some samples of the work of the firm; but it is impossible for these to be even regarded as an indication of the range of design, from the delicate lines of the pendants and brackets applicable to the drawing-room to the more substantial looking (though by no means heavy) dining-room fittings—mostly with metal bands, round or oblong, in the various finishes, with silk shades. We like the hall pendants with cylindrical glasses for single inverted lights, as well as those with the bowl-shaped globes. A good style is also the broad open metal support in hall pendants, which removes the metal work from immediate intrusion in the path of heated products of combustion. There is not much flexible metallic tubing found in the firm's fittings; but it comes in very useful to run through pendants with centre chain supports, in place of the ordinary down-rod.

The firm make special fittings for the "Metrolite" series of

for an approximate consumption of 4 cubic feet of gas per hour, it is claimed that an illuminating power equal to 130 candles per burner can be obtained. The features of this copper-case lamp are: The inverted incandescent gas-burner can readily be unscrewed and bodily removed for cleaning purposes, without in any way taking the lamp apart. The magnesia nozzle is brass mounted, and fitted with a patent (applied for) dual fitting; and being provided with two sets of projections, it will carry any sort of inverted mantle. Both air and gas regulators are visible and accessible. The gas-regulator is constructed without springs, the thumb-bit cannot be removed, and an escape of gas is impossible. All the burners are furnished with Jena glass cylinders, with 2½-inch fitting. The copper case and enamelled reflector are mounted on a strong cast-iron frame and rim, and are said to be unsurpassed for durability. The inexpensive glass shade is an important feature, as it reduces the cost of maintenance to a minimum. The lamp (which is only one of many patterns made by the firm) is arranged for two, three, or four burners.

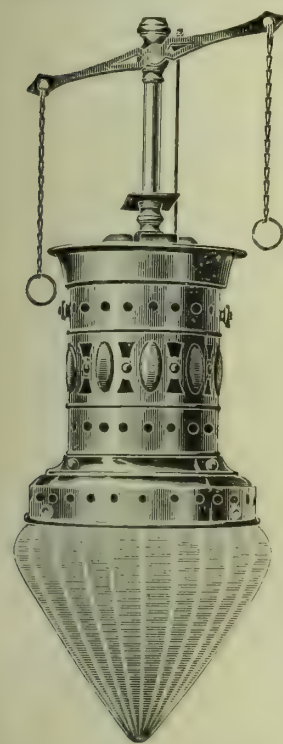


Guest and Chrimes' Public
Lighting Cluster.

regulating gas-nipple, the regulating pin of which (operated from outside) cannot be entirely removed.

Messrs. Falk, Stadelmann, and Co., Limited.

It is not many weeks since a notice appeared in these pages of a new medium-sized inverted burner and a reversible swan-neck burner brought out by Messrs. Falk, Stadelmann, and Co., of Farringdon Street, E.C.; but a further visit to the well-filled



The "Luminette" Inverted
Lamp.

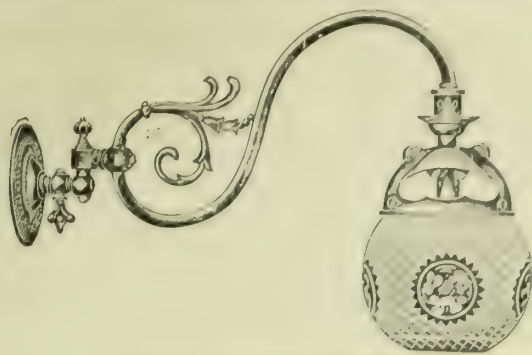
show-rooms demonstrates that these two introductions do not by any means exhaust the gas-fitting novelties which have been prepared by the firm for the lighting season now being entered upon. There are many others—not all of them big departures, of course, but in every case calculated to be of some assistance under one condition or another. And in gas fittings, as in other matters, a great deal depends on small things.

Before referring to some of these unobtrusive but useful articles, attention may be drawn to the English-made "Luminette" inverted lamp, which enjoys advantages both from the point of view of appearance and from that of cost—being attractive to look at, and withal extremely moderate in price. It has an embossed brass casing, and is fitted with two burners having adjustable gas-injectors, bye-pass lever cock, XX. "Veritas" mantles, and a clear optic ribbed globe. The gas consumption of the lamp is about 7 cubic feet per hour; and the light developed is an excellent one. The globe allows some of the light to be diffused above the lamp, instead of it all being thrown downwards. Altogether, the lamp is one that may be recommended for interior lighting.

Messrs. Falk-Stadelmann show a large number of handsome table and other standard gas-fittings arranged for upright burners; but by means of the special adapter illustrated, any of these can

The firm of Guest and Chrimes have also an inverted burner cluster, which is designed specially for existing street-lanterns, either for pillar fixing or for suspension. These clusters can be arranged for practically any number of burners; and the gas can be connected at the top or bottom. They are provided with a white vitrified enamelled steel reflector and flue; and the burners, which are of cast brass with dual nozzles, will carry any description of inverted mantles. Adjustable air-regulators are provided; and each of the burners is fitted with a springless

verted burners are on view; and among these, special attention may be drawn to a billiard light fitting, by the aid of which existing shades and frames employed with flat-flame burners can be utilized for inverted incandescent lighting. The shade wires are, of course, fitted to the ring shown. Another fitting which may be illustrated, as an example of one of many patterns stocked by the firm, is a patent bracket which can be converted for use with an upright burner by merely removing the screws attaching the arm to the swing-plug, reversing the arm, and replacing the screws.



Convertible Incandescent Gas-Bracket.

Mention has been made here of only a few of the new lines which attracted notice in a walk through the show-rooms. There are to be seen many handsome and up-to-date goods which might be referred to did space permit. Both indoor and outdoor lamps are on view in countless variety; and there is a range of inverted brackets, consisting of no less than 130 different patterns, which give the widest possible choice as to material, design, and cost.

Gas Companies' Protection Association.

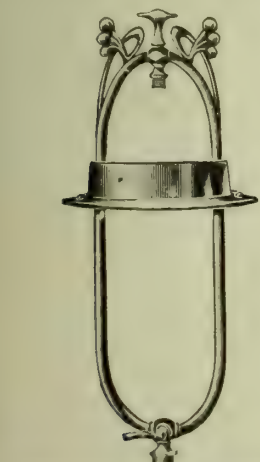
The twelfth annual general meeting of the Association will be held at the Westminster Palace Hotel, on Thursday, the 28th inst., when the annual report of the proceedings of the Association and the accounts and balance-sheet for the year will be presented, and seven gentlemen will be elected to serve on the Committee—six in the place of those retiring under rule 9, and one in place of Mr. E. W. H. Eady, who has resigned his seat on the Committee owing to ill-health. The following are the members of the Committee retiring, and all of whom offer themselves for re-election:—

Mr. Edward Allen, Liverpool United Gas Company.
Mr. George Andrews, Swansea Gaslight Company.
Mr. C. E. Botley, Hastings and St. Leonards Gas Company.
Mr. George Clarry, Cardiff Gaslight and Coke Company.
Mr. Douglas H. Helps, Reading Gas Company.
Mr. R. O. Paterson, Cheltenham Gaslight and Coke Company.

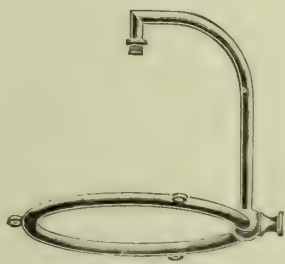
A Reinforced Concrete Water-Tank.

A reinforced concrete water-tank, 30 feet in inside diameter and 90 feet high, similar to the ordinary type of steel stand-pipe which is of the same diameter from the ground upwards, has been built by the Cananea, Yaqui River, and Pacific Railroad at Empalme (Mex.). The foundation, according to the "Railroad Age Gazette," is octagonal, with a minimum diameter of 38 feet, is 5 ft. 3 in. thick, and rests on 97 "Simplex" piles, 3 ft. 6 in. on the centres. The wall is 10 inches thick at the bottom; but for a height of 4 feet above the floor, the thickness is 18 inches, in order to make an efficient joint with the floor. The shell decreases to a minimum of 5 inches at the top. It is reinforced horizontally and vertically with corrugated bars in two circles, 2½ inches apart at the bottom and 2 inches at the top; one circle stopping 14 ft. 4 in. from the top, the other continuing in the middle of the wall. The vertical rods are ½ inch square, set staggered in the two circles and 10½ inches apart; making 55 in each circle. The horizontal bars vary from ¾ inch to ¾ inch square from the bottom to the top of the tank; the spacing depending on the depth of water. The minimum spacing of the ¾-inch bars is 2½ inches on the centres. The floor is a 9-inch layer of concrete over the foundation slab, and is reinforced with ¾-inch rods, 8 inches on the centres in both directions. The wall and floor are made of 1 to 2 to 3½ concrete, with ¾-inch broken stone; while a 1 to 3 to 6 mixture was used in the foundation. A man-hole is built into the lower 4-foot ring. The tank has been kept filled to within 4 inches of the top.

Artesian Wells in London.—The boring of an artesian well has been completed at Basildon House, Moorgate Street, and a supply of water amounting to 2000 gallons per hour has been obtained from a depth of 450 feet from the surface. Steel tubes 8 inches diameter were used to line the upper portion; about 235 feet through the chalk being unlined. The pump is coupled direct to an electric motor; an automatic arrangement being attached to start it when the water in the storage-tank drops below a certain level. The work has been carried out by Messrs. Alfred Williams and Co., of Bow, E. Among other artesian borings in London is one on the works of the Gaslight and Coke Company at Beckton, which yields 10,000 gallons per hour.



Adapter for Standard Fittings.



Billiard Light Fitting.

be converted for use with inverted incandescent burners. The adapter, it will be noticed, is fitted with a gallery to hold the globe. A large number of other adapters for bijou and large in-

GASHOLDER RECONSTRUCTION.

By JOHN HOLLIDAY, of the East Hull Gas Company.
[A Paper read before the Eastern Counties Gas Managers' Association.]

For the past year or two my Board of Directors have had under consideration the question of the expediency of replacing No. 2 gasholder; and in the early part of the current year I was instructed to take the necessary steps to carry out the work.

In order to convey to your minds a clear idea of the situation, first let me, as briefly as may be, give a *résumé* of the conditions leading up to this point.

The details of the storage accommodation on the works at the end of 1908 were as follows: One three-lift holder (No. 1), 150 feet in diameter by 35 feet deep. This is the holder that figured in the well-known "Drypool Gasholder Case," the litigation relating to which started in the Chancery Court, Queen's Bench Division, in 1896, and ended in the House of Lords in the year 1900. It is of a capacity of 1,800,000 cubic feet. Then there is a two-lift holder No. 2 (that under review), 120 feet diameter by 26 ft. 6 in. deep, capacity 540,000 cubic feet. And, lastly, there is a single-lift holder (No. 3), then out of use. Their relative positions on the works are shown in fig. 1.

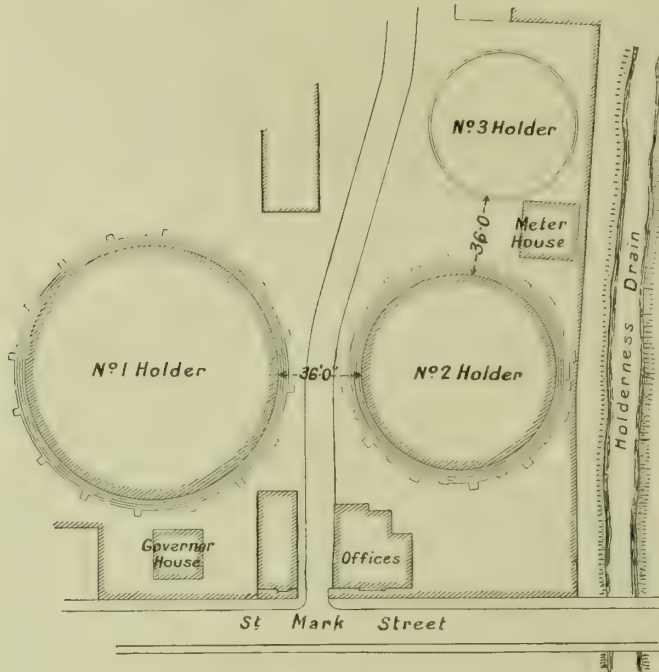


Fig. 1.—Site Plan of the Holders.

No. 2 holder was built in the year 1873, and had done good work; but as the general design, the condition of the sheeting, and particularly the defect of too great a "dimension" between the carriages and the guide-rails on the cast-iron columns forming the framing (see fig. 2), seemed to point to an entirely new design being desirable, it was ultimately decided to start *de novo*.

At this point, it will be well for me to tell you that, owing to

the character of the area of supply—large oil and cake mills, grain warehouses, docks, at which the motive power for working the coal-hoists and also for discharging ships is largely gas, preponderating—and further, owing to the great natural development of the district (the present yearly increases averaging 10 per cent.), and with all our manufacturing plant from the retort-houses to purifiers working under full winter load, at its maximum capacity, it was found desirable and indeed necessary (especially with the continuous winter fogs to which we are peculiarly liable) to provide a fair margin of storage accommodation for safe and economical working.

To more fully emphasize the necessity for this precaution, the following table of outputs per hour in one day during the month of December of last year speaks for itself:—

Time p.m.	Gas Sent Out.		Output per Hour. Cubic Feet.
	Half-Hourly Output. Cubic Feet.		
3 to 3.30	..	28,000	66,400
3.30 to 4. 0	..	38,200	
4. 0 to 4.30	..	48,900	97,300
4.30 to 5. 0	..	48,500	
5. 0 to 5.30	..	53,800	103,700
5.30 to 6. 0	..	49,900	
6. 0 to 6.30	..	41,800	89,900
6.30 to 7. 0	..	48,100	
7. 0 to 7.30	..	44,400	86,600
7.30 to 8. 0	..	42,200	
8. 0 to 8.30	..	44,300	86,600
8.30 to 9. 0	..	42,300	
Gas sent out for the six hours, 3 to 9 p.m.			530,500

Bearing this fact in mind, it was decided by the Directors to put down in the existing No. 2 tank a four-lift spiral-guided holder of the following dimensions:—

	Diameter.	Deep.
Outer lift.	120 ft. 0 in.	27 ft. 6 in.
Third lift.	117 ft. 6 in.	27 ft. 6 in.
Second lift.	115 ft. 0 in.	27 ft. 6 in.
First lift.	112 ft. 6 in.	27 ft. 6 in.

with a working capacity of 1,100,000 cubic feet approximately.

Once more returning to fig. 1, you will see the close proximity of No. 3 holder to No. 2; and as the framing of the former was in bad condition it was decided before starting with No. 2 to dismantle No. 3, and also to clear the tank of water. During the period we were engaged emptying No. 3, the water-level in No. 2 was carefully gauged daily over a period of two months as a guidance of what we must expect in dealing with it.

Fortunately the tank of this holder (No. 2) was found to be quite satisfactory—no appreciable fall in the water-level taking place, though No. 3 tank itself was found to be defective. Thus, anxiety Number 1 was "written off."

On the 1st of March this year No. 2 holder was turned out of use; and the work of dismantling the framing, consisting of twelve cast-iron columns and one tier of lattice girders (see fig. 2), and the emptying of the tank, was commenced.

The only holder now available for use, I may point out, and upon which we had to depend absolutely for the supply of gas to our district during the spring, summer, and part of the autumn was now No. 1. This holder also stands (see fig. 1) in very close proximity to No. 2, with the main entrance road to the works (over which all traffic must pass) right between; and we had to proceed with very great caution in our pumping operations on No. 2 tank. Daily readings of the water-levels on No. 1 were taken. A rain-gauge was fixed close to the tank walls, and daily records were kept on a specially prepared chart. These readings extended over a period of five months; and they satisfied me

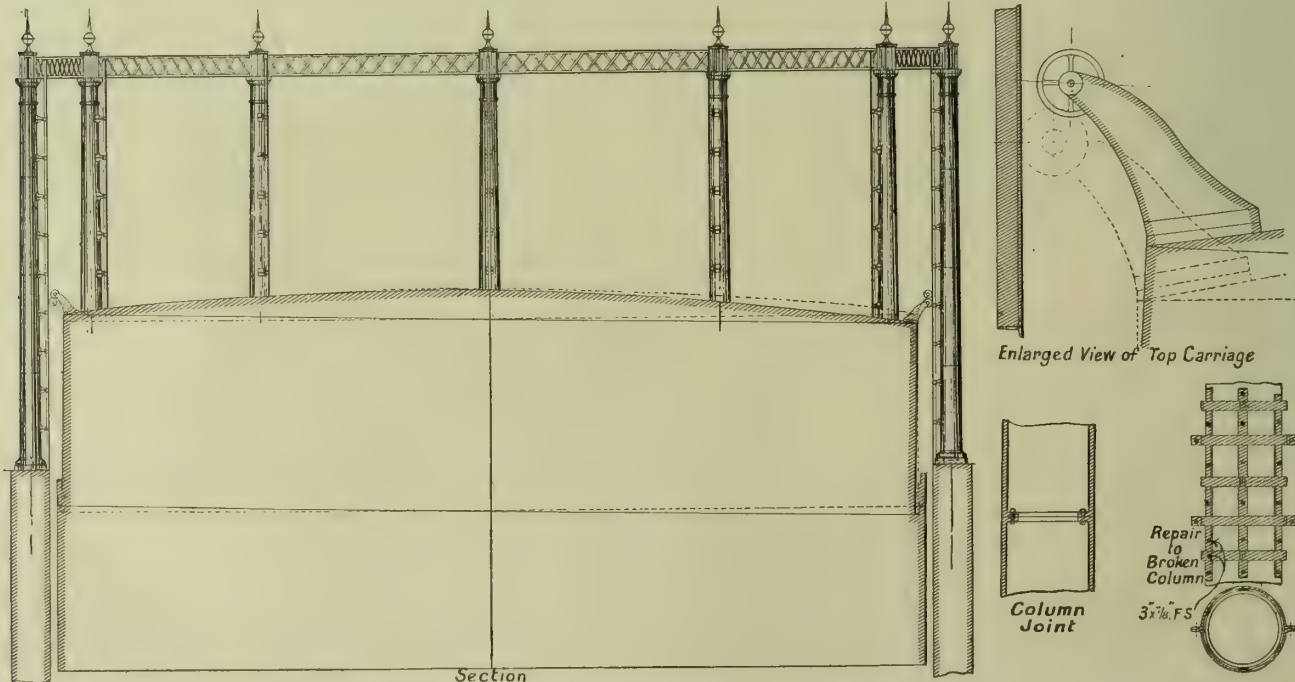
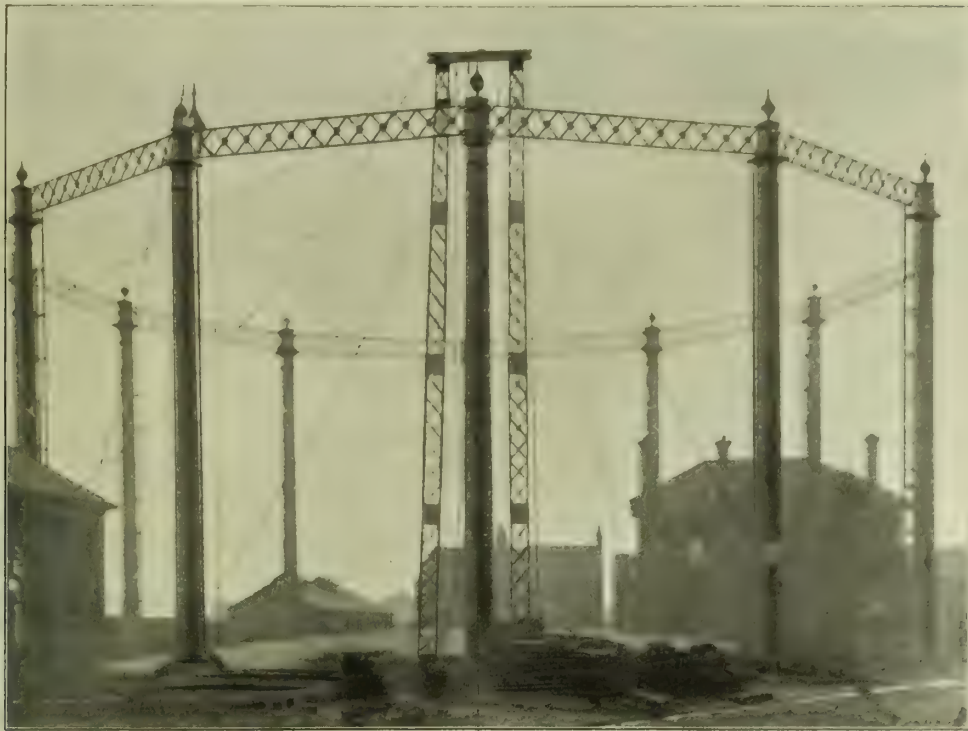


Fig. 2.—Section of the Holder and Some Constructional Details.



Preparations for Removing the Holder Columns.

from the commencement, that we were not under ordinary circumstances going to have much trouble on this point, as No. 1 tank proved to be perfectly water-tight. Anxiety Number 2 was accordingly also "written off."

By the 17th of March, tank No. 2 had been cleared; and we were now in a position to go "full-speed-a-head."

The only accident arising during the period of dismantling, occurred on the 9th of March. Two of the cast-iron columns and three of the lattice girders had been removed; and the pair of lattice-steel shear-legs used by the contractors for the purpose, were in position to remove No. 3 columns in sections. The lattice girders on either side of this column had been lowered safely; and the column therefore stood alone—*i.e.*, without any lateral supports whatever. The construction of the column is simple, as you see from the photo. and drawing; the sections being bolted together by internal flanges (see details shown on fig. 2). This, however, necessitated a man being lowered down the interior of each column to remove the bolts on the joints. On the column referred to, the first length had been disconnected inside, and the fitter had just emerged, and got clear with his mates, when, without any warning whatever, the lowest section snapped at the base, and the whole column fell with an alarming crash bodily through the crown-framing, into the water of the tank, which at that date was about 10 feet down from the top of the tank walls—as seen in one of the photographs.

Examination of the base showed that the bottom moulding of the column body was (as shown in another of the photographs)

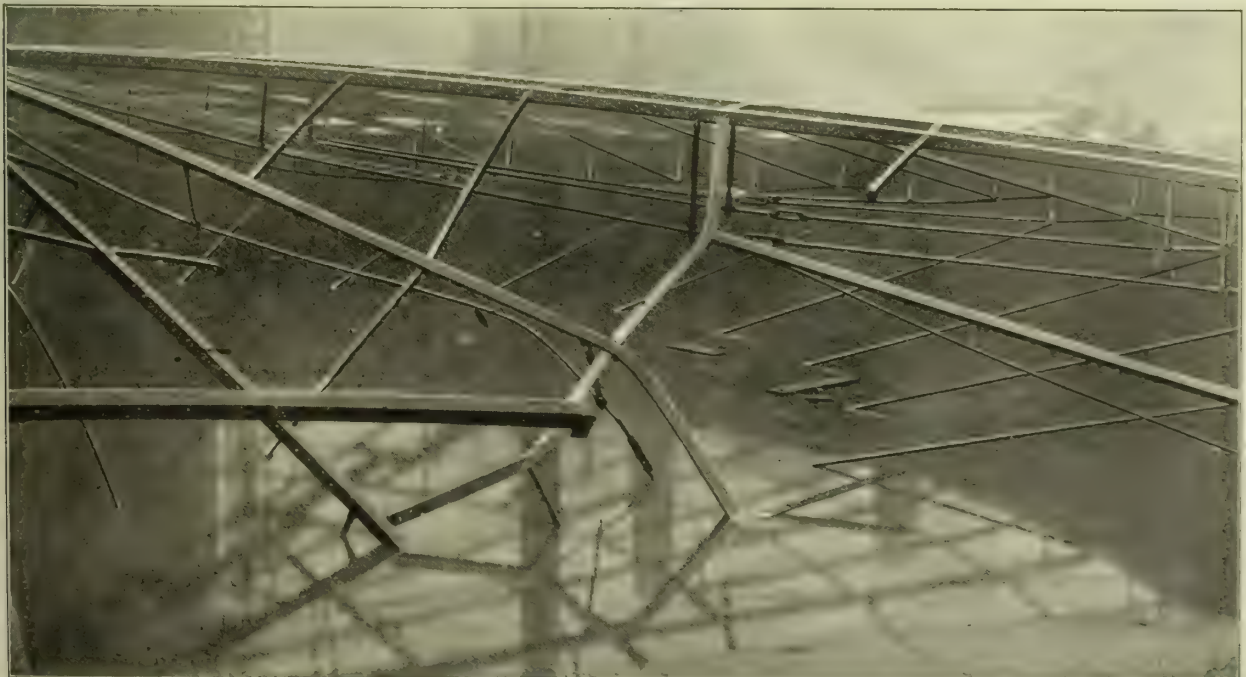
almost entirely cracked away from the base; only about 2 square inches of metal, on the whole circumference, appearing bright and crystalline.

There is, in my mind, no doubt whatever that the base had been separated from the column itself for a long time—the column being held in position for years probably only by its own weight and a top attachment by the cross latticed girders to the remainder of the framing. This was regarded as a sufficiently strong hint to walk warily with the remaining nine columns; and instructions were at once given that before any further sections were disconnected, additional guys must be attached to each of the columns, to prevent further incidents of this kind.

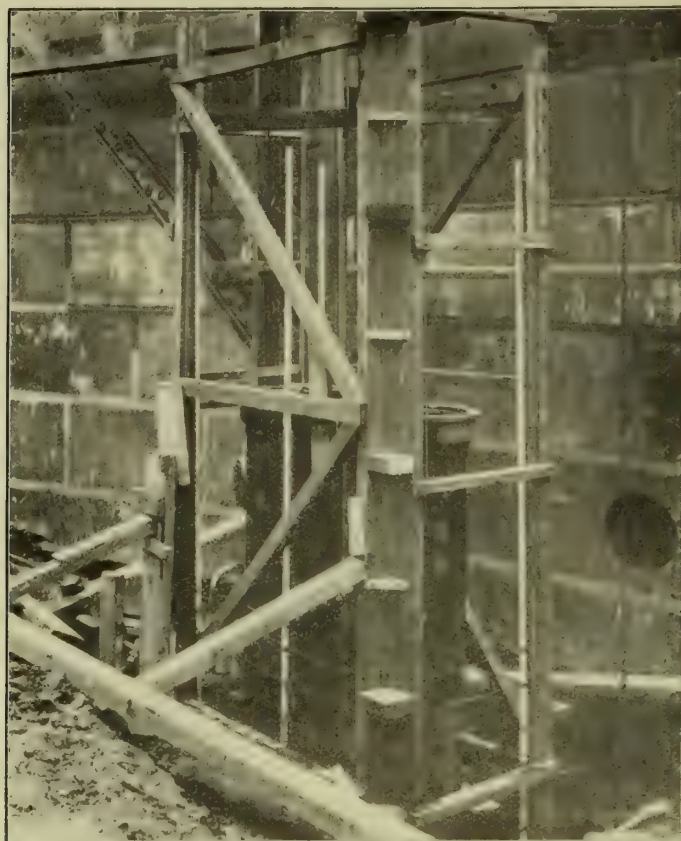
No other trouble was experienced during the dismantling of the framing, though many flaws in the castings forming the body of the columns were met with. Details on fig. 2 show the means adopted to temporarily deal with some observed blemishes.

By the 7th of April we were in a position to deal with the fixing of new additional rest-blocks required for the spiral holder. The existing rest-blocks were levelled round with a "Dumpy" level; and the figures thus obtained were used for setting out the new blocks. When completed, these were proved by flooding with water to their top level round the circumference of the tank.

An interesting point, involving some thought, now arose—as to the best method of fixing the new intermediate holding-down bolts between each pair of the existing column bases for the carriages of the outer lift, without damaging in any degree the existing tank walls—a somewhat similar problem to that of successfully putting



The Damage done to the Crown Framing.



Placing Reinforced Concrete Round the Inlet and Outlet Pipes.

"new wine into old bottles." It was decided that the best way to meet this was by a special type of front bolt, provided with a hook at the bottom end, engaging with a cast-iron block let into the face of the wall (see fig. 3).

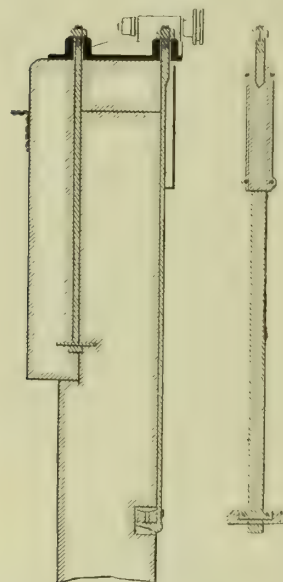


Fig. 3.—Intermediate Holding-Down Bolts.

Each bolt, before being accepted, was carefully tested in the following manner on the contractors' works, in the presence of an accredited representative of the Gas Company.

Abstract from Clause in Specification.

The front bolts for the intermediate tank carriages are to be tested at the works of the contractors, in the presence of the engineer or his deputy, and are to withstand a tensile load of 5 tons (total) without causing fracture of the heel of the strap.

Note.—The calculated total tensile stress on each bolt is $3\frac{1}{2}$ tons.

INLET AND OUTLET PIPES.

The next item of interest in my mind arose on the question of a decision as to how we were to deal with the inlet and outlet pipes for the enlarged holder. Nothing definite could be done in the matter until the tank had been emptied, a portion of the crown sheeting removed, and an inspection made, as no plans were available showing what really existed.

After inspection, the respective merits of the system of "boosting" the gas through the existing 12-inch diameter pipes or the alternative of installing new pipes of larger diameter, were considered. Finally, as the remainder of the works' mains have been and are gradually being replaced in sections by those of larger diameters, and further, on a point of costs, the latter method being decided upon, the existing pipes were entirely discarded and disconnected inside the tank to as near as possible the line of the dumphing, and the section remained in, rammed solid with concrete.

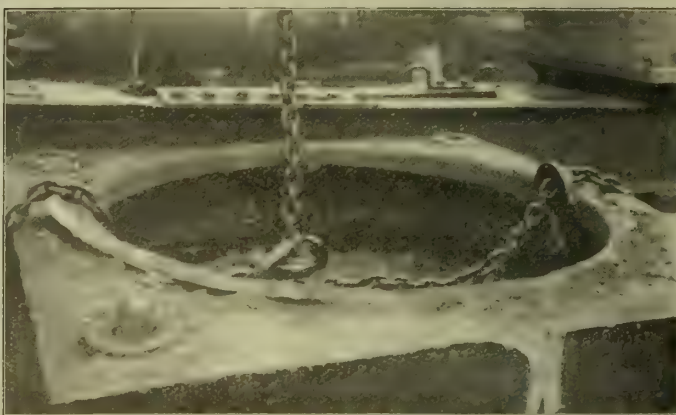
In the month of May, a start was accordingly made with the necessary excavation outside the tank walls. At a depth of 10 feet from the surface, we struck a "run" of fine silt, with the inevitable accompaniment of a slight "slip" behind the timbering, on either side of the well. To accentuate the trouble, the trunk main from the meter-house to No. 1 gasholder ran directly through the centre of this cutting; and it was now necessary to act promptly, so as to minimize all risks of serious fracture or drawn joints, and consequent break-down of the manufacturing plant. Stout cross timbers—supported on one end by the coping of the tank, and at the other by long runs of transverse timbers—were, therefore, placed; and the main was slung to these on chains which were left in position until the work was eventually completed.

Sheet piling was at once adopted, to overcome the difficulty of

the running silt. It was carried to the full depth required for the pipes—viz., 38 feet; and this proved quite efficient to stop the fault. The different strata encountered were: (1) Yellow and black dry silt from 10 feet below the ground level; (2) running silt, 7 feet; (3) black soft warp clay, 9 feet; and (4) hard dry marl clay below.

Beyond this, we had also to deal with that very general and oft-times deadly enemy, especially when encountered in this class of work in conjunction with running silt—water—at a depth of about 15 feet, and pumping was required daily.

The horizontal lengths of pipe being successfully laid under the footings of the tank walls, we next had to turn our attention to closing-up, and making completely water-tight, the opening necessary. It was at this step that we really found the water most troublesome. A constant flow, with considerable pressure behind it, was met with—due either to the tapping of an underground spring, or more probably to the backed-up water collected behind



The Fracture at the Base of the Column.

the tank walls, from a water-logged area lying in close proximity to the Holderness drain—only some yards away eastward.

The advantage of having previously cleared the water from No. 3 tank was here made manifest, as if the weight of water standing in the defective tank when full had also been against the well walls, it is highly probable our efforts might have spelled "failure" and disaster. As it was, we found it impossible to stop the leak by the ordinary method of concrete blocks and puddle and had therefore to turn our minds in other directions.

Mr. Nelson, the Assistant Engineer, suggested the alternative of a 3-inch diameter pipe, let in under the footings at the point of leakage; and this scheme after consideration, was adopted. The pipe was carried horizontally from the initial point of flow to another point 9 feet within the tank walls. A vertical pipe, furnished with an automatic valve on top, was then attached to the horizontal lengths. Details of this arrangement, also of the inlet and outlet pipes enclosed in reinforced concrete, are shown.

The space around the pipes was carefully concreted; and the mass of concrete was again cased with from 2 to 3 feet thick of good, carefully worked, clay puddle. The water meanwhile flowed up a relief pipe and over the valve-seating into the tank.

On filling the tank with water, the pressure on the inside gradually increased as the level rose and closed-down the valve firmly on its seat by counterbalance action—thus preventing any water escaping from the tank to the outside while at the same time it prevented any flow from the outside into the tank.

This I think is, so far as it relates to the tank, the full tale I have to tell you of the troubles met with in the conversion from an old type to suit new conditions. In this short paper (which has been prepared at the request of the President for the special purpose of the proposed inspection of the holder on your visit to the Company's works to-morrow), I do not purpose dealing with any constructional details relating to the new holder itself. We are not quite finished yet; but I do not think, when our labours on this section of our works' extensions are over, that the position will be that of the unfortunate crew of the "Snark," who discovered too late, to their dismay:

That the captain they trusted so well
Had only one notion of crossing the ocean,
And that was—to tinkle his bell.

Better and more material results are confidently anticipated.

We have received from Mr. Harold E. Temple, the Hon. Secretary, a copy of the "Transactions," 1908-9, of the Midland Junior Gas Engineering Association, reprinted in book form from the pages of the "JOURNAL." This is a record of the proceedings during the fourth session of the Association, the papers contributed to which certainly equalled in excellence those contained in the preceding volumes. Among the accounts of visits is included that which the Association, jointly with the other English Junior Gas Associations, paid to the Franco-British Exhibition. Copies of the volume, and of earlier sessions, may be obtained from Mr. Temple, The Croft, Warwick Road, Olton, Birmingham; price 2s. 6d. paper covers, 3s. 6d. cloth.

MIDLAND JUNIOR GAS ASSOCIATION.

The Opening Meeting of the Fifth Session of the Midland Junior Gas Engineering Association was held at the Birmingham Technical School last Saturday—the chair being taken at the commencement of the business by Mr. James Hewett, of Birmingham, the Retiring President. Subsequently, the Incoming President (Mr. A. O. Jones, of West Bromwich) took his place, and proceeded to deliver an Inaugural Address, after which, there still being some time on hand, the members indulged in a short informal discussion.

THE NEW PRESIDENT.

The minutes of the previous meeting having been read by the Hon. Secretary (Mr. Harold E. Temple) and confirmed, Mr. HEWETT said the time had now come when he would relinquish the chair. Mr. A. O. Jones, who would take his place for the coming session, required no introduction from him. He had been present at most of the meetings of the Association, and had taken a prominent part in the discussions. He was sure the members would bestow on Mr. Jones the same consideration that they had extended to him (the speaker) and other Past Presidents.

THANKS TO THE RETIRING PRESIDENT.

Mr. A. O. JONES (West Bromwich) then took the chair amid applause, and remarked that his first duty as President was a pleasant one—namely, to propose a hearty vote of thanks to Mr. Hewett for his conduct in the chair during the past year. There was an old saying that “good servants make the best masters;” and if Mr. Hewett’s ungrudging service and expenditure of time in the interests of the Association, as Hon. Secretary, were anything to go by, they were justified in expecting that he would make a good President—which the members would certainly agree that he had done. With his knowledge of the machinery, so to speak, of the Association, he had united exceptional ability, tact, and that evenness of temper which was one of the best guarantees for the smooth working of affairs.

The HON. SECRETARY, seconding, said he felt that everything Mr. Jones had said was true. He (Mr. Temple) had been brought into rather closer contact with the work of the Association than other members, in his position as Hon. Secretary, and had often had to confer with Mr. Hewett; and the help that gentleman had given had been most valuable. He had invariably been willing to spend his time in the interests of the Association.

The motion having been cordially agreed to, Mr. HEWETT thanked the members for the vote, and remarked that after all the office of President was not a very onerous, though it was certainly a very honourable, one. The co-operation he had received from all the members during his occupancy of the chair had been a source of gratification to him, and he hoped they would accord the same consideration to Mr. Jones. If the members failed to cling together, attend the meetings well, and take an interest in affairs, the Association could not expect to thrive. They desired that it should thrive; and therefore they must work together.

Mr. JONES then proceeded to deliver the following

INAUGURAL ADDRESS.

During the present year, carbonization has been, again, the subject of foremost interest among gas engineers; and the ultimate type of plant and method of working in the future still remain an uncertainty. However, we have a definite goal for our endeavours. We are all agreed that our aim is to sell more heating and lighting units for a penny than our competitors. The incandescent gas-mantle already gives the cheapest light; but we have to make some further reduction in prices before our commodity will be acknowledged as the cheapest, as well as the most convenient, source of heat and power.

In considering the question of carbonization, the variety of opinions as to what quality of gas we ought to make, and the lack of uniformity in testing it, add difficulty to the solution of the problem. But, in view of the fact that the flat-flame burner is at least five times as expensive as the incandescent gas-burner for an equal light, we may take it that the former will eventually be discarded by the great majority of consumers, and the successful method of carbonizing will be the one which provides the consumer with the largest number of heat units for a penny.

With regard to the candle power of the gas, it is a noticeable fact that the gas obtained by increased yields from a ton of coal is almost invariably tested with the No. 2 “Metropolitan” argand; and this must be allowed for in comparisons with results from works where the No. 1 argand is the standard burner. To show you the difference between the candle powers obtained by these two argands from gases of the same calorific power, I have drawn up a table of comparison. The deductions are from published results in the case of the No. 2 argand, and from my own experience in the case of the No. 1 argand tested at the 5-feet rate. As a matter of interest, I have added Professor Lewes’s results obtained by the use of the No. 1 argand at a variable rate of gas consumption.

Of course, such a table is not exact for every individual case, and does not apply at all where water gas is mixed with coal gas; but as an average for pure coal gas, it may be used to show what

Average Relation between Candle Power and Gross Calorific Power of Coal Gas.

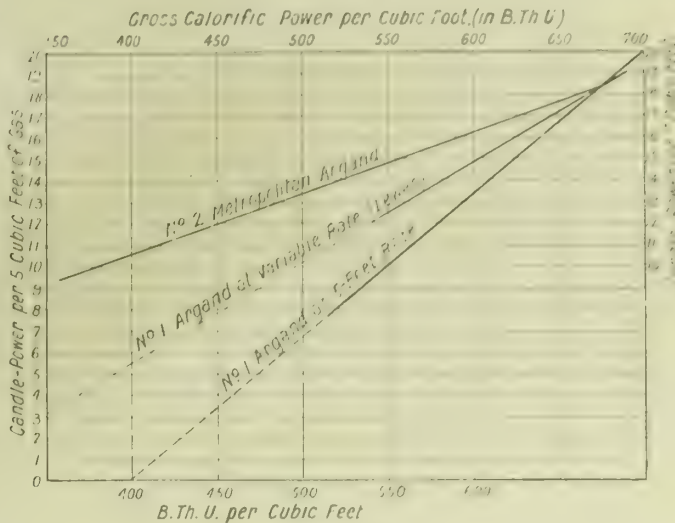


Diagram No. 1.

an important point this discrepancy is, and how necessary it will be to have a general adoption of the new standard argand if we are to make gas of 15-candle power or less. And if water gas is used to any great extent, the No. 2 argand is essential to get the proper illuminating value from the gas.

At the Institution meeting last year, Professor W. A. Bone pointed out the advantage of retaining the maximum percentage of marsh gas (CH₄) in the gas, and an examination of the composition of ordinary coal gas emphasizes this; for it will be found that the heavy hydrocarbons, or illuminants, supply approximately 77 per cent. of the light, as tested in the argand, and CH₄ and other members of the paraffin series only 23 per cent. But from the point of view of calorific power, the illuminants supply about 15 per cent., against 56 per cent. obtained from the CH₄ series; and a variation of 1 per cent. of CH₄ makes a difference of 10 B.Th.U. per cubic foot of gas.

Constituents.	Percentage by Volume Present in Coal Gas.	Illuminating Power which each Supplies when Tested in Standard Argand.	Calorific Power which each Supplies.
Paraffin series (CH ₄ , &c.)	36.2	Per Cent. 23	Per Cent. 56
Illuminants.	4.0	77	15
Hydrogen	51.5	..	29
Carbon monoxide.	5.0	..	3
Oxygen, nitrogen, &c.	3.3	..	..
	100.0	..	..

In this connection, the researches of Professor Bone and Mr. Forbes Carpenter are of the utmost value—showing as they do that, though temperature is the chief factor in the decomposition of hydrocarbons, yet surface contact, time contact or rate of flow, and the presence of moisture and carbon, all have an important bearing on the results obtained from coal distilled in a retort; the variation in the rate of flow alone being sufficient to neutralize, and even reverse, the effects of both surface contact and increased temperatures.

With these facts before us, we find that “high heats and quick gasification” is still a counsel of perfection, and a thing to be aimed at if we are to get the largest yield of high-grade gas from the coal. Furthermore, they show that our present temperatures are quite high enough, if not too high, provided we can get them more thoroughly and quickly applied, especially during the first hour of a charge, when, to all intents and purposes, a low temperature distillation takes place and 50 per cent. of the tar is formed. To remedy this, the early part of a charge must be reduced to a minimum—in other words, continuous carbonization of coal must be adopted.

Turning now from principles to practice, we find, naturally, that carbonization in bulk looms large on our horizon. We are tempted by visions of carbonizing wages at less than 6d. per ton of coal, of doing things on a large scale (which is always very attractive), of producing a thin tar and a superior coke, and of some more questionable benefits. But the dumping of from 2 to 8 tons of coal into a heated chamber is only an exaggeration of our existing unscientific methods, and from the gas-making point of view a thing to be avoided. By the mere bulk and weight of the charge, and its inability to expand much, the coal, and afterwards the coke, lies close and compact; and though this is an advantage where a hard, dense coke is required, yet it will retard the free evolution of gas. Moreover, when the crust of hot coke begins to form, its action on the portion of hydrocarbons which pass through it is very destructive; for in spite of the fact that during several hours after the beginning of the charge the conditions

are such as to yield a low-temperature product, we find the total result is a moderate yield of poor quality gas. Notwithstanding this, the safeguarding of the residual markets and other considerations may render a partial adoption of the method advisable. Mr. Thomas Glover's 21 cwt. charges at Norwich are a case in point; and his results show an improved quality of coke without much depreciation of the gas.

Mr. J. Ferguson Bell, of Derby, has shown us what can be done with horizontals; and I have already mentioned how cheaply coke-ovens can be worked. Nevertheless, all things considered, including operating wages, cost of installation, stoking-machinery required, maintenance charges, and gas production on a given area, &c., I believe vertical retorts show the greatest economy in the cost of carbonizing at present, and the most scope for further reductions. In addition to this, there is an improved yield and quality of residuals and less naphthalene, though these are as much due to the full retort as to its vertical position.

But viewing it simply as a gas-producer, we find that the intermittent system shows 11,500 cubic feet of gas of 580 B.Th.U. gross and 16-candle power (by the No. 2 argand) per ton of coal, which is no improvement on the best practice with horizontals. The continuous systems, however, show close on 13,000 cubic feet of gas of 570 B.Th.U. gross and 15½-candle power (by the No. 2 argand) per ton of coal. This is a notable advance, and is not the last word on this system (just emerged from the experimental stage); for the tar produced is thin and contains a high percentage of light oils, which points to a low-temperature distillation, and possibilities of still greater gas production.

The advisability of admitting steam to vertical retorts for the production of water gas, is a much debated question of doubtful advantage. In the first place, the water gas produced is of inferior quality, containing as it does, 8 or 10 per cent. of carbonic acid or even more, which shows that the temperature is not high enough in the retort for efficient water-gas production. I say this advisedly, because the depth of coke is quite sufficient to reduce the carbonic acid if the temperature was high enough, and the rate of production of water gas is much slower than in a water-gas generator—being, according to the Berlin tests, only about 20 cubic feet per hour per cubic foot of effective retort capacity, against 170 cubic feet in a water-gas generator.

The supposed advantages of this method of water-gas production are saving of fuel and wages; but where illuminating power is of any consequence, the extra cost of purification or enrichment required to neutralize the increased production of carbonic acid would be sufficient to counteract any saving in wages; so the question is whether there is any saving of fuel.

A vertical retort carbonizing 23 cwt. of coal per 24 hours, using coke as fuel at the rate of 14 lbs. per 100 lbs. of coal, will have 15 lbs. of coke consumed per hour in heating it; and if the dampers and air-slides are not altered during the time the retort is being used for water-gas making, we must presume that very nearly, if not quite, as much coke is being consumed per hour. Taking the Berlin figures again, we find that the water gas produced is 600 cubic feet per hour, and the coke consumed in the retort-furnace during the same time (as indicated above) is 15 lbs., which is equivalent to 25 lbs. per 1000 cubic feet of water gas. In addition to this, every 1000 cubic feet of water gas contains in itself 15.8 lbs. of carbon, as I have shown elsewhere. So this makes a total of $25 + 15.8 = 40.8$ lbs. of coke per 1000 cubic feet of water gas made in this way, as compared with 32 lbs. per 1000 cubic feet which water-gas plant makers are prepared to guarantee.

The heat from residual coke in a retort, which represents about 15 per cent. of the heat produced in the furnace, is certainly worth recovering; but there are other, and apparently more reasonable, methods of utilizing it. There is, for instance, the Bolz system, in which a water-gas generator is arranged, together with the setting producer, immediately under the vertical retorts, and hot coke is fed direct, either into the furnace or water-gas generator; and in this way, you will observe, the whole of the heat in the coke is recovered, and not a portion of it only, as is the case when steaming the retorts.

If all the coke remaining after providing for the heating of the setting was used in this way for water-gas making, it would bring the total gas made up to about 47,000 cubic feet per ton of coal; but the calorific power would be something less than 400 B.Th.U. (gross) per cubic foot, with an illuminating power of only 2 or 3 candles. However, provided crude petroleum oil could be relied upon at the present low prices—at little more than 2½d. per gallon—such a mixture could be cheaply enriched to 15-candle power of about 530 B.Th.U. gross per cubic foot, by the addition of 2 gallons per 1000 cubic feet of water gas; and the waste heat from the gases leaving the generator could be utilized for the heating of the secondary air supply to the retort-settings.

Another method of making use of the heat contained in the coke is that employed in the Glover-West vertical retort-setting, where the coke gives up practically all its heat to the secondary air entering the setting. As an alternative to the use of the Bolz system only, a portion of the settings might be constructed of the Glover-West type; and in this way, there could be obtained 30,000 cubic feet of gas per ton of coal, with a calorific power of over 550 B.Th.U. gross and 14 or 15 candle power. This would be made with a minimum expenditure of fuel and labour, leaving 5 or 6 cwt. of coke for disposal in the ordinary way.

But carbonization is not the only thing; attention to details all round is required. It is not without reason that the ordinary spoon has an egg-shaped outline, as you will realize if you try to

take your pudding with one of another shape. So nothing is too insignificant for our consideration; and it is a great mistake to magnify the importance of one thing to the neglect of others. A high yield of gas per ton of coal and cheap carbonization, though important, are not the only requisites to economy; and, in fact, nowadays, where carbonizing costs are low, their advantages are easily neutralized by inattention to other matters.

Capital expenditure requires serious consideration; and the modern practice of increasing this out of current revenue is not an unmixed blessing, especially if it makes us more careless of such expenditure, and raises the real total capital expenditure above what it should be. For unless it gives a good return for the outlay, it is, like contributions in aid of rates, money which a wiser and more far-seeing policy would devote to lowering the price of gas. The increase of capital spent on machinery and labour-saving appliances is also a modern tendency, and should not be undertaken without making a liberal allowance for maintenance and depreciation, &c., inasmuch as it necessitates the addition of skilled mechanics to the permanent staff engaged at the works, and accounts for the increasing cost of works' maintenance charges. Again, capital outlay for minor recoveries—such as cyanogen, &c.—must yield a proper return. A result obtained over a short period under special supervision is not the criterion, but uniformly good results daily for twelve months, because profit per annum is the thing to measure its success by.

Another matter is the importance of levelling-up by every legitimate method, not only the day load compared with the night, but the summer with the winter. As an example of how cost per 1000 cubic feet of gas increases as the consumption of gas falls away in the summer, the works wages-sheet may be taken. Every works of any size has a certain number of men—including clerks, foremen, engine men, artisans, &c.—constituting an irreducible minimum, even in the lightest summer months, who form a permanent staff. Its cost per 1000 cubic feet is at a minimum in winter, when there is a large production of gas to spread the expense over; but as the gas made decreases to the summer minimum, the staff is not decreased in proportion, and so the cost per 1000 cubic feet of gas goes up. The effect of this in the case of the West Bromwich works is that the total cost of wages in the winter is only 2½d. per 1000 cubic feet of gas; and it gradually increases, till in summer it reaches 4d. per 1000 cubic feet, or about 60 per cent. higher.

Cost of Wages per 1000 Cubic Feet of Gas Made; Showing the Influence of Permanent Staff on Same as the Make of Gas Decreases.

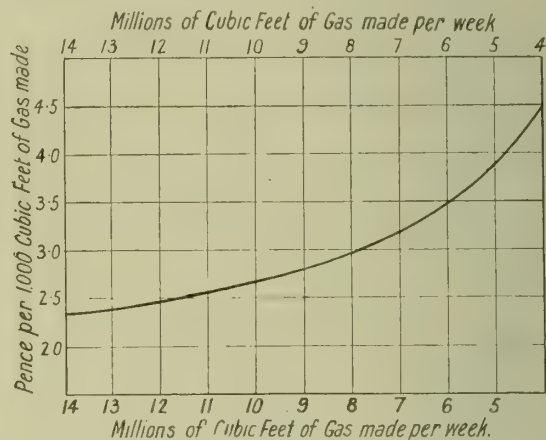


Diagram No. 2.

This is only one instance. But all standing charges have a similar effect on the cost per 1000 cubic feet; and when they are all added together you can appreciate what a big difference it makes. These are some of the problems; but there are many others requiring our attention, if the future usefulness and success of the gas industry is to be maintained.

In conclusion, we have much to learn, and a right understanding of the science of our work is essential, because no good practice ever came of an unsound theory. Practice without science, we are told, is like a pilot without rudder or compass. But we must cultivate, not only the science, but the art of gas engineering. We must not only have the knowledge, but be able to apply it in a practical way; and by studying economical as well as purely scientific ideas, learn to discriminate between what is theoretically inviting and what is practically advisable. As students, we must remember that we bring a wrong measure of things from books and study if we do not correct it by the hard test of experience in the trials and difficulties of our daily work. For there is required, not only the acquisition of knowledge, but the exertion, and constant application, of those untought attributes and faculties of character which give sagacity, self-reliance, sound judgment, and the just decisions of reliable and capable men—men of integrity and perseverance, working for the dignity and reputation of an honourable calling.

VOTE OF THANKS TO THE PRESIDENT.

Mr. R. S. RAMSDEN (Burton-on-Trent) proposed a vote of thanks to Mr. Jones for his able and instructive address, which gave them, among other things, a *résumé* of the latest results of the different

methods of carbonizing. He thought one of the most encouraging points about the address for those who had to work with the older types of plant was the remark that at any rate in some cases the results obtained with vertical retorts were no better than the best results which were secured with horizontals. This showed that, before they decided upon the wholesale abandonment of existing systems of carbonization, it would be as well to look round and see whether, at a moderate outlay, the plant they already had could not be arranged so as to give the results they wanted—a satisfactory yield of gas of moderate illuminating power and good calorific value, which would meet the requirements of consumers.

Mr. W. H. JOHNS (Saltley) seconded the proposal, and said that one remark made by Mr. Jones struck him as being of great importance, and that was capital expenditure. They heard a lot nowadays of vertical retorts, high yields, gas of about 15½ candles, and calorific value of something like 530 or 540 B.Th.U.; but he thought that, before branching out into any big expenditure, it was, as Mr. Ramsden had said, advisable to look round and see whether better results could not be obtained with the plant at disposal at any particular works at the present time. The results in Birmingham with inclined retorts, he thought, were coming on very close to what was secured with verticals on the Continent. In the latter case, they claimed that they secured about 13,000 cubic feet per ton of, he believed, 12-candle gas; but in Birmingham they had to make gas of 15½-candle power. At Saltley, they were making about 12,000 cubic feet per ton of 15½-candle gas; and therefore it was his opinion that, if they tested with the "Metropolitan" No. 2 burner, they could show results equally good. No doubt when new works were being erected verticals could be considered; but before incurring any heavy capital expenditure, he thought some of the modern methods of charging retorts—either with the De Brouwer or other machinery—should have attention, because there was no doubt that the results of a manager's working were best shown at the end of the year in the balance-sheet. Of course, verticals were things of the future; but, at the same time, he thought that, with proper attention paid to the existing plant, they should be able, working with the new burner, to obtain the same figures, or nearly the same figures, with horizontals.

The vote was heartily carried.

The PRESIDENT, in returning thanks, said that he was more than repaid if he had been able to say anything of interest to the members. When he undertook the presidency, it was not because he felt he was the best man for the position, but because he was anxious to do what he could for the Association. He hoped every member would have this feeling, because it was only by united effort that they would be able to go on in the future as they had done in the past.

AN INFORMAL DISCUSSION.

Mr. JOHNS suggested that, as the business before the meeting had been completed at rather an early hour, a little informal discussion should take place on anything of general interest that might occur to the members.

The PRESIDENT thought this a very good suggestion, and remarked that the Presidential Address just delivered by him was quite open for discussion, if those present cared to take up any of the matters dealt with in it. One of the points he had made which appeared to him to be rather important was the different results obtained in testing for illuminating power, by the No. 2 "Metropolitan" argand and the No. 1 argand, gases of the same calorific power. The gas obtained by very high makes was almost invariably tested with the No. 2 argand; and as most gas-works in the country used the No. 1 argand, and the No. 2 gave a very much higher result, it was rather unfair to compare the two. This fact should be taken into account when comparisons were made between works using the No. 1 burner and those where the No. 2 argand was employed. The intermittent system of vertical retorts, he mentioned, was no better than they were doing at present as regarded results; but the continuous method of working, he thought, showed an improvement.

CAPITAL EXPENDITURE.

Mr. F. J. WARD (Knowle) remarked that, with regard to capital expenditure, he did not think it was quite the correct thing to say that those undertakings which had a rather large capital expenditure were embarrassed as compared with others where the figure was smaller. It might be that in the case of the concerns with the smaller capital expenditure the plant was very inefficient, and that those with the larger outlay had plant capable of producing results which more than covered the difference. Capital, of course, should always be most carefully expended. It was possible to spend money on ornamentation, &c., which was totally unnecessary, and produced no results, while it added to the maintenance. Personally, he deprecated anything in the way of elaboration; but in his district, which was largely residential, they had to elaborate somewhat, as otherwise the people would look down upon them with scorn. Taking the Birmingham works, for instance, he thought they were not situated in residential districts; and in such a case as that it was possible to economize largely in respect to capital expenditure on the ornamentation of retort-houses and such things as those.

INCANDESCENT BURNER MAINTENANCE.

Mr. RAMSDEN said there was one subject not touched upon in the address which was coming rather to the fore now; and as a

discussion on general matters had been suggested, perhaps some information might be elicited in regard to it. He referred to the maintenance of consumers' incandescent gas-burners. In Burton-on-Trent, the ironmongers and gas-fitters were never very pleased if the Corporation did work themselves; and so an effort was made to induce these tradesmen to take up a maintenance system at so much per burner per annum or per quarter inclusive or exclusive of material. After a good deal of persuasion, these people sent out circulars saying what they were prepared to do; and he did not think they obtained more than half-a-dozen customers. The line he was working on now was to have a paragraph in bold letters on the gas bills, asking anyone who had complaints to make regarding his gas supply to communicate at once with the gas-works, when a man would be sent on free of charge to investigate. If the defect proved to be only a slight one, remedied by (say) cleaning out a burner or blowing through a fitting, and no materials were required, no charge was made. If a customer had mantles in stock, the Corporation put them on; but if he had not, then they fixed new mantles and charged the ordinary retail price. This was what Croydon, he thought, were taking up, after having tried a maintenance system on inclusive terms. It would be very interesting to hear what other gas undertakings were doing.

Mr. R. J. ROGERS (Birmingham) said that, as Mr. Ramsden had raised the point of maintenance, perhaps the members would like to hear a few words about the Birmingham system. In the first place, the youths that they employed on this work were youths who, when they came to the department, were quite new to the work. They were not fitters' boys or youths who had had anything to do with gas-burners. The Corporation gave them a workshop training for (say) a month, and provided them with old burners—purposely knocking up the gas-nipples or opening them out. They were taught thoroughly how to adjust, so as to secure the best results, burners of upright, inverted, or intensified types. At the present time they did not in the maintenance department undertake to maintain high-pressure burners; but no doubt this would come later on. After about a month or six weeks' training, these youths were capable of going out on the district and maintaining, cleaning, and adjusting the burners. At the present time they had something like 17,000 or 18,000 burners under maintenance; and the scheme had only been in operation about eighteen or twenty months. It was giving general satisfaction. It might be interesting to the members to know what method of fitting-out these youths was adopted. Each one was provided with a dust-sheet, a pair of canvas slippers, an apron, and all necessary tools for adjusting and cleaning the burners. They had a specially made anvil or tool for inserting inside the nipple of the burner, so that the youth was able to rivet or hammer up a gas hole. They found this was a very great convenience. In the case of the old "C" upright burners—of which there were a great number even now in use—it saved knocking the small piece of metal out of the nipple and thus spoiling it. This was a small point; but at the same time it was an interesting one. Owing to the rather scattered nature of their area, and to there being a great number of consumers in some of the outlying districts, the department provided a cycle with a special outfit on the front of the machine, so that if they got a complaint from a consumer some miles away, a man was able to go straightaway on the cycle and attend to it. In this way, they did not leave a consumer in darkness at night when it was possible to avoid it. Of course, they charged for maintenance. They fixed an inclusive price for the labour, and charged the consumers for each mantle that was fitted. For the mantles they charged the ordinary retail price; and usually a visit was made once a month. In the case (say) of a shop or factory, however, where the burners required to be cleaned fortnightly or even weekly, they only made the same charge. Any number of visits would be made for the same amount.

Mr. RAMSDEN: Do you send once a month whether you get a complaint or not?

Mr. ROGERS: Yes. Continuing, he explained that they worked on the card system. Each consumer's name was registered on a card; and this card was ruled off so as to show the number of burners the youth had to clean, while there were columns left for entering up the number of mantles, chimneys, and rods used. No charge was made for rods, which were the only things they supplied free at present. On the same card there was a space for the consumer's signature, so that he could see exactly what he was going to be charged afterwards. These cards were handed to the youths in the morning; and on arrival at the office again, they were checked. During the day, the next morning's work was being got out, so that the youth gave in one lot one day and had another the next day. These cards were placed in a special book on the loose-leaf principle. The clerk entered on the office card, also on the index system, the number of mantles used; and from this the account was made out. There were thus no slips. It was much better, in his opinion, than the method of carrying on the business by means of books, which was adopted in many cases, because it allowed for expansion. With cards, an addition was very readily made. If they secured a further 1000 or 10,000 consumers on maintenance, it would be quite easy to fit them in in the proper order, so that everything would work smoothly; whereas with books it often meant the complication of matters. They found that these youths (who were about 18) now that they had been in the department for about a year and a half had become very proficient in cleaning burners, &c. Of course, great

care was taken to choose the right sort of person. It was no use employing heavy-handed youths for such work. Especially for dealing with consumers in large residential districts, it was necessary to get intelligent youths who were able to answer any ordinary question. Of course, they did no actual fitting work. They had slips provided; and in case a consumer wanted any gas-fitting done, or work of that character, the youth had to put it down on the order slip, and hand it in to the office at night. A complete uniform was provided for the youths, including a special vest, so that the wearer, when walking to his job, did not have a lot of things bulging out of his jacket pockets. In fact, there were no pockets in the coat. On removing the jacket, he had underneath the special khaki, sleeved vest, with pockets in it for tools; and this always looked nice and clean in the house for working. Mr. Ramsden mentioned the question of free maintenance. Personally, he believed—though perhaps it was rather early to forecast—that sooner or later the majority of large undertakings would have to come to this method. From his own experience of mantle maintenance, he thought that it would be much better, for this reason: Under the present arrangement, they got a set order of going round these jobs once in four or six weeks; and very often they found the burners that had been cleaned about a month before really did not require then to be attended to again. Some would go three months or six months; and others, again, wanted cleaning every fortnight. Therefore he thought it would be better if some method were adopted whereby a consumer could request the gas undertaking to send a man to clean burners just when it was required. Under the present conditions, occasions arose when a youth who went to a job might be more or less in the way, through having called at an inconvenient time. It was rather difficult to speak on the matter without taking everything into careful consideration; but the change suggested might mean a large fluctuation in labour. They might want twenty men one day, and only ten the next. All these points would require to be thought out; but there was no doubt that in the future something of the kind indicated would have to be done by gas undertakings if they wished to maintain and develop their business. It was a most important phase of their industry that they should look after this sort of thing, because it was no use getting high yields, &c., in the retort-house if they did not satisfy the consumers, for this was the point that told.

The PRESIDENT said they owed the speakers their thanks for the interesting remarks made. At West Bromwich, they had a sort of combination of the two systems. They had a periodical payment arrangement; and they also kept a staff of men to attend to burners as required. He fully agreed with those who thought that the distribution department was not a thing to make money by, but to increase the business of the undertaking. He did not think it should be a profit-making part of the concern at all. Everything should be done at the lowest possible cost, so as to encourage the consumers to use as much gas as they would.

PROGRAMME FOR THE SESSION.

The subsequent meetings and business for the session will be as follows: Nov. 13, a visit to the Foleshill Gas-Works of the Coventry Corporation. Dec. 11, a paper by Mr. C. C. Barber, on the "Erection and Construction of a New Retort-House at the Adderley Street Gas-Works." Jan. 8, a visit to Messrs. Hardman's tar distillery. Feb. 12, papers by Mr. P. C. Balcon, on "Calorimetry," and by Mr. W. Todd, on "Meters and Meter Repairing." March 12, annual general meeting—election of officers, &c., and a paper by Mr. B. J. Bell, on "Competition and the Development of Gas Sales." April 9, a visit to the Sutherland Meter Company's Works. June 11, a visit to Malvern.

Large Order for Stoking Machinery.

One of the largest orders for stoking machinery ever placed in this country is now being executed by Sir William Arrol and Co., Limited, of Glasgow, for the South Metropolitan Gas Company. The order comprises eight Hunter-Barnett coke-pusher discharging machines and ten Arrol-Foulis charging-machines. The eight pushers and eight of the charging-machines are for the Company's East Greenwich works; the other two charging-machines for the Vauxhall works. After this machinery is introduced at East Greenwich, the only type of machinery there employed will be the Hunter-Barnett 20-feet through coke-pusher dischargers and the Arrol-Foulis charging-machines. The equipment of the station throughout with this type of machinery is to enable the Company to charge their retorts with a weight of coal up to 12 cwt. One of the outstanding points in favour of the Arrol-Foulis charging-machine is its ability to put in larger or smaller charges of coal as may be required from time to time. The necessity for this arises, it is hardly necessary to point out in this connection, from the fact that while some coals expand considerably in carbonizing, others shrink in the process; and to obtain the best results from the new method of operating the retorts, it is necessary that these should be so filled as only to leave just sufficient space for the egress of the gas. The time allowed for carbonizing these large charges has been extended to twelve hours. We understand that the order here referred to was placed after full consideration by Mr. Carpenter of the various new methods proposed for coal carbonization; and that the Company contemplate extending the machinery to the whole of their production.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

The work of the Scottish Junior Gas Association for the session was inaugurated last Saturday afternoon, when the Eastern District held their sixth annual meeting in the Heriot-Watt College, Edinburgh. There was a very good attendance.

The HON. SECRETARY AND TREASURER (Mr. J. DICKSON, of Kelty) said he had received a telephone message from Mr. A. Morton Fyffe, of Dundee, the retiring President, stating that he found it impossible to attend the meeting. There was an exhibition going on in Dundee, and Mr. Fyffe had been in Carlisle for the previous two or three days, in connection with the post of Engineer and Manager there, which he had unfortunately lost by one vote. Things were requiring attention in Dundee, and he had been obliged to ask him (Mr. Dickson) to express his great regret at not being able to be present. He had letters of apology also from Mr. A. Wilson, of Glasgow, and Mr. W. B. M'Lusky, of Perth. Mr. H. Rule, of Falkirk, the President-Elect, was present, and would be pleased to proceed with the business.

Mr. RULE, having taken the chair, thanked the members for the honour done him in electing him President. He also expressed regret at the absence of Mr. Fyffe, and his pleasure at seeing such an encouraging attendance of members, which he was sure augured well for the rest of the session.

The minutes of the last annual meeting, the report of the Council for the past year, in which the work done was reviewed, and it was stated that the membership numbered 85 (10 honorary and 75 ordinary members), and the Treasurer's report, which showed a credit balance of £12, were submitted and adopted.

The PRESIDENT proposed a hearty vote of thanks to the Hon. Secretary and Treasurer for his labours in the past session. He said that, as a member of the Council, he could appreciate the amount of work which Mr. Dickson put into the business of the Association; and he was sure that much of the progress they were making was due to this.

The proposal having been cordially agreed to, Mr. DICKSON returned thanks.

The PRESIDENT then asked the Hon. Secretary, in the absence of Mr. Fyffe, to accept for him the President's Medal. He said he was sure they would all agree with him that Mr. Fyffe had performed his duties, first as Vice-President and latterly as President, most admirably. His conduct in the chair had been at all times dignified and courteous; and he had carried on the work of the Association with great zeal and energy. He would ask the Hon. Secretary, in handing the gift to Mr. Fyffe, to convey to him their thanks for his past services, and their hope that he might still continue to take an interest in the work they were doing.

The HON. SECRETARY said he would have much pleasure in handing over the medal to Mr. Fyffe on an early opportunity, and in doing so would express to him what the President just said.

President's Inaugural Address.

The PRESIDENT then delivered his Inaugural Address, in the course of which he said:

In looking back upon past years, I think our Association may claim to have carried out very well indeed its aims and objects as laid down in its constitution. There is one exception, however, and that one I should like to see inaugurated soon—viz., a library. We cannot all afford to purchase the latest books in connection with our industry, however much we may wish to keep abreast of the times; and some such means as this, whereby we can have the perusal of those books, will, I am sure, be highly welcomed by all of us. This idea has been in my mind for some time; but the difficulties in the procuring of books and the subsequent issuing of them to the members prevented me from bringing the matter forward earlier. In this connection, there are one or two suggestions I might make. The first is that as the Association at present has not the funds to fit out a library with a sufficient number of books, I would suggest that any member possessing (say) some text-book which he has read might make a gift of it to the Association. In this way a sufficient number of books could be got to start the library; and then at the end of each session, if the Association has a surplus, a part of it might be spent in the purchase of additional books, or there might be a voluntary annual subscription of (say) 1s. per member towards the library fund. Secondly, in the issuing of books and the carrying on of this scheme, there will devolve upon the Secretary some work in addition to his already onerous duties. Should the idea be adopted, however, from what I know of our present Secretary, he will not grudge the extra work in this connection. Having broached this subject, I leave it with you, and trust this valuable adjunct to our Association may be an accomplished fact before long.

Coming now to the gas industry generally, a glance at the returns of the various gas undertakings throughout the country forms most interesting reading. [The President quoted statistics in support of this statement.] The figures are indicative of the present healthy state of our industry; but there is still room for further expansion, and with so much keen competition there is more need than ever for the energetic pushing forward of the claims of gas.

In view of the fact that in Scotland at the present time there

are several gas-works about to be taken over by the Local Authorities—viz., Kirkcaldy, Carnoustie, and Fraserburgh—I may be pardoned for bringing forward a few thoughts on the subject of "Local Authority v. Company in Gas-Works Management." This question is usually one in which the gas manager, whatever his opinion is, has no voice, but has just to accept the inevitable. In Scotland, the usual procedure in the acquisition of gas-works from a company is for the local authority to adopt the Burghs Gas Supply (Scotland) Act; and the purchase price of the undertaking, failing a mutual agreement between the parties, is usually settled by arbitration. It would appear in the majority of cases that the local authority has to pay very much more than the stock value of the concern, for the average price paid per £100 of stock in the case of 71 gas-works (14 Scotch) was £196. This means that the local authorities have to pay interest on £196 at (say) $3\frac{1}{2}$ per cent.; and this would have enabled the gas companies to pay a dividend of nearly 7 per cent. It is unfortunate that local authorities, in their endeavour to acquire gas undertakings for the good of the community, should have to pay so heavily; for there is no doubt that there are many gas-works at the present time suffering from over-capitalization from this cause, as evidenced by the selling price of their gas.

There are, of course, advantages to be gained by local authorities acquiring the gas-works. In some places, excessive dividends, shared in by a few, become the property of the ratepayer, who benefits accordingly on a reduction in his gas bill; but the most valuable point to me in municipal management lies in their power to tackle the smoke abatement problem, which is becoming a more and more pressing one every year. We all desire to have clean cities and towns, from a health point of view as well as the pleasure given to the eye. It has been estimated that upwards of 32 million tons of coals are used in this country in domestic fires. Here, then, is a field which can be effectively tackled by local authorities by advocating strongly the use of gas cookers, fires, and radiators in the domestic household, and letting these out on hire—if not free, at least for a nominal sum—and so at the same time encouraging the use of their own manufacture.

Depending as we do on the cost of coal as one of the main factors in the price of gas, most of us will view with some concern a proposal of the present Government to tax the mineral rights on minerals over 4s. per ton. This tax will—and it is difficult to see otherwise—almost certainly have to be paid by consumers of coal; and the gas industry, using as it does one-tenth of all the coal raised for home consumption, must inevitably have its share to pay. With this coming hard after the almost already regretted Mines (Eight Hours) Act, what the ultimate effect will be we can only surmise; but the outlook for cheaper coal, should the proposal become law, is anything but hopeful in the immediate future. Would it not be better just now to preserve our supplies in this country by resorting again to the taxing of exported coal? Failing the discovery of some other fuel taking the place of coal, some measure such as this will, sooner or later, have to be taken. At the same time, by the universal adoption of cooking and heating by gas, the waste accruing from the use of coal in domestic fires will be avoided; and it is to attain this end that our attention must be given.

The system of carbonizing coal in vertical retorts, so far as it is applied to gas manufacture, though farther on than the experimental stages in England and the Continent, has not yet reached the practical stage in Scotland. I believe, however, that there is at least one experimental setting north of the Tweed. But it does seem strange that Scotland, the home of oil-works, where this method of carbonization is in use as applied to the manufacture of shale oil, should be among the last to take it up in connection with gas-works. The results of installations at Kensal Green and Burnley are being awaited with the greatest interest—by none more than those who have charge of congested works; for, to my mind, one of the advantages of this type of setting appears to be the large amount of gas produced per square foot of floor area, as compared with horizontal settings.

There are so many details nowadays requiring a gas manager's personal attention, especially in medium and large-sized works, that he has not the time that he would like to devote to all departments. The costs, therefore, and the particulars of daily production, output of gas, and carbonizing records, as well as working costs, must be condensed into a form that can be appreciated at a glance. A short time devoted to the study of costs, both of one's own works and others, is well spent; for, with the advent of so many labour-saving appliances, it is more necessary than ever for the manager of a works to know how his working costs compare with those of the previous weeks, months, or years. As this subject formed one of last year's questions submitted (but unfortunately not discussed), I offer no apology for now bringing up the matter.

The President exhibited some diagrams illustrating this portion of his address, and said the systems shown were very elastic, and could be enlarged or modified to suit any works. The first one was a carbonizing record giving for each day the amount of gas manufactured from 6 a.m. to 6 p.m. and from 6 p.m. to 6 a.m., as well as the gas sent out for these periods and the stocks of gas. From the column "Ovens in Use," the life of each setting could be obtained. The totals could be added up at the end of either a week or a month; and the whole of them gave a sheet of valuable figures. The second diagram was a cost sheet, and was suitable for monthly statements. It enabled the user to compare these costs with corresponding periods. Any excessive item could be

detected in a few moments, and the reason for it gone into. The President said he did not bring these systems before the members as the best or the most elaborate that could be produced; his object being simply to emphasize the advantages accruing from the use of some such systems as those he had exhibited.

With the advent of each new type of burner, a higher duty per cubic foot of gas consumed in each is claimed; and the limit of improvement in this direction seems far from being reached. One of the biggest improvements, however, in connection with incandescent lighting would be an indestructible mantle. I believe that efforts are being directed towards this end; and when it does come, it will be one more advantage in favour of gas, and assist in still further popularizing this already popular light.

Technical training is becoming more and more necessary to the gas engineer. Indeed, one will not go far nowadays without it, whatever may be his sphere in life; and when we consider the facilities given at the present time for technical education at very low cost, in the Heriot-Watt College, in the Glasgow and West of Scotland Technical College, and in the various other science schools throughout the country, surprise must be felt that more advantage is not taken of them. I can testify to the benefits derived from classes I attended at both of the above Colleges; and I would earnestly advise all who would go farther in our industry, and who have not gone through any particular study there, to begin at once.

Mr. W. DUNLOP (Kirkcaldy) asked the members to accord a hearty vote of thanks to the President for his able address. He agreed with Mr. Rule in what he had said regarding a library; and he should like to see one established at an early date.

The President returned thanks, and said it had been their custom, in past years, for the business of the opening meeting of the session to conclude at this point. But they were that night to be favoured with an address from Mr. Herring. They were glad at all times to have any of their honorary members with them, because it gave them encouragement in the work they were doing. Mr. Herring's arduous duties did not allow of his attending their meetings very often; and they offered to him a very hearty welcome. Their relations with him began at the first meeting of the Association, at which he was present; and he had always kindly given them permission to visit the Granton works. Mr. Herring did not require any introduction from him; and he would just call upon him to give them his address.

Address by Mr. W. R. Herring.

Mr. HERRING gave the following address.

I have watched with considerable interest the proceedings of the Association, and the interest that has been taken in it by many of its members; and though I have not had the opportunity of being present on more than one or two occasions, I am conscious that really good and effective work is being done, and work which will inevitably redound to the credit of its authors and to the profit of the undertakings with which they are connected. I sincerely hope it may also enhance the monetary advantage to themselves.

Personally, I think insufficient encouragement is given to the junior members of the staff for the extra time they voluntarily devote to acquiring knowledge which they apply in the discharge of their every-day duties; and I was so convinced on this point some years ago, that, in organizing a system of apprenticeship covering all the various departments of the undertaking which I have the honour to control, I not only stipulated the subjects which must be compulsorily taken up at night schools, the Heriot-Watt College, and similar institutions, but I went farther, and attached a monetary value to "pass certificates" in the subjects more specifically associated with the work of the apprentices engaged in the respective departments.

It is a misfortune that at the present time few of us are permitted to acquire knowledge for its own sake, as the philosophers of old were able to do. The mission of most people now is the application of knowledge for commercial profit. I am, therefore, a staunch advocate of the principle that he who acquires knowledge, having even only an indirect bearing upon the particular work he is engaged upon at the moment, should have a recognized monetary reward in advance of another similarly placed, who has not taken the trouble to acquire special knowledge; for such a person must be a better man and a more efficient worker.

In the case of the Junior Associations, it will perhaps be not out of place to say that the majority of the members are looking forward to the day of promotion to more important positions, which will not only bring with them higher pay and greater responsibilities, but usually afford less time and opportunity for acquiring knowledge of the many branches which now go to make up the daily work of the responsible head of a gas undertaking. So that the importance of taking every possible advantage of one's present-day opportunities cannot be too strongly urged, and every hour uselessly spent should be looked upon as a monetary loss, if not to yourselves, then to the position you may be ultimately called upon to fill.

One of the most important features of the present time is the fact that the efficiency of established practice is not taken for granted. Routine must justify itself; and everything in connection with the administration, working, and equipment of a gas undertaking is being questioned and subjected to very rigorous analysis. An important change has come over the industrial and scientific world within the lives of the youngest member present. All branches are now engaged in reconsidering their relative

positions; and conclusions which sufficed our fathers and younger selves are being sternly questioned to-day. Up to a comparatively few years ago, science and practice in industry (where science prevailed at all) was established on what was then considered an immovable basis. What was, was considered best; and the practice and routine was unalterable. Even our text-books on science in all its branches taught us the limitations beyond which it was useless to contemplate advancing. What is the position to-day? These limitations have been far out-distanced; and what was considered impossible only a few years ago is now established practice.

Perhaps the reason of this was that science acted little better than analytically—dissecting the practice of the past, and setting forth rules and data for what practice had already accomplished, and thus setting limitations beyond which we were taught or led to infer that it was fruitless to venture. The exigencies of commercial competition and the practical demonstration of the rapid advance of America and Germany in the industrial and scientific world, however, spurred on our practical men again to advance. This time they wisely determined that science should be at their back; and it is only by a judicious union of science and practice that industrial advance can be made commercially possible.

So far as the gas industry in our country stood, at the time of which I am speaking, in relation to its compeers abroad, it must be admitted that the British gas engineer has nothing of which to be ashamed. So far as the Continent of Europe is concerned, where I had occasion to visit practically all the important gas-works, there was nothing of importance that was not already more than established on a more general scale in our own country, thanks to the enlightened policy of our Technical Press, who had kept the British gas engineer fully informed of what was going on abroad. So far as America is concerned, it was almost exclusively devoted to the practice and manufacture of water gas, and has only recently again turned its attention to modern coal gas manufacture. In passing, however, we must give credit to our Continental friends for the introduction of regenerative furnaces; and though they were adapted and very greatly simplified for British practice, their home is on the Continent, if we exclude the development of the late Sir William Siemens, which was applied to a limited extent in some works. As we know the system to-day, it is purely British.

In many respects the British gas industry was no further advanced than other industries in this country. The necessity for labour-saving devices was not appreciated, and their application was on a most limited scale. The old methods had been repeated from time to time and from place to place, and very little originality prevailed as between one works and another. Contrast these conditions with what you know to be the case to-day, and you will, I am sure, appreciate what an advance has been made, particularly in the method of handling the raw and residual materials resulting from the process of gas manufacture, whereby hundreds of thousands of pounds a year have been saved by the introduction of what, after all, is a simple and easily repairable mechanical device, to say nothing of the newer methods of carbonizing, by mechanical chargers, inclined retorts, and what will undoubtedly be the system of the future—the vertical type of retort, with which we are so familiar in Scotland associated with the shale-oil works.

In suggesting that you should contrast the conditions of the old type of works with the new, I am also disposed to ask you, in passing, to contrast the advantages which the junior members of the profession now possess, as compared with the advantages of but twenty or fewer years ago. At that time, visiting other gas-works and works of a kindred character by the junior staff collectively was undreamed of, and even individually was not indulged in. The necessity for the junior members of the staff seeing other works performing the same tasks in a different manner was even discouraged, if not forbidden. Suggestions emanating from a subordinate were often received coldly, if not in other terms; and as for a junior member of a staff communicating his views either to a meeting or in a form whereby it became the property of the Technical Press, it would have been considered a crime that would have met with stern rebuke. Think of these conditions for a moment, and then contrast them with those that you at present enjoy. The utmost freedom of intercourse and inspection, free speech, and the liberty of laying before your seniors propositions for improvement in methods and practices, and having them appreciated, even if not put into practice—this is indeed a great step in advance.

I do not, of course, suggest that everything the junior member of the staff, with his necessarily limited knowledge of all internal and external and other influences which go to affect the well-being of an undertaking, may bring forward is always a proposal that could be carried out, or one it would be wise to follow. On the other hand, there are many enthusiastic youths who, if given free play, might turn the undertaking topsy-turvy two or three times a year. I merely wish to indicate that a properly reasoned suggestion, placed before a superior in a proper way by a junior, will to-day receive the utmost consideration at the hands of his chief. Such a policy must tell for the efficiency and advancement of the interests involved; and, properly directed, it is calculated to be of inestimable value to the undertaking where it is carried out, and indirectly to the advancement of the gas industry as a whole.

It is a little difficult to prescribe the means by which the best can be made of the circumstances that now prevail; but a few

hints to guide you in approaching such a question may not be out of place. In the first instance, I have a profound belief in appreciating the practice that prevails, but only until I have had time to intelligently investigate it from all points of view. By this I mean that what is established practice is, or was, founded on sound reason and common sense, and represents at least the average of intelligence that has been brought to play upon the particular issue. It is therefore of supreme importance that, before questioning its accuracy, we should first ascertain the source of its origin. Maybe we shall discover that, in process of time, the conditions which necessitated the practice that prevails have so entirely changed as to necessitate also the abandonment of the practice, and that what is is not the best suited to accomplish the object in view.

Before, therefore, rushing forward with suggestions for altering the present methods, it is first of all necessary to appreciate properly, and grasp in its complexity and also in its simplicity, the primary object in view. Next in importance is to consider the means at present employed for accomplishing that object, and to discriminate whether they are the best and the simplest, or whether, by some change, the same could be achieved better, or even as well, at less expense; for, after all, the whole of our work is subjected to the question of pounds, shillings, and pence. Many, many things could be done differently; but if they cannot be done as well or better at the same or less expense, there is little, if any, reason for changing from what is to a newer method, excepting when the change relieves the operatives from onerous work that can be as well performed by mechanical means.

As juniors, you have even greater opportunities than the seniors in taking up these questions. You can, by keeping comparative notes of results in relation to costs of the particular part or parts for which you may be responsible, compile data which your superior would be glad to have submitted to him. If you could at the same time show clearly, or even suggest, that, by some change, money would be saved, you can depend upon it that you would get a favourable hearing, and I trust also some share of the economies brought about.

It is not necessary to look for great and sweeping reforms, as these can only come after most mature consideration and experimental development in your own or other works. But there are many practical points which the juniors can bear in mind and put into daily practice. For instance, you cannot expect to have well-heated retorts without having clean fires and clear flues. You cannot expect to get a good make of gas per unit of coal used if you have not clean ascension-pipes and a minimum seal in the hydraulic main, which, in its turn, is influenced by the steady running of the exhaustor and freedom from pulsation in the mains. Sometimes you will find that you can afford to run the exhaustor harder when the mouthpiece doors are closed than during the process of charging and drawing. Then, again, the illuminating power of the gas cannot be kept up unless all the joints on the vacuum side of the exhaustor are sound and airtight. This can be easily tested periodically by putting a slight back-pressure on the entire system, and testing the whole of your joints, from the exhaustor to the ascension-pipe, with soap and water in the ordinary way.

Little can be said with regard to the condensers, provided they are sufficient in area to give the gas time to pause and deposit its liquid and solid impurities and reduce its temperature to a normal degree. The washers and scrubbers require daily attention, in order to prevent the escape of the minutest trace of ammonia past the outlet; and, on the other hand, the unnecessary use of water and dilution of the resulting liquors. Two or three bucketsful of a soft soap solution put into the fresh water inlet periodically act like magic in cleansing the washer and its internals from the tar and oily deposits which inevitably accumulate.

As to the purification, oxide of iron is now almost exclusively used; and there is no reason in the world why it should not be. The carbonic acid left in the gas is merely a diluent, and represents so many candles of illumination lost or to be made up by other means. With oxide of iron purification, as in other methods, it is most important that the temperature of the boxes should be maintained at not less than about 55° Fahr. From this up to 70° is quite a practical region within which the material in the boxes will do its best work. But anything above 70° should be guarded against; and the temperature can be kept up to the desired degree by the admixture of known percentages of atmospheric air or oxygen carefully controlled, preferably under a pressure apparatus, so that a definite percentage enters with the gas at all hours of the day and night. If the boxes get too warm, the percentage should be reduced. It sometimes happens that partly-spent oxide of iron becomes stale, cold, or sour, and acts indifferently, if at all. A batch of this kind of material can be resuscitated by sprinkling with a weak solution of ammoniacal liquor from watering-cans, turning over the mass, and giving it time to heat and recover.

As to the measurement of the gas, the more frequently the meter is read and compared with the coal charged, the more certain is the check on the working of the whole system. Even in the smaller works, the weight of coal used should be at least a daily record; and preferably a record should be kept of the coal used and gas made against each shift. In large works, such a record is of hourly computation. Then, again, it is the easiest thing in the world to burn more fuel in the retort-house furnaces and boilers than is necessary for the work being done. This can only be guarded against by keeping a daily record and a constant check on the operations proceeding. Again, as to the handling

of coke for sale, it is not infrequent to see one man holding up an empty sack while another is engaged in filling it, with the intervention sometimes of a third man riddling it by shovelfuls. I am quite sure that it is not beyond the ingenuity of every member present to devise some other means of holding the sack, and, with very little expense, a more direct means of feeding the coke from the retort-house over screens and filling sacks and carts beneath. It is important that you should look closely after your refuse heap. Large quantities of coke and usable fuel are often lost in this way which is quite suitable, with present-day forced-draught furnaces, for raising all the steam required on a gas-works. Those who are using strong caking coals can afford to mix practically their whole make of coke dust with the coal. Not only does this facilitate the evolution of the gas from the charge in the retort, but it effectively binds the dust into the mass of large coke. This is a common practice in coke-oven works.

Another phase of our operations with which you must all be closely concerned is the annual repair, maintenance, and overhauling of the plant. I need not point out the necessity for every valve and syphon and other mechanical device being looked to frequently, to see that it is in proper working order. The more often this is done, in reason, the easier for everybody. With regard to the repairs to your retort-settings, &c., there is no excuse for old bricks, or even good half bricks, leaving the works. As a matter of fact, a twice-burned fire-brick is better than a new one, and will make equally good work. The material used for mortar should consist of two parts of fine ground fire-brick dust and one part of new clay, mixed either with salt water or a little alkaline water, such as soda, &c.

Keep a sharp look-out on the sundry stores used, and a record in relation to the work done. Even the quantity of oil and waste used in the engine-house and other places is worth keeping a note of, and comparing it from week to week and year to year in proportion to the number of hours worked. It all adds very greatly to the interest of one's daily work, and will usually be found to be an economical practice. All oily refuse, as well as the thick tar and pitch from the retort mouthpiece doors, which particularly accumulates during the repairing season, should be returned to the retorts for carbonizing. It not only gets rid of what is otherwise a nuisance, but it will be found that there is some coal intermixed with the tar, and certainly oil in the waste. The syphon water from the street and from all other sources on the works should be accumulated and pumped through the hydraulic mains. This not only gets rid of what would be a serious nuisance in the drains, but the illuminants, of which there is undoubtedly a proportion present, will be transmitted into the gas produced.

Keep your works and every part of them clean and tidy; have a place for everything, and keep things in their places. You will find that keeping works tidy costs much less than leaving them to look after themselves; for the amount of good stock that can be picked up from day to day would surprise anyone who has not given thought to this question. Old bolts, nuts, washers, pieces of pipe and connections, partly dirty waste, and a thousand-and-one other things, if left to lie about, simply waste, but if put to a bench and oiled and adjusted represent good stock. Keep a sharp eye on your scrap heap.

Those of you who have anything to do with sulphate of ammonia manufacture will appreciate the necessity for very closely watching the character of the effluent water from the stills. Liquor can escape so easily through a sulphate of ammonia plant that you should, by means of a pet-cock and suitable vessel, accumulate daily an average sample of the effluent liquor from the plant; this sample being tested the following day, not necessarily quantitatively but qualitatively. No ammonia should be present in this liquor. Then, again, when your acid tanks or liquor tanks are below ground, take every opportunity of gauging them for tightness during periods when the plant is not at work. Large quantities have been lost through tanks leaking into the earth undetected for a time, to say nothing of the irreparable damage done by acid leaking in a similar way.

I am afraid it would not be fair to continue this terrible list of little things which go so far to make up the successful management of a gas-works; but as good management consists in seeing and doing little things that others are mostly blind to, this must be my excuse for enumerating a few points that have occurred to me in passing.

At the close of the address,

The PRESIDENT said they had all listened with very great pleasure indeed to the remarks of Mr. Herring. He said at the beginning that his address would be somewhat long. If this had been so, he thought it had been so interesting that they could have done with more. He was sure those under Mr. Herring, in his works at Granton, must appreciate his remarks regarding suggestions about improvements in working. His advice as to looking after small things in the different parts of the works must be much appreciated by every one of them. They often found that it was in small things that the money went. If any of the members wished to make remarks upon the address, they would be glad to hear them.

Mr. T. O'NEIL (Dunbar) thought there was not much that anyone could say. Personally he had experienced some of the little things alluded to by Mr. Herring, which told more in small than in large works. He made some tests in regard to the costs of keeping up an ordinary boiler in his small works; and he found that, by taking the simple operation of weighing the stuff—

ordinary breeze and the like—he actually saved 10s. per week from what he had to pay before. Waste and oil, even in very small works, if not attended to, amounted to £5 or £6. They were much indebted to Mr. Herring for bringing these points before them. It was rather a novelty that one in Mr. Herring's position should do so; but he thought he could not have given them a better address, because it dealt with things which appealed to every one of them. He hoped that those who had charge of works, and those who were assistants in works, would take notice of what Mr. Herring had advised them to do.

Mr. W. DUNLOP said Mr. Herring had treated the matter so thoroughly that he might be said to have left nothing undone. He was fortunate enough to be under Mr. Herring for some time, and could conscientiously say he always carried out in practice what he preached.

The PRESIDENT asked the members to give to Mr. Herring a very hearty vote of thanks for his kindness in coming there and giving them such a valuable address.

This was agreed to with great cordiality.

Mr. HERRING said that, in rising to thank them for the very cordial manner in which they had received the address which he had had the honour to give them, he would like, if he might be allowed to do so, to make reference to the very excellent address of the President. It was his intention to have risen to do so at the proper time; but he did not find an opportunity. First, he would like to compliment the President upon the very broad views he had taken of the different things affecting the industry. What, perhaps, struck him more than anything else was that he began with the question of the library, and he finished with the question of technical education. He did not know if this combination were accidental or not; but if it were, it was a very happy one. With regard to the library, he quite thoroughly appreciated what the President had said as to the necessity for some such institution in connection with the Junior Association. While many of their technical books were cheap, there were also many others which should be in their hands, but which ran into a fairly large sum. Personally, he did not see any difficulty in organizing a circulating library, provided they got their Council, and particularly their hard-worked Secretary, to take up some extra trouble in the matter. He would like to be allowed to highly commend this proposition; and if they would allow him, he would like very much to start it with a certain number of books. He could not name them at the moment, because he was not prepared for the suggestion; but the President and Secretary would keep in touch with him in the matter, and they would be able to select a number of up-to-date books. He was quite sure this was exactly what was wanted. Another thing was that he would strongly advise the regular reading of the Technical Press. Everyone of them should read his "GAS JOURNAL" and "Gas World" from beginning to end, including a glance at every advertisement for work. They would probably come across a great deal of matter which they might think uninteresting, and a lot which they might think of no use to them; but if they came into a position, in after-life, they would find how useful many of those things would be to them, when it was necessary to apply the knowledge which they had on any subject. But apart from this, it made them strictly up-to-date. He might say that there was no more in the Technical Press than could be got through quite easily by systematic reading. Whether they could appreciate or understand all that they might be reading at the moment, take his advice, and read it none the less. They would understand it later.

The PRESIDENT said he had to thank Mr. Herring, especially for the kind remarks he had made regarding his address. He was sure they were more than pleased with Mr. Herring's offer in connection with the starting of their library. There should be no difficulty now about getting it established.

ARRANGEMENTS FOR THE SESSION.

The PRESIDENT intimated that the Council had approved of the following programme of business for the session: Oct. 30, visit to Pumpherson Oil-Works; Nov. 13, quarterly meeting, in Dunfermline; Dec. 16, visit to the Alloa Corporation Gas-Works; Jan. 15, quarterly meeting in Perth; Feb. 12, visit to the meter-works of Messrs. R. Laidlaw and Son (Edinburgh), Limited; March 12, quarterly meeting in Edinburgh; March 26, joint meeting with the Western District at Falkirk.

The PRESIDENT also intimated that their number was increasing; and he read out to the meeting a list of twelve applicants for membership.

Following the practice of the other Junior Associations, the Council of the London and Southern District Junior Gas Association have had reprinted in pamphlet form the reports of the proceedings at the meetings held during the past session which appeared in the "JOURNAL." They include, it may be remembered, the valuable paper by Mr. J. M. Campbell (formerly of Luton, and now at Margate) on the three-lift gasholder and tank at Devonport, which is illustrated by two folding plates. Appended to the "Transactions" is a report of the joint meeting of English Junior Associations held at the Franco-British Exhibition; and portraits of the three Presidents (Messrs. Grafton, Upton, and Liberty) are given as a frontispiece. The Hon. Secretary of the Association is Mr. S. A. Carpenter, of 25, Briarfield Avenue, Finchley, N.

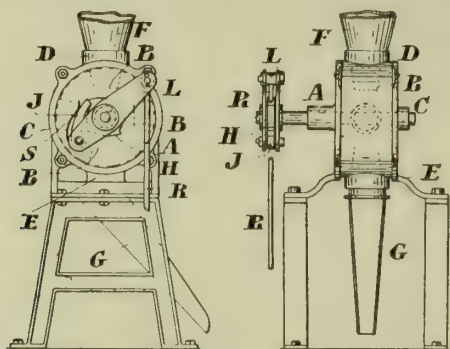
REGISTER OF PATENTS.

Delivering Measured Quantities of Granulated Substances.

JOWETT, J., of Bolton-le-Sands.

No. 14,634; July 10, 1908.

The patentee describes a measuring machine (for granulated or like substances) comprising a hopper, a casing below, containing a pocketed drum, with pockets constructed to hold a given quantity of the substance to be measured, blanks in the drum to cut off the supply from the hopper, and means for intermittently rotating the drum—the measured quantity being delivered in bulk.



Jowett's Measuring Machine.

In carrying out the invention, a drum, like A, is provided in its periphery with a number of cells or recesses B—say, four—as shown in dotted lines—each constructed to hold a given quantity of material. Should a less quantity be required, the permanent cells have smaller cells fitted therein. The drum is mounted in a casing C, so as to be a somewhat tight fit; and in the casing are formed inlet and outlet apertures D and E. The inlet will be provided with a hopper F, and the outlet E with a slide or funnel G.

Mounted conveniently on the shaft of the drum is a ratchet-wheel H, and in proximity thereto is fulcrumed a lever L carrying at one end a pawl J to operate the ratchet-wheel H. A spring S is arranged to keep the pawl in gear with the teeth of the ratchet-wheel. To the other end of the lever L is attached a rod R, which is, in turn, attached to mechanism capable of imparting, through the rod, a reciprocating motion to the lever.

In operation, the hopper F being filled with the desired substance, motion is imparted to the rod R, thereby operating the pawl J and ratchet-wheel H, and therefore the drum A. As a cell or recess B comes opposite the inlet D, the substance will fall therein; then as the drum further revolves, the supply will be cut off by the blank of the drum between the cells until another cell comes opposite the inlet, and so on. When the full cell comes opposite the outlet E in the casing, its contents will be at once discharged down the funnel G into a bag or the like placed for its reception.

Protecting Gasholders from Cyanogen Compounds Entering the Water of the Seal from the Gas.

KAYSSER, O., of Dortmund, Germany.

No. 18,672; Sept. 5, 1908.

In gas-works, the patentee remarks, the metal walls of the gas-holders and their tanks are very liable to become corroded owing to impurities in the illuminating gas entering the seal water of the holder. This is particularly the case with cyanogen compounds in combination with carbonic acid, oxygen, and other substances, which attack the walls—metallic iron being dissolved and converted into ferric hydrate. Despite the provision of purifying apparatus, certain quantities of cyanogen compounds may remain in the gas; and the purpose of this invention is "the destruction of these cyanogen compounds in the seal water, without the formation, however, of any products of decomposition noxious to iron."

The inventor finds that a suitable destructive agent is permanganate of potassium, which, when added to the seal water in a finely-divided state mixed with equal parts of fresh cement, destroys all the cyanogen in a very short time. The cement binds a portion of the carbonic acid and at the same time forms, with the oxides of manganese precipitated from the potassium permanganate, a precipitate which settles rapidly and can be equally readily removed. The agent not only exerts no injurious influence upon the quality of the gas, but acts favourably on it, inasmuch as the percentage of sulphur is very essentially diminished.

In carrying out the process, he proposes to add the preparation in pulverulent form to the seal water of the holder (the quantity per cubic metre depending upon the age or percentage of cyanogen contained therein) and intimately mix it with the seal water. A few kilograms of the reagent may be added to the seal water from two to four times a year, according to the quantity of gas passing through the holder. The deposit which forms settles rapidly and compactly, and can be removed without difficulty.

Gas Lighting and Extinguishing Apparatus.

ELTON, E. H., and STEPHENS, R., of Clevedon.

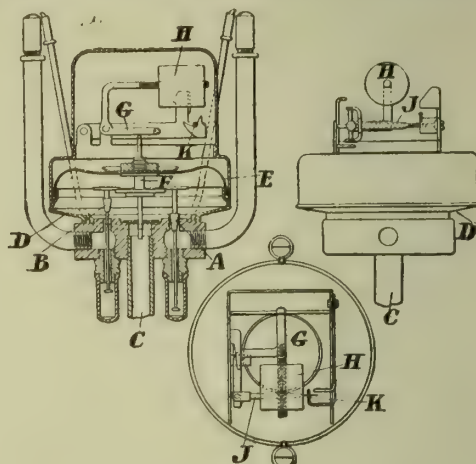
No. 18,860; Sept. 8, 1908. Addition to No. 15,067 of 1906.

This gas lighting and extinguishing apparatus is an improvement on the construction described in patent No. 15,067 of 1906. The present invention has for its object the construction and disposition of the parts of

the device in such manner as to avoid enclosing the pressure regulating lever within the expansible gas-chamber, and so as to permit of the ready adjustment of the mechanism according to the pressure at which it is to be operated, to provide for the ready inspection of the valves, and to render the arrangement applicable for the operation of two or more main burner valves.

The valve seats are disposed upon a plate or fitting which carries the diaphragm, and which, with the diaphragm, forms an expansible chamber around the valves. The valves are adapted to be operated by the diaphragm spindle through such a device as will permit a number of valves to be operated from the single diaphragm spindle. By this arrangement, also, the valves are operated quite independently of the weighted pressure regulating lever mounted in a readily accessible position above the diaphragm; so that adjustment of the working pressure can be made without difficulty, while for the inspection of the valves the diaphragm and regulating lever can be removed bodily and thus expose the valves and their seatings.

On the admission of gas into the gas-chamber and the attainment of the necessary pressure for opening the valves, a flange or projection provided on the diaphragm spindle engages the valves admitting gas from the gas-chamber to the respective burners controlled; and this movement of the diaphragm spindle causes the corresponding movement of the controlling lever. Any mechanism for adapting the controlling lever to open and to close the burner valve or valves may be employed but preferably such as is described in patent No. 2816 of 1908.



Elton and Stephens' Lamp Lighter and Extinguisher.

The illustrations show cross sectional elevations of apparatus for controlling two burners, at right angles to each other, and a plan.

The fitting shown carries two adjacent valves A B, each disposed within a vertical passage in the fitting, the upper part of which serves as an outlet for gas supplied through the inlet C, and, at the same time, as a seat for the valves; while the spindle extends downwardly and advantageously protrudes so that the respective valves may be adjusted without the necessity of opening the gas-chamber. Screwed caps cover the lower protruding extremities of the valve spindles.

A circular upstanding flange receives the screwed boss of a circular base plate D serving as the base of the gas-chamber, and provided with an upstanding peripheral flange, upon the upper extremity of which the edge of the diaphragm E is carried. Centrally of the fitting is a diaphragm spindle F, which is disposed intermediate of the respective valves, and advantageously carries a flange adapted to contact with the underside of the valve-heads, which for the purpose may be suitably extended. The upward end of the diaphragm spindle may be provided with a knife edge to take a bearing within the recess provided for the purpose in the control lever G, or an adjustable weight H may be provided on the lever according to the construction described in the earlier patent referred to.

Upon a first increase of pressure, the lever G is lifted by the diaphragm E, the rod I swinging against a stop so that both valves are opened. When the pressure is decreased by a certain amount, the lever falls and the rod engages with the notch K. This fall is sufficient to secure the closing of the valve A, thus extinguishing one burner; the valve B remaining open, since the weight of the pressure-control lever is removed from the diaphragm spindle, and the diaphragm thus remains extended under the reduced pressure and holds the valve B off its seat. A further temporary increase and decrease of pressure will suffice to disengage the rod I from the notch K and allow it to swing towards the lever fulcrum; the lever G falling at the same time and permitting the valve B to close and extinguish the second burner. Should it be necessary to retain both burners alight in spite of the fall in pressure, two notches would be provided in the top of the cam-piece, and the action would then be slightly varied.

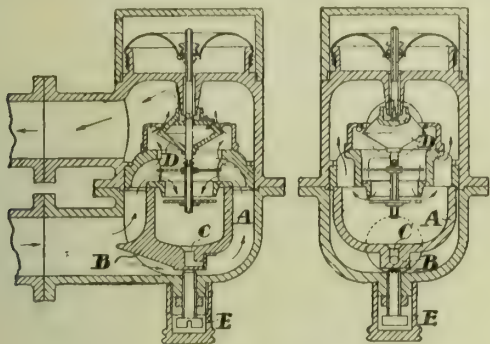
Regulating the Pressure of Gases.

FAIRWEATHER, W.; a communication from MAX JASPERSEN, of Hamburg.

No. 20,043; Sept. 23, 1908.

This invention relates to devices for regulating the pressure of gases—especially of coal gas, heating, and power gas—in which the extent of opening or closing the valves is regulated by the rising and falling of a diaphragm or cup under the influence of the gas, and which therefore decreases or increases the gas supply accordingly. The gas conducted from the supply pipe to a valve casing flows from this through an upper and lower valve in quantities corresponding to the consumption, into the upper part of the regulator connected with the diaphragm chamber, and thence into the conduit-pipe leading to the place of consumption. Such devices are already known, the patentee remarks;

but they have "not given satisfactory results owing to the injurious influence on the valves by the current of gas and the precipitation water from the gas, as well as owing to the friction of the valve-spindle."



Jaspersen's Gas-Pressure Regulator.

As shown in fig. 1, the proposed apparatus consists of a casing, to the lower half of which the gas-inlet pipe is connected, and to the upper half the outlet. In the lower half is arranged a hollow body A, open at the top, so that between it and the casing there is a space for the outflow of the unregulated gas. The base of this hollow body is formed with a projection B, which affords a hollow space between the base of the body and the casing for the admission of gas, and also serves to divert the current of gas. At the bottom is a passage C on which a flap is fitted, serving to trap any water which may collect. Above the hollow body is a valve casing having two pairs of slots or ports opposite each other—one pair opening from beneath into the inner valve-chamber of the casing, while the other pair lead to the interior of the receptacle A arranged beneath the valve to receive the precipitation water. The valve-casing forms the seat for the conical valve D and two disc valves, fitted on a common valve-spindle provided with joints. Both slots serve to admit gas from the inlet-pipe, so that it can enter through the valves into the upper part of the casing or into the hollow body A, which is pressed against the valve-casing by a screw bolt enclosed in a cap E.

The operation of the device is as follows: The gas flows into the interior of the casing through the inlet-pipe with unregulated pressure; and should there be no consumption of gas, the pressure above and below the valves will be the same, and the diaphragm will be pressed up and the valves closed. As soon as gas is consumed, the pressure in the upper part of the casing falls, and, with it, that under the diaphragm and also the valves. When the consumption of gas diminishes, the pressure on the diaphragm is increased, whereby the valves are proportionately raised. Should the diaphragm become leaky or broken, the valve spindle falls, so that the valve D falls on to its seat and closes; and one of the disc valves leaves only a small space between it and its seat. Accordingly, the lights burn lower. The condensation water, should there be any, flows away through the slots in the hollow body A and thence to the meter. Should excess of precipitation water enter so that the inflow is greater than the outflow (which can only occur under very unfavourable circumstances), the water rises in the hollow body A till one of the valves is finally immersed and, in consequence of the diminution of weight, is pushed up higher. Also in this case the lights will burn lower. The regulator therefore "indicates automatically any irregularity without completely shutting off gas."

Charging Vertical Retorts.

DEMPSTER AND SONS, LIMITED, and TOOGOOD, H. J., of Elland.
No. 19,437; Sept. 16, 1908.

This process of charging intermittent vertical retorts "so as to produce throughout the length of the retort a vertical column of relatively high permeability which consists in feeding into the retort and adjacent to its sides a relatively thin stream or relatively thin streams of mixed coal," was described and illustrated in the "JOURNAL" last week, p. 27—from the particulars given in the identical French patent issued at an earlier date than the English one.

Money Registering Mechanism of Prepayment Gas-Meters.

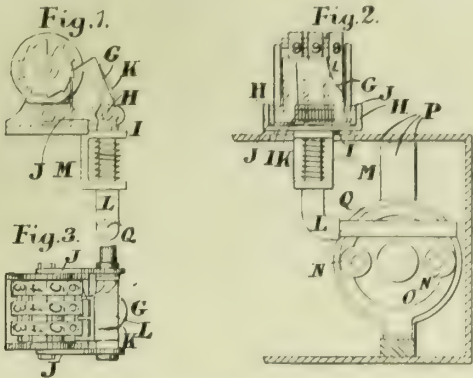
LOCKHART, J., and CHRISTIE, W., of Perth.
No. 20,128; Sept. 25, 1908.

This invention has reference to an arrangement of mechanism to be applied to prepayment gas-meters with the object of enabling both the consumer and the collector to have "a positive visible register of the amount of money that has been placed in the cash-chamber of meter." By these means, "the money will not require to be counted by hand, and it will be a check for the gas department over the collector."

Figs. 1 and 2 are elevations at right angles to each other, showing sufficient of the mechanism of the meter to illustrate how the mechanism is operated. Fig. 3 is a plan of fig. 1.

The counting mechanism is mounted on the frame of the prepayment mechanism—preferably near the coin-slot. This mechanism would preferably consist of three discs mounted on a spindle carried in a frame screwed to the casing of the meter. The discs have numerical numbers in sequence on their rim surface, so as to indicate units, tens, and hundreds; and they would each have teeth or wheels formed on their sides. A three-toothed spring pawl G would be mounted to engage with the teeth of these wheels when actuated to do so by the insertion of coins in the money-box. This is effected by making the pawl of a broad plate with three teeth formed at its free or engaging end at spaced distances transversely apart, so as to engage with the teeth of the wheels at requisite times. The pawl is mounted at its opposite end on a trans-

verse spindle H carried on the end cheeks of a crosshead I; and the spindle would be coupled to the one end of free working links J having their other end attached to the frame carrying the disc wheels. A spring K, mounted on the spindle H at a part cut away of the pawl G, is made to bear against the disc wheels. The vertical arm H of a rod L is attached at its top end to a crosshead, and passes through guiding eyes of an underhung bracket M attached to the frame or on the meter casing, and bent round at right angles so as to have a horizontal arm with a projecting or weighted free end. Projecting stud-pins N are fitted on a



Lockhart and Christie's Register for Prepayment Meters.

coin-turning barrel O, so that when a coin is inserted through the slot P of the meter, and the handle is turned to the right the stud pins N would act on the horizontal arm Q and raise the kneed rod L, and, through it, the spring pawl G would advance the toothed wheels one figure, and so indicate on the discs the number of coins inserted in the meter. A spring mounted on the vertical part of the rod L, by its recoil action, automatically brings back the horizontal arm Q to its normal position ready for the next action of one of the stud pins N when the coin-barrel O is turned.

When the index dial read 009, the first tooth on the spring pawl would drop into a deep notch on the first wheel, and thus bring the second tooth of the pawl G into gear with the teeth on the second wheel. The disc of this second wheel would indicate tens; and when the index showed 099, the first and second teeth of the pawl G would drop together into deep notches, which would bring the third tooth of the pawl into gear with the teeth of the third disc, indicating hundreds.

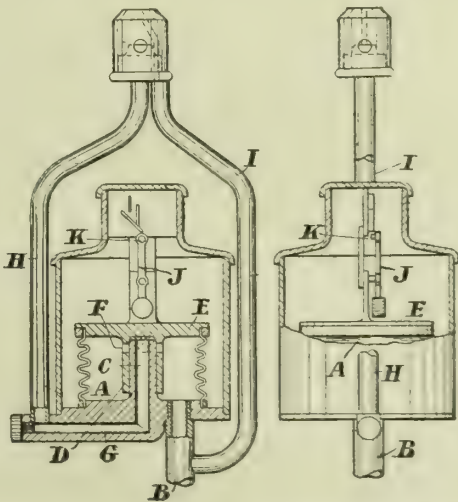
Automatically Lighting and Extinguishing Street Gas-Lamps.

BEDFORD, A. J., of Melbourne.

No. 4332; Feb. 22, 1909. Date claimed under International Convention, April 15, 1908.

This invention relates to a device for automatically lighting (from a pilot light) and extinguishing street gas-lamps controllable from a central station or gas-works where governors are employed.

The tubular metal casing shown is provided with a bell-shaped cover on which is placed a removable loose cap to allow of easy access to the interior. A disc formed with two shouldered bosses comprises the bottom of the casing and that of a flexible holder A supplied with gas from a pipe B, the inner end of which is secured in a hole formed in the bottom.



Bedford's Automatic Street Lamp Lighter and Extinguisher.

Upon a gas outlet or burner supply pipe C integrally forming part of the bottom cover is slidably socketed the cylindrical valve D depending from, and formed integrally with, the underside of the diaphragm E, which is of sufficient weight to fall by gravity and close down upon the outlet pipe with a minimum pressure. F are inlet ports provided in the valve to admit gas from the holder to the outlet or burner supply pipe. Against the inner face of the valve D is placed a leather disc to render it gas-tight when seated upon the top end of the outlet-pipe. The diaphragm E as also the bottom have projecting bosses upon which the ends of the flexible holder are tightly held by slip rings. The outlet-pipe communicates with the gas-passage G, the outer end of which is screw-threaded to receive a milled-headed screw-plug, which is easily removable to permit the brushing out of any foreign matter

that accumulates. The pipe H communicates with the burner; while a pilot-light tube I communicates with the gas supply pipe, and at its upper end terminates at the ignition point of the burner. A stem upon the top side of the diaphragm carries a counterweighted pivoted arm J with a pin K projecting from it. Above the pin, upon a vertical guide plate, is a V-shaped segment having two legs, one longer than the other. A guide-arm projected from the stem engages the guide-plate, so that as the diaphragm rises and falls with the cylindrical valve it will not cant sideways. The guide-plate slides into vertical grooves formed in the inner valves of the cover. A guide-rib is also secured to the plate, so that the counterweighted arm pin will be guided in and out of the recess of the segment according to the pressure applied to the holder.

The patentee proceeds to describe the features here referred as they relate to the different forms of segments and recesses (with guide-ribs therefor) for use in connection with the device when fixed on street gas-lamps located in three different districts—one form for each district.

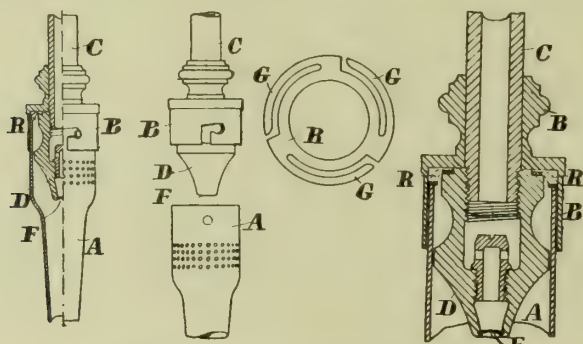
For operating the invention as shown, there is introduced to the gas-holder a pressure of (say) 45-10ths, so as to expand the flexible holder which lifts the cylindrical valve D until the holes in it are clear above the gas-outlet pipe C, thereby allowing gas to pass through the holes to the outlet-pipe and the passage G, thence to the conducting pipe H and the burner; while the counterweighted arm simultaneously moves angularly to place the pin K at the upper end of the long leg of the segment—the "first position." When the pressure is reduced to the minimum of 18-10ths, the counterweighted arm and diaphragm fall with the holder to a suspended or "second position," leaving the pin K engaging the segmental recess formed by the two legs, while the gas is at constant working pressure—thereby preventing the cylindrical valve D shutting off the supply of gas to the burner. On increased pressure being applied to the holder, the latter expands and lifts up the arm J, so that the pin K will be guided out of the segmental recess and over the other leg of the segment to the "third position." On the pressure being again reduced, the counterweighted arm carrying the pin falls to its "normal" or "starting" position as shown. The holder thereupon slackens and allows the cylindrical valve to immediately descend and press upon, and close, the open end of the outlet-pipe C, thereby cutting off the gas supply to the lamp burner.

Inverted Incandescent Gas-Burners.

CARPENTER, C. C., of Old Kent Road, S.E.

No. 5289; March 4, 1909.

This invention, relating to the bunsen gas-burners of the inverted or downwardly inclined type, has reference to the means whereby the burners can be removed from the fitting for cleaning, &c., without disturbing any essentially gas-tight joint.



Carpenter's Inverted Incandescent Burner.

At the extremity of the pipe which forms the gas-fitting, a cap B is fixed, provided with a bayonet joint. The end of the tube C of the fitting projects inside the cap a sufficient distance to allow a nozzle or jet-piece to make a gas-tight joint between the inside surface of the cap and the nozzle. The upper part of the nozzle is recessed to form a shoulder, upon which fits tightly a special spring washer R, provided with spring pieces G, the points of which stand downwards from the body of the washer. Before the nozzle is screwed on to the gas-fitting, the washer is placed in position upon it, so that the points project outwards, and the nozzle is then screwed gas-tight into its position.

The air-mixing tube A of the bunsen burner is provided with projecting lugs to allow them to enter the slots of the cap when the burner tube is inserted therein.

In operation, the gas issues from the jet F by the nozzle D, drawing in air through the holes of the burner-tube in the manner common to bunsen burners of this type. The passage of air into the burner-tube by reason of this being a working fit in the cap is immaterial, the patentee remarks, since no gas can escape.

Alternative types of springs may be used—one being an extended volute spring, another consisting of two or more helical springs which press, through rods, a ring against the top of the burner-tube.

Purifier-Box Explosion at Birmingham.—Early last Thursday morning, an explosion occurred in an oxide of iron purifier at the Adderley Street Gas-Works of the Birmingham Corporation, by which five workmen sustained slight injuries. The box was about to be emptied; and the valves had been shut off as usual. As soon as the lid was raised, however, some small quantity of gas that must have remained in the purifier was fired. Little damage to property was caused by the explosion; and only one of the men—who it was thought might have been hurt internally—was detained at the hospital. A report on the occurrence was submitted by Mr. W. Chaney, the Engineer-in-Charge, to the Gas-Works Sub-Committee, who expressed sympathy with the workmen.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Proposed Joint Bill for Authorizing the New Test Burner.

SIR,—At a meeting of the Committee of this Association held this afternoon, it was decided that the Association should take steps for the promotion of a Joint Bill by gas companies authorizing the substitution of the Metropolitan argand burner No. 2 in place of the burners now used by the companies joining in the promotion of the Bill.

I enclose a copy of the resolutions which were passed at the meeting by the Committee.

I am sending out a circular to gas companies, inviting them to join in the promotion of the proposed Bill, and requesting them to attend a meeting at the Westminster Palace Hotel, Victoria Street, S.W., on the 28th inst., at 1.30 o'clock in the afternoon.

I shall be glad if you will allow me to take this opportunity of inviting representatives of any companies interested in the matter who may not receive my circular, to attend the meeting.

FRED. E. COOPER, Secretary,
Gas Companies' Protection Association,
5, Victoria Street, S.W., Oct. 7, 1909.

[ENCLOSURE.]

GAS COMPANIES' PROTECTION ASSOCIATION.

Copy of resolution passed by Committee at meeting held Oct. 7, 1909.

Proposed by Mr. C. E. BOTLEY, seconded by Mr. A. G. SNELGROVE, and resolved—

(1) That this Committee do take steps for the promotion of a Joint Bill or Bills in Parliament authorizing the substitution of the Metropolitan argand burner No. 2 in place of the burners now used by the companies joining in such promotion.

(2) That this Committee do recommend the Association to contribute a sum not exceeding £200 towards the cost of promoting such Bill or Bills.

(3) That the members of this Committee be appointed a Special Committee to deal with the matter, with power to add as members of that Committee such representatives of the gas companies joining in the promotion of the Bill as those companies may appoint.

A Trip to Berlin.

SIR,—The reference in "Electric Lighting Memoranda" (Sept. 28) to our recent visit to Berlin prompts us to write to you.

We do not remember to have seen the paragraph in the report of the City deputation which you now quote. Presumably therefore only extracts were given in the electrical press. Of course, the presence of no less than 6531 gas-lamps, against only 1076 electric lamps puts a different complexion on the case, though the comparison is not such as, at first sight, it appears, seeing that each arc lamp is probably equal in candle power, in most cases, to a large number of gas-lamps.

Our reference to the matter of lowering gear for gas-lamps was quite germane to the controversy, and scarcely justified the rather harsh remarks you thought fit to make, especially as it was somewhat of a revelation to you to learn that the problem was not one which presented any difficulty to us.

As to the object of our visit to Berlin, it was simply to conclude an arrangement with a large German concern for the manufacture in that country (under royalty) of lowering apparatus made under our patents, which are equally suitable for lowering gas-lamps; and, as we have other patents in France, the United States, and elsewhere, we hope to control the interests in this apparatus.

THE LONDON ELECTRIC FIRM,

Oct. 4, 1909.

G. A. HUGHES, Commercial Manager.

[We are pleased to learn that the "JOURNAL" has been the channel of information to Mr. Hughes as to certain facts regarding the lighting of Berlin of which he was not cognizant when he wrote his misleading letter to the electrical press, the editors of which were in possession of the report in question, though Mr. Hughes was evidently not; and so, had they felt honestly disposed, they could have put their correspondent right. Concerning the second paragraph of the letter, it may interest Mr. Hughes to further learn that there are in Berlin streets 1531 gas-lamps (high-pressure) of various sizes and illuminating powers ranging from 545 to 4555 candle power; 2900 low-pressure upright gas-burners of illuminating powers ranging from 63 to 70 candles; and 2600 inverted burners of about 90-candle power. These are official figures. Regarding the third paragraph, it was not a revelation to us that the lowering gear problem for gas-lamps had been solved. It was solved, in one form, before the birth of the London Electric Firm. The revelation was to our electrical contemporaries, who, in their ignorance on this matter, were chuckling over what they believed to be the dilemma of the gas industry in complying with the condition suggested by the deputation.—ED. J.G.L.]

The Pontefract Town Council have decided to hold a special meeting to consider an expert report which recommends the extension of the Roall Water-Works by further borings. Mr. Robinson, one of the members, said he was afraid Pontefract was threatened with a water famine. The Town Clerk pointed out that the works were now self-supporting; £1200 would be the profit this year. The Mayor (Colonel Shaw) advised caution. There had been, he said, a long series of annual low rainfalls. They had always been advised that there was plenty of water at Roall.

LEGAL INTELLIGENCE.

UNFOUNDED CLAIM FOR A GAS EXPLOSION.

In the West London County Court last Wednesday, before Sir William Selfe, Mr. G. Cristel, a naturalized German tailor, of Redclyffe Road, South Kensington, sued the Gaslight and Coke Company and Mrs. Bacon, of Gilston Road, South Kensington, for £71 9s. 6d., as damages caused to his stock of goods by an explosion of gas and a subsequent outbreak of fire. Mr. Eric Dunbar, who appeared for the plaintiff, said that in April, 1908, he leased a shop and room from Mrs. Bacon. When he took possession of the premises, gas was already laid on; and the meter was placed under the front window. He paid rent for the meter to Mrs. Bacon. In the August following, an explosion took place; a search having previously been made for an escape of gas. Fire broke out, and it was not subdued before the whole of the stock of cloth and silk linings in the window was destroyed. Plaintiff was called and bore out this statement. He said the meter was close to the stall-board under the window, and this was so weather-worn that a smoker passing in the street could throw a lighted match between the fissures and hit the meter. Answering Mr. A. Neilson, who (instructed by Messrs. Monier-Williams and Co.) represented defendants, plaintiff said that though the fire occurred in August, 1908, he did not issue his plaint till July last. He left the shop all right on the night of Saturday, the 22nd of August, and he was brought to the fire on the following evening. He was not in the shop on the Sunday morning. Mrs. Bacon was insured; and, after inquiries, her claim had been paid. He was not insured. Plaintiff detailed the articles which had been destroyed by the outbreak; among them being a Singer sewing-machine, for which he charged £10 10s. He added that he had frequently complained to the officials of the Gas Company respecting an escape of gas on his premises. The station officer of the London County Council Fire Brigade stated that when he arrived on the scene the fire was practically extinguished. He noticed that it originated near the gas-meter. Damage to the extent of about £20 was done to the building. The gas service-pipes were melted by the fire; but there were no signs of an explosion having occurred. He could not put down the outbreak to an escape of gas, as the plaintiff had suggested. Mr. F. Tapwell, of Barbican, who repaired the damage for the Insurance Company, said the fire originated at the meter. Workmen in the employ of the Gas Company proved that the meter was sound at the date of the fire. Mr. Neilson said there was no evidence of an explosion, or that the meter was defective. There might have been a pin-hole escape, which would not do any harm unless a naked light was taken near it; but for this the Company could not be held responsible. There was no evidence that either defendant had been negligent. Mr. Dunbar submitted that, according to the ruling of Chief Baron Pollock, the Company were liable whether there had been an explosion or not. His Honour thought the evidence was not sufficient to establish a case against either defendant; and he accordingly gave judgment for them, with costs.

USE OF DISCS FOR PENNIES IN SLOT-METERS.

At the Wimbledon Petty Sessions last Wednesday, before Mr. Tyrrell Giles, K.C., and Mr. J. F. Schwann, Francis George Cooper, of No. 45, Prince George's Avenue, Raynes Park, was charged on remand with stealing 3000 cubic feet of gas, of the value of 14s., the property of the Mitcham and Wimbledon Gas Company. Mr. Cupison prosecuted; Mr. Bellingham appeared for the accused.

The evidence given was to the effect that ordinary collectors had been unable to get access to the meter, and a special inspector was sent. After some difficulty, he saw the meter, and found it had been tampered with, and that in the box, instead of the amount due according to the index (£1 5s. 10d.), there was only 16s. 9d. in money, but there were 175 discs—cut pieces of tin. The prisoner set up the defence that he intended to pay the difference to the Company, but admitted that he had made no offer to do so, as he had been out of employment. For depositing the discs instead of pennies, he offered the excuse that, being short of pence, he put in the discs, intending to refund the equivalent in money to the collector when he checked the meter. In other words, he regarded the matter as one of "account;" and he put forward the plea that this was a system recognized by the Company. In reply to questions on this point, the special inspector denied this, and said that where discs were found instead of coppers the discovery would be reported. He admitted, however, that though discs had been found in other meters, the Company had not before prosecuted. Mr. Cupison said the whole matter turned on the question of felonious intent; and he submitted that there was such intent in the present case, because, when pressed, the customer said he was in monetary difficulties. His conduct was only consistent with the knowledge that he was defrauding the Company.

In giving judgment, the Chairman said the Bench were quite clear upon the point that where the evidence was that a man put a disc into a penny-in-the-slot machine with the intention of getting something for nothing, it was a larceny. But in a charge of larceny the Court had to decide whether or not there was felonious intent. In the present case, the prisoner made use of something the size of a penny to get the gas; but he knew he would be looked upon to make good any deficit between the cost of the quantity of gas consumed and the amount of money in the box. If a man found he had not a penny, and put in something else with the intention of paying some other time, and if the Court believed his statement, he could not be charged with stealing. The Bench were agreed upon this point. Here there were a large number of discs; and this fact made it clear that the customer was under the impression that by using them he was not stealing, but simply meant at some future day to make good the amount represented by the discs. It was clear he was under the same impression when the inspector called, because he said he had not the money to meet

the difference at the moment, but intended to pay at a future date. The question was important, because of the large number of penny-in-the-slot machines in use. A case of this kind had not arisen before, and, so far as the Bench were concerned, they were loth to establish a precedent to make this act stealing on such evidence as was before them. In other cases they might consider it to be stealing; but in this one there was no evidence of felonious intent, and the prisoner would be discharged.

Gas Company Damage an Electric Cable.

An action was heard at the Isle of Wight County Court, before His Honour Judge Gye, last Wednesday, in which the Sandown Electric Company sued the Sandown Gas Company for £8 19s. 1d., for damage to an electric cable in Albert Road, due to the negligence of the Gas Company or their servants. Mr. C. F. Hiscock appeared for the plaintiffs; and Mr. J. Marsh, for the defendants. Tiles had been laid over the electric cable; and a fault being discovered in the cable, the ground was opened, when it was found that the fusing of the wires had been caused by the cable having been punctured by some sharp instrument. The *crux* of the whole matter lay in the evidence of a fitter named George Cooper, who admitted that, while laying a private service, he had searched for the gas-pipe with a chisel-headed bar, which had touched the electric cable. Judgment was thereupon given for the plaintiffs, with costs.

Claim against the Gaslight and Coke Company.

At the Woolwich County Court last Wednesday, Thomas Cable, a filler, brought an action against the Gaslight and Coke Company to recover compensation in respect of incapacity through an accident. Mr. Blackwall, who appeared for the applicant, explained that in February Cable was engaged in shooting refuse into a barge. He was standing on the shoot when he was knocked on to the barge, fell a distance of 24 feet, struck the barge, and then fell a further 5 feet into the mud. He was helped out and taken home, and, after medical treatment, was sent to the Convalescent Home at Bexhill. He did not get much better, but would often start up in the night when dreaming he was falling. The Company paid him half wages (17s. 11d. per week) from Feb. 17 to July 2, but had stopped them on the latter date. Applicant was called and said he was still unable to do even light work. He had become slightly deaf, his eyesight was not good, and when he went out became quite faint and giddy. In answer to Mr. Vaughan Williams, who represented the Company, witness confirmed the statement made by Mr. Blackwall as to his starting up in the night. Conflicting medical evidence was given; and finally his Honour found that the applicant was able to work, and expressed the hope that his resolution would allow him to go back the next morning. He would award him 17s. 11d. per week from July 2 to the present time.

Bye-Passing the Meter.

At the Rochdale Borough Police Court, William Boardman was summoned by the Corporation for unlawfully connecting a pipe with a certain other pipe used for conveying gas to his house, without their consent. Mr. Robinson, who prosecuted, said that defendant was liable to a £5 penalty under the Gas-Works Clauses Act. On Sept. 9 Mr. J. W. Sharrocks, a gas inspector, called at defendant's house, and finding the front door open walked inside to the kitchen. As he was about to examine the meter, Boardman stood in front of it saying that the inspector could not look at it then. Mr. Sharrocks insisted, and found that the inlet and outlet pipes had been disconnected from the meter, and joined together by means of a rubber tube. This arrangement secured a supply of gas without it passing through the meter. The matter was reported to the Gas Committee; and they decided to make an example of defendant—more particularly so as he had been before the Committee for a similar offence in June. On that occasion he was given another chance. Gas was a dangerous commodity for an amateur to tamper with; and only authorized fitters were allowed to make connections. The offence could be dealt with otherwise than under the portion of the Act to which he had alluded; for Boardman could be prosecuted for larceny. Defendant admitted every statement of the prosecution, and said he had been "hard up" lately, and had a sick wife. The Bench imposed a fine of 21s. and costs.

Owner's Liability for Water-Rate.

At the Westminster County Court last Thursday, his Honour Judge Woodfall had before him an action brought by the Metropolitan Water Board to recover from Mrs. M. Smith the sum of £21 10s. for water-rate. Mr. Desmond Collins, who appeared for the Board, said the claim was made under section 72 of the Water-Works Clauses Act, 1847, which made the person receiving rents liable for water-rate. The amount was made up of rates due for supplies to flats at Shirley Gardens, Hanwell, of which the defendant, according to his case, was the owner. The collector, in the course of deposing to the amount claimed being due, said he had tried to collect the rates from the tenants, with the result that, in the majority of cases, they vacated the premises. In cross-examination, he said that in arriving at the amount of the arrears, no allowance had been made for empties. Tenants were then called with a view to showing that Mrs. Smith received the rents; but his Honour held that the evidence was not sufficient. Mr. Collins then called Mrs. Smith, and she deposed that the odd-numbered houses were her property, and that she was F. W. Smith. Mr. Collins said the Board were claiming for Nos. 26 and 48 and Nos. 15 to 23. Witness said only Nos. 15 to 23 belonged to her. In answer to the Judge, she said her tenants had not paid their rents, and this was why the rates had not been paid. His Honour said witness was liable for £5 16s. for her houses. He amended the summons altering the initials of the defendant, and gave judgment against her for £5 16s., less any sum that was found to be allowable for empties.

MISCELLANEOUS NEWS.

EXHIBITION OF GAS APPLIANCES IN DUNDEE.

An exhibition of gas lighting and heating appliances, which is without doubt the largest and finest of its kind which has yet been seen in Scotland, was opened in the Drill Hall in West Bell Street, Dundee, last Wednesday. While the exhibition is in itself excellent, much aid to the appreciation of it is given by the general arrangement and scheme of colour which has been adopted. The working out of the arrangements was in the hands of Mr. A. Morton Fyffe, the Assistant Gas Engineer, who has enforced uniform treatment in the fitting up of the stands—the colours selected being pale green for the walls, with white standards and divisions; the signboards being also green, with white lettering. There is no electricity whatever about the exhibition. The area is lighted by Graetzin high-pressure lamps—a cluster of three, and two single burners, each burner rated at 1500 candles; the compression being obtained by means of a Grice's gas-engine, which is outside the building. There are no exhibits of motive-power appliances. The yard outside is lighted by four lamps containing three inverted burners each (each lamp giving 1000 candles, the gas for which is compressed by a water-motor, and two lamps, of 600-candle power each, over the doorway. The lecture hall is lighted by six three-light Graetzin lamps.

There are fifteen stands. On the first are shown the water-heating apparatus of the Davis Gas-Stove Company, Limited, Messrs. R. & A. Main, Limited, the Parkinson Stove Company, Limited, and Messrs. Fletcher, Russell, and Co., Limited; the exhibits consisting chiefly of geysers supplying baths. The stand is brilliantly lighted by Bland lights, the gas for which is compressed by a Bland compressor to 6½ inches. The merit of this compressor is that, on the stoppage of the compressor, gas immediately passes to the burner at ordinary pressure, and the light remains in.

On the stand of Messrs. R. & A. Main, Limited, lighted by Messrs. George Hands and Co., of London, the principal feature is the "St. Nicholas" fire, which is as close a resemblance to an ordinary coal-fire as can be attained in heating by gas. While all the gas parts can be reached and handled as in an ordinary gas-fire, the gas-flame is used to heat to a warm glow lumps of a black asbestos material laid in the ordinary fire-grate.

Messrs. Fletcher, Russell, and Co., Limited, show some very pretty gas-fires, encased in attractive tilings.

Messrs. John Wright and Co. have on exhibition their "Essex" boiler for motor garages and greenhouses; also fires, the fuel in which is of greater width than usual, giving a larger heating surface.

The Parkinson Stove Company, Limited, in their gas-fires, show pillar fuel of more than ordinary height. Their fires include the "Agate," a new stove with 15-inch fire, for heating large areas; and the "Savoy," which is of artistic design, made of copper throughout, and with a cathedral glass front. The "Thistle," a new radiator this season, is heated by flat-flame burners. The stand is lighted by Bray lamps.

The Carron Company, on a stand lighted by Bland burners at ordinary pressure, have a general display of the large variety of goods they produce, including gas-fires for all sorts of apartments, finished in Berlin black, porcelain enamel, electro bronze, armour bright, and nickel. A special feature is a nickel-plated "Osborne" fire, a very pretty fire which gives a large amount of heat for a small consumption of gas. A new fire, with special brass embellishments on the canopy, pillars, and base, is shown in nine different designs.

The Davis Gas-Stove Company, Limited, whose stand is also lighted by Bland lights at ordinary pressure, show the Davis steamless radiator—a unique form of gas-heating apparatus, which gives exactly the same results as heating by steam or hot water, without the employment of water or liquid of any kind, and works at less cost. There are also shown several new fires, and the "Pyro" fuel the Company supply.

A dining room, drawing room, and kitchen are furnished by Messrs. R. Buist and Sons, of Dundee. They are lighted by Messrs. George Bray and Co., Limited, and Messrs. Falk, Stadelmann, and Co., Limited. There are several stands on which elegant lighting devices are shown by Messrs. Falk, Stadelmann, and Co., Messrs. Bray and Co., Messrs. J. & W. B. Smith, and Messrs. Hands and Co.

The Corporation of Dundee have a stand, embellished by group portraits of the six Managers of the Dundee Gas-Works since 1826, and of seven of the Treasurers, beginning with 1846. On this stand, the Engineer (Mr. A. Yuill), by a range of burners, illustrates the evolution of gas lighting, beginning with the rat-tail burner of the earliest days, continuing with the flat flame burner made by Milne, and coming down to the latest high-pressure incandescent inverted burner.

At the opening ceremony, Councillor J. Reid, the Convener of the Gas Committee, intimated that apologies for absence had been received from Messrs. W. Ford, of Stockton, D. Macfie, of Edinburgh, J. Bond, of Southport, W. R. Herring, of Edinburgh, J. Hepworth, of Edinburgh, and T. Waddom, of Newcastle.

Mr. REID said that the exhibition was just in keeping with the progressive policy adopted by the Gas Department during the past six or seven years. By a resolution of the Town Council, passed some time ago, it was determined to hire out gas-fires and other heating appliances. They were aware that a large number of people were not conversant with the benefits to be derived from gas heating, and they were also aware that a very large proportion of the population were not able to buy gas appliances. They had determined, therefore, to purchase for them what they could not buy for themselves, and to charge a very small sum—10 per cent. on the capital cost—as rental, for a number of years. In a short time the consumers would have their gas-fires absolutely free. The cost of heating by this was very reasonable indeed. An ordinary gas-fire cost only about ½d. per hour for gas.

Lord Provost URQUHART, in declaring the exhibition open, said that, whatever might be said by critics, either ill-informed or ill-natured, Dundee, speaking generally, had been governed by an enlightened and

a progressive municipality for at least a generation. It very early recognized that the supply of water and the manufacture of gas should not be in the hands of private companies, to be exploited for the profits of lucky shareholders; and the Corporation very wisely acquired these vitally important concerns, at a huge original cost, and had administered them to the great benefit of the citizens. More recently—in their own time—the tramway system was taken over and vastly improved and extended, to their great convenience and comfort. So that, with the electricity department—itsself a large, an important, and a growing undertaking—the Corporation, in addition to the ordinary administration of a large city, actually controlled and directed four enormous trading concerns belonging to the ratepayers, every one of which was in a thoroughly sound financial condition and excellent working fettle. This night they were more immediately brought into touch with gas affairs. He gathered that it was mainly due to the enterprise and zeal of their Manager, Mr. Yuill, that they were indebted for the existence of the exhibition. What must strike the most casual observer was the fact that, notwithstanding the introduction of electric light and of electricity for motive and other industrial purposes, the manufacture of coal gas and the application of it for municipal, domestic, and commercial purposes had increased by leaps and bounds. He could remember that, when the Town Council began the generation and sale of electricity, there were many lugubrious parties, inside the Council and out of it, who prophesied that the gas-works, which had cost so much, would soon be an asset only on paper. But what did they find to-day? The undertaking was never in a healthier condition, the output had greatly increased, the cost of production and the price to consumers had been largely reduced, and the capital debt had been lessened by nearly £46,000. And, as showing that gas making all over the kingdom was by no means a decaying industry, it might be noted that the annual consumption of coal for this purpose had increased in the last five years to the enormous extent of 2,600,000 tons. It was obvious that such a state of matters would not pertain had the gas managers and engineers and chemists of the country complacently accepted electricity as superior in every way to gas. Instead of doing this, they determinedly set about making their goods capable of competing against all comers. The incandescent burner itself effected a revolution in gas lighting; and many other ingenious inventions had contributed to this condition of prosperity in the gas world. They would agree that such exhibitions as theirs must do much to spread a knowledge of the uses to which gas could be put, and so secure an ever-increasing flow of custom. He would not enlarge on the necessity of ample street lighting. That, he thought, was recognized by even the most ardent advocates of economy. Let him, however, claim, in passing, that Dundee folks got off very easily under this head. They paid considerably less than was paid in any of the five largest burghs in Scotland—5d. per head less than in Aberdeen, and 1s. 6d. per head less than in Edinburgh. It was to the domestic uses of gas that he would take this opportunity of directing the attention of the citizens, and more especially of the working classes. He hoped that they would come there in their thousands and see for themselves how they could be helped in their households by many of the appliances exhibited there. There used to be a prejudice against cooking at gas-fires. This, he hoped, had been blown away for ever by the testimony of the most eminent physicians. In larger houses, a gas-stove was a convenience; but to the working housewife it must indeed be a blessing. No man or woman could do a good day's work, and no child could be expected to get up lessons, unless they got a sufficiency of well-cooked food. There was very little time at meal hours for the lighting of fires; and in homes in which they were not fortunate enough to have a housekeeper, there was little chance of cooking being done at ordinary fires until the evening. This was one of the greatest blots on their industrial life, and was surely one of the root causes of the degeneracy they heard so much of. He was glad to say that the use of gas cooking-stoves had increased tremendously of late years in Dundee. In 1904, the total fixed during the preceding twenty years numbered 1333; to-day, there were upwards of 17,200. They would see that there was still plenty of room for more; and he, for one, looked forward to a speedy increase as one result of the exhibition, which would bring real and far-reaching benefit to their citizens. He would be failing in his duty were he to omit some tribute to the work and ability of their Gas Manager. He had a very stiff job to tackle when he went there; and he had himself to win the confidence of the Commissioners. He could only say that he had acquitted himself in a way that had placed him alongside their most trusted and esteemed officials. In 1900, the price of gas was 3s. 10d. per 1000 cubic feet; to-day, it was 2s. 3d. Then the net cost of production was nearly 2s. per 1000 cubic feet; to-day, it was under 9d. These figures spoke eloquently in praise of their Gas Manager; and he was sure they would join with him in congratulating Mr. Yuill on the magnificent results of his management.

Mr. YUILL, in a few words, expressed his thanks for what had been said, and hoped that the exhibition would be a success.

Mr. R. B. MAIN (Glasgow) proposed a vote of thanks to Lord Provost Urquhart, which was heartily accorded by the large gathering of citizens who had attended the opening ceremony.

The exhibition is to be open for a fortnight, and twice daily lectures on cooking are being given by Miss E. M. Dods, late Principal of the Dundee School of Cookery.

MANCHESTER CORPORATION GAS UNDERTAKING.

Criticism of the Gas Department.

In the "JOURNAL" last week (p. 60), reference was made to some criticisms of the Gas Department of the Manchester Corporation by Mr. J. C. B. Percy, at the annual meeting of the Ratepayers' Association. Mr. Percy, it may be remembered, challenged the statement contained in the last report of the Gas Committee that the gas undertaking was "never in a better condition." In support of his challenge, he subsequently sent a letter to the "Manchester Guardian," in which he amplified and illustrated by figures the remarks he made at the meeting. In the course of his letter he said: "I would ask how the

Gas Committee arrive at an increased excess of assets over liabilities of £544,000 in the ten years under review ;" and he gave the following tabular statement.

Manchester Gas Undertaking—Years 1900 and 1909 Compared.

[Decimals not taken into consideration.]

Expended on Land, Works, &c.				Percentage of Increase.	
1909	.	.	.	£2,781,634	12 4
1900	.	.	.	2,121,681	11 10
Increase	.	.	.	£659,953	0 6
Mortgage and Other Loans.					
1909	.	.	.	£1,226,058	2 8
1900	.	.	.	1,026,456	7 0
Increase	.	.	.	£199,601	15 8
Excess of Assets: Sinking Fund, &c.					
1909	.	.	.	£1,671,108	8 7
1900	.	.	.	1,126,834	1 0
Increase	.	.	.	£544,274	7 7
Interest on Loans.					
1909	.	.	.	£51,500	18 10
1900	.	.	.	38,400	16 10
Increase	.	.	.	£13,100	2 0
Sinking Fund.					
1909	.	.	.	£63,766	0 9
1900	.	.	.	36,686	3 8
Increase	.	.	.	£27,079	17 1
Income.					
1909	.	.	.	£761,363	12 2
1900	.	.	.	654,526	19 8
Increase	.	.	.	£106,836	12 6
Percentage of Decrease.					
Gross Profit.					
1900	.	.	.	£149,051	12 0
1909	.	.	.	141,374	2 5
Decrease	.	.	.	£7,677	9 7
Net Profit.					
1900	.	.	.	£110,650	15 2
1909	.	.	.	89,873	3 7
Decrease	.	.	.	£20,777	11 7

Mr. Percy pointed out that, in addition to the above, during the ten years profits to the amount of £157,055 had been added to capital, instead of borrowing ; a great part of this sum having been used to instal the carburetted water-gas plant. Turning to the revenue account, he said it seemed also in a bad way.

On the 31st of March last, according to the "abstract," the account stood as under :

Liabilities.	
Bank overdraft*	£174,424
Sundry creditors	146,587
	£322,010
Assets.	
Stocks, &c.	£130,174
Cash in hand	1,152
Sundry debtors	173,899
	£305,225
Adverse balance	16,491
	£322,010

* The bank overdraft is reduced by the sum of £132,799, by using cash in hand on account of sinking fund, capital, renewal, and reserve.

In further support of his statements, Mr. Percy quoted from "Field's Analysis" the following figures comparing the gas undertakings of Birmingham and Manchester ; remarking that, so far as he could gather neither city charged meter or stove hire.

	Birmingham. Year ending Mar. 31, 1909.	Manchester. Year ending Mar. 31, 1909.
Capital raised	£2,085,506	£1,349,532
Sinking fund applied in substitution of loans	£823,443	£1,391,740
Total capital employed	£2,908,949	£2,741,272
Capital employed per 1000 cubic feet of gas sold	8s. 6d.	10s. 2d.
Outstanding capital debt per 1000 cubic feet sold	6s. 1d.	4s. 6d.
Average price of gas sold	23'95d.	27'40d.
Gas made (thousand cubic feet)	7,327,587	5,779,256
Gas unaccounted for, per cent. on make	4'77	5'76
Total sale of residuals per 1000 cubic feet sold	7'96d.	7'14d.
Manufacturing charges do.—		
Salaries	0'35d.	0'28d.
Wages	2'73	2'12
Purifying	0'24	0'05
Wear and tear	5'19	2'07
Distribution charges per 1000 cubic feet sold	2'01	2'57
Management charges—		
Salaries	£3509	£4,899
Collectors	1500	11,924
Stationery and general charges	4685	5,830
Total management expenses	9700	22,659

On these figures Mr. Percy remarked : "It will be noticed that the price per 1000 cubic feet is 3½d. less in Birmingham than in Manchester. If 1d. per 1000 makes a difference of £20,000, is it clear that Manchester would be £70,000 a year worse off than at present if the

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 99.

Issue	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
500,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	13½-19	-½	5 5 3	195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
268,955	10	"	7	Do. 7 p.c.	13-13½	..	5 3 8	561,000	Stk.	"	10	Liverpool United A.	223-225	..	4 8 11
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	9½-100	+2	4 0 0	718,100	"	"	7	Do. B.	165-167	..	4 3 10
200,000	5	May 27	6½	Bombay, Ltd.,	51-64	+½	5 6 1	306 083	"	June 25	4	Do. Deb. Stk.	104-106	..	3 15 6
40,000	5	"	6½	Do. New, £4 paid . . .	48-48	+½	5 6 8	75,000	5	June 11	6	Malta & Mediterranean.	44-51	..	5 17 1
50,000	10	Aug. 26	15	Bourne-	28-28½	..	5 5 3	500,000	100	Oct. 1	4½	Met of 15 p.c. Deb.	109-102	..	4 18 0
311,810	10	"	7	mouth Gas B 7 p.c. . .	16½-17	..	4 3 7	250,000	100	"	4½	Melbourne J 4½ p.c. Deb.	100-102	..	4 8 3
75,000	10	"	6	and Water Pref. 6 p.c.	153-158	..	3 10 8	511,920	20	May 27	3½	Monte Video Ltd. . . .	124-134	..	5 5 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	25½-259	..	4 17 8	1,775 892	Stk.	July 29	4½	Newcastle & Gateshead Con	107-108	..	4 3 4
300,000	"	"	5	Do. New	193-192	..	4 19 0	518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	93-94	..	5 14 6
50,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	55,940	10	Aug. 26	7	North Middl sex 7 p.c.	13-13½	..	5 3 8
206,250	"	June 11	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	303,030	Stk.	Apl. 29	8	Oriental, Ltd.	133-141	..	5 13 6
220,000	Stk.	Sep. 10	1	Brighton & Hove Ord.	28-283	..	5 3 3	60,000	5	Sep. 10	8	Ottoman, Ltd.	98-101	..	5 5 6
246,320	"	"	1	Do. A Ord. Stk.	150-152	..	5 5 3	31,830	53	Aug. 26	13	Portsea Island A.	137-139	..	4 19 0
460,000	20	Apl. 16	10	British	43-43½	..	4 11 11	60,000	50	"	13	Do. B.	129-131	..	4 19 3
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c. . . .	118-120	..	5 0 0	100,000	50	"	12	Do. C.	120-123	..	4 17 7
165,708	"	"	4½	Do. B 3½ p.c.	88-90	..	5 0 0	114,800	50	"	10	Do. D and E.	101-103	..	4 27 1
82,278	"	"	3½	Do. C 5 p.c.	106-108	..	5 1 10	398,490	5	May 13	7	Primitiva Ord.	12-12½	..	4 14 11
54,902	"	June 25	54	Do. 3½ p.c. Deb. . . .	88-90	..	3 17 9	796, 80	5	July 29	5	Do. 5 p.c. Pref.	54-54	..	4 10 11
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	138-144	..	4 18 3	485,900	100	June 1	4	Do. 4 p.c. Deb.	91-96	..	4 8 4
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	95-99	..	4 2 6	1, 60, 000	10	Apl. 20	8	River Plate Ord. . . .	104-174	..	4 42 9
100,000	10	"	—	Cape Town & Dis., Ltd.	41-5	..	—	312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	96-100	..	4 1 8
100,000	10	"	—	Do. 4½ p.c. Pref. . . .	54-6	..	—	250,000	10	Sep. 20	8	San Paulo, Ltd.	144-144½	..	5 8 6
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	488-494	..	6 1 3	62,500	10	"	6	Do. 6 p.c. Pref.	118-124	..	4 18 0
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82-84	..	5 7 2	125,000	50	July 1	5	Do. 5 p.c. Deb.	10-51	..	4 18 0
157 157	Stk.	Aug. 12	5	Chester 5 p.c. Ord. . . .	106½-108½	..	4 12 2	135,000	Stk.	Sep. 10	10	Sheffield A	230-232	..	4 6 2
3,791,735	Stk.	Aug. 26	5½	Commercial 4 p.c. Stk.	109-111	..	4 13 8	21,908	"	"	10	Do. B	129-131	..	4 6 7
4,193,975	"	"	5	Do. 3½ p.c. do.	104-105	..	4 14 4	523,50	"	"	10	Do. C	129-131	..	4 6 7
258,740	Stk.	June 11	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	70,000	10	June 11	10	South African	13-13½	..	4 7 8
62,500	Stk.	"	7	Continental Union, Ltd.	95-97	..	5 3 1	6,429,895	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	120-122	..	4 7 4
49,270	Stk.	"	4	Do. 7 p.c. Pref.	138-140	..	5 0 0	1,895,445	"	July 1	3	Do. 3 p.c. Deb.	85-87	..	3 8 11
148,995	"	"	5	Derby Con. Stk.	121-123	..	4 1 4	209,822	Stk.	Aug. 26	8	South Shields Cor. Stk.	143-155	..	5 5 3
486,909	10	Oct. 2	12	Do. Deb. Stk.	103-105	..	3 16 2	605,000	Stk.	Aug. 12	5½	S'th Suburb'n Ord. 5 p.c.	119-121	+1	4 13 11
551,603	10	July 14	12	East Hull 5 p.c. Ord.	97-99	..	5 1 0	60,030	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
15,141,545	Stk.	Aug. 12	4½	European, Ltd.	24½-25	..	4 16 0	117,978	Stk.	July 14	5	Do. 5 p.c. Deb. Stk.	102-124	..	4 0 8
2,600,000	"	"	3½	Do. £7 ros. paid . . .	81-10	..	4 14 9	502,310	Stk.	May 13	5	Southampton Ord. . .	111-113	..	4 8 6
3,791,735	"	"	3½	Gas 4 p.c. Ord.	106-107	..	4 7 2	120,000	Stk.	Aug. 12	6½	Tottenham A 5 p.c.	133-135	..	5 1 9
4,193,975	"	"	3½	light 3½ p.c. max. . . .	88-90	..	3 17 9	453,940	"	"	58	and B 3½ p.c.	111-113	..	4 13 5
258,740	Stk.	June 11	3	and 4 p.c. Con. Pref.	103-105	..	3 16 2	149,470	"	June 25	4	Edmonton 4 p.c. Deb.	100-102	..	5 18 5
62,500	Stk.	Sep. 10	5	Coke 3 p.c. Con. Deb.	85-87	..	3 8 11	182,330	10	June 11	8	Tuscan, Ltd.	9-9½	..	8 8 6
730,000	10	"	6½	Hastings & St. L. 3½ p.c.	82-84	..	5 6 4	149,000	10	July 1	5	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
131,070	Stk.	Sep. 10	6	Do. do. 5 p.c.	117-119	..	5 9 3	230,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	109-111	..	4 10 1
65,380	"	"	5	Hongkong & China, Ltd.	174-177	..	6 4 0	255,606	Stk.	Aug. 26	6½	Wands- B 3½ p.c.	119-141	..	4 14 0
65,500	"	"	5	Ilford A and C	138-140	..	4 1 10	79,416	"	June 25	5	worth 3 p.c. Deb. Stk.	73-75	..	4 8 0
4,943,000	Stk.	May 13	8	Do. B	105-107	..	4 13 6	835,772	"	Aug. 12	58	West Ham 5 p.c. Ord.	124-126	..	4 5 4
1,735,000	Stk.	Aug. 12	3½	Do. 4 p.c. Deb.	102-104	..	3 16 11	210,000	"	"	5	Do. 5 p.c. Pref.	127-129	..	5 17 6
				Imperial Continental .	180-182	+1	4 7 11	253,300	"	June 25	4	Do. 4 p.c. Deb Stk.	112-114	..	5 13 2
				Do. 3½ p.c. Deb. Red.	95-97	..	3 12 2								

Prices marked * are "Ex div."

same average price obtained as in Birmingham. The difference in wear and tear is also large, while Manchester's excess in management charges is extraordinary, and surely calls for some explanation and justification. One would think that the above figures are sufficiently bad in themselves, even if we were getting a good illuminant; but considered with the 'light' that is supplied, it is not too much to say that the present condition of the Manchester gas undertaking is unsatisfactory, discreditable to the management, and demands some radical alteration."

Reply of the Chairman of the Gas Committee.

In a letter which appeared in the "Manchester Courier" last Saturday, Alderman Gibson, the Chairman of the Gas Committee, replied as follows to Mr. Percy's criticism.

It has been said that "a little knowledge is a dangerous thing," which is fully exemplified in Mr. Percy's case. Had he known more of the matter he was talking about, he would have saved himself, myself, yourselves, and the general public much unnecessary trouble. I should be happy to refer the matter to any competent gas expert. In the meantime, may I say the years which Mr. Percy has selected for comparison are wholly dissimilar as regards the extent and prosperity of trade. For example, the year 1900 was the last of a series of six during which the output of the Gas Department was increased by about 1200 million cubic feet, or 34 per cent.; while the year 1908-9, in common with the general trade of the country and competition with electricity, resulted in the greatest reduction of output yet experienced in the history of the Manchester gas undertaking.

In dealing with the capital expenditure for the period 1900-1909, Mr. Percy has given figures and percentages of increase without regard to the all-important factor of extension of business. Great extensions of plant have necessarily been made to meet the increasing demands of the last decade; the consumption of gas has also been promoted by the free supply of cookers and other gas-consuming appliances, with results greatly to the benefit of the citizens generally. The outstanding capital debt of the Gas Department—i.e., the ratepayers'—was in 1909 £228 per million cubic feet of gas sold, and £229 in 1900. About half the capital expenditure during the period 1900-1909 has been met out of money borrowed for short terms; and the effect of this is seen in the increased amounts placed to the sinking fund. The fruits of this policy are referred to later.

The gross profits for the year 1909, in common with other industrial undertakings, suffered a set-back in consequence of the unfavourable state of trade already referred to. Despite Mr. Percy, "decimals" must not be ignored. The fall in residual products accounts for 0.5d. per 1000 cubic feet sold; and this fraction means £11,208 to the Gas Department. The average receipts per 1000 cubic feet sold in 1909 were 0.54d. less than in 1900; being £12,105 on the year's sales. Rates and taxes have risen 0.53d. per 1000, equalling £11,881. Summarizing the reduction in receipts per 1000 feet, the fall in market values, and the

increase in rates, it will be found that the gross profits in 1909, on the 1900 basis, would have been increased by £35,194, or from £140,022 to £175,216; and in like manner and to the same extent the net profits have been affected. The gross profits of the year 1900 and the last three years are as follows: 1900, £149,052; 1907, £166,598; 1908, £163,988; 1909, £140,022.

The assets and liabilities of the Manchester gas undertaking for the years 1900 and 1909 were as follows:—

	1900.		1909.
Assets	£2,382,396	..	£3,086,383
Liabilities	1,255,562	..	1,415,275
Excess of assets over liabilities	£1,126,834	..	£1,671,108
Percentage of assets over liabilities	89.75	..	118.08

The full significance of this will be attested by a comparison with the period 1890-1899.

	1890-1899.		1900-1909.
Increase in assets	£740,486	..	£703,987
Increase in liabilities	462,458	..	159,713
Increase of excess of assets over liabilities	£278,028	..	£544,274

The fact to be deduced from these figures is that the financial position of the gas undertaking is more favourable than that of the previous decade.

The following particulars illustrate in a striking manner the relative results of recent years:—

	1890-1899.		1900-1909.
Paid in aid of rates	£512,701	..	£563,183
Paid in rates	184,742	..	408,431
Increase per cent.	£697,443	39.2	£971,614
Placed to sinking fund	£179,122		£488,338
Increase per cent.	172.6		

Thus it will be seen that, in addition to the large contributions in rates and in relief of rates which the department has made, the policy in regard to the redemption of debt is saving an annual charge for interest of at least £10,000, and in addition has given to the city during the last ten years, free of charge, plant of the value of £488,338, against a corresponding item in the previous ten years of £179,122—a clear advantage of £309,216.

Mr. Percy quotes figures, forgets to dispense with "decimals," and conceals anything which would help to elucidate the relative position of the two gas undertakings at Manchester and Birmingham. For example, he shows the capital expenditure as follows:—

	Manchester.		Birmingham.
Capital employed	£2,741,272	..	£2,908,949
Do. per 1000 cubic feet sold	10s. 2d.	..	8s. 6d.

OUR Patent "THERMO" Firefront,

The Pioneer of Perfect Radiation.

OUR Patent "N.V."

The Pioneer of the Adjustable Gas-Fire Idea,

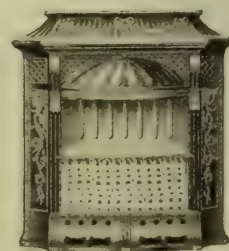
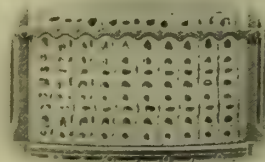
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The First wide Fire that has ever been a working success.

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as embodied in the "SALON"
21-inch Gas Fire.



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But he omits the following important factors :—

Miles of mains	913	..	764
Number of consumers	170,938	..	134,696
Gas sold per consumer (cubic feet)	29,365	..	48,528
Gas sold per mile of main (cubic feet).	5,898,000	..	9,000,000

This makes his comparison unfair and misleading. As shown, Mr. Percy has ignored the facts that Manchester supplies a greater area than Birmingham, that its main mileage is 149 miles longer, and that the output per mile of main is only 5,898,000 cubic feet, as compared with 9,000,000 cubic feet in Birmingham, or 34·5 per cent. less, and that Manchester has expended nearly £200,000 in the provision of free cookers for its consumers, whereas Birmingham makes no such provision. The criterion as to the general financial position is the outstanding capital debt, and this is greatly in Manchester's favour, as the following figures show : Outstanding capital debt per 1000 cubic feet of gas sold—Manchester, 4s. 6d. ; Birmingham, 6s. 1d.

Mr. Percy supplies an array of separated items, and avoids giving their total, which is necessary to a just estimate of the position. In dealing with costs of manufacture, the net cost of gas per 1000 cubic feet into holders should be the basis of comparison. The figures are : Manchester, 11·11d. ; Birmingham, 13·45d. Mr. Percy states "the difference in wear and tear is also large." It certainly is ; the figures being, as quoted by Mr. Percy, Manchester, 2·07d. ; Birmingham, 5·19d. per 1000 feet of gas sold—advantage to Manchester, 3·12d. The costs of distribution per 1000 feet sold are : Manchester, 2·57d. ; Birmingham, 2·01d. The difference arises partly on account of the repairs and maintenance of stoves (£8851 = 0·40d. per 1000 feet), Birmingham having no similar charge, and to the much larger annual consumption per consumer in the latter place ; the respective quantities being 48,528 cubic feet in Birmingham, against only 29,365 cubic feet in Manchester. It is obvious that with an average annual consumption as high as Birmingham the cost per 1000 feet would be relatively enormously reduced. On a "per consumer" basis (omitting cost of stoves repairs), the average cost of distribution charges per consumer was 8s. 6d. in Birmingham, compared with 5s. 8d. in Manchester.

For some obscure reason, Mr. Percy makes no mention whatever of the important question of rates and taxes. The cost of rates and taxes per 1000 feet sold was respectively as follows : Manchester, 2·47d. ; Birmingham, 1·56d.—difference, 0·91d. This amounts to £20,416 on the year's sales of gas.

The higher average consumption in Birmingham has a vital effect upon the costs of management. The Birmingham output could be dealt with by the present Manchester staff without an increase in expense or numbers. The costs were as follows :—

	Manchester.	Birmingham.
Salaries	£4,899	£3,509
Stationery and general charges	5,836	4,685
	£10,735	£8,194
Average cost per consumer .	1s. 3d.	1s. 3d.

Thus on a fair basis these costs are no more and no less in Manchester than in Birmingham.

The systems of collection are dissimilar, Birmingham allowing a discount of 5 per cent. for early payment ; the amounts paid in salaries being £1506 in Birmingham against £11,924 in Manchester. A discount of 5 per cent. on the Birmingham rental amounts to £36,342 for the year under review. The amount of discount availed of was £26,152. Adding to this the cost of salaries, we arrive at the cost of collection in Birmingham—viz., £11,716, equalling 1s. 9d. per consumer per annum. Under the Manchester system, the cost of which is borne by all consumers, the average cost is 1s. 5d. per consumer per annum.

As already shown, the Manchester gas undertaking is under the disadvantage of a low average consumption ; and this must necessarily be reflected to a corresponding extent in the price of gas. The average prices received per 1000 cubic feet sold were as follows : Manchester, 2s. 3·4d. ; Birmingham, 1s. 11·95d. The difference in price (3·45d.) is more than accounted for by the costs incurred in connection with free cookers, which cost us £45,900 per annum, the excess of our rates and taxes, and the varying conditions before referred to.

On this frank statement, it is submitted that Manchester has every cause to welcome a just comparison, and that the Manchester gas undertaking has been well administered and soundly financed, is in a better position to-day than ever it was, and that the Gas Committee deserve the thanks of the community.

DEVONPORT GAS CONTRACTS.

The Agitation about Contracts.

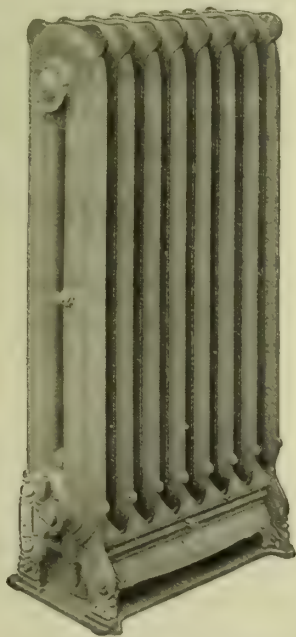
The affairs of the Gas Department are receiving some attention in the municipal elections at Devonport ; and on Thursday evening last Alderman Tozer, the Chairman of the Gas Committee, took an opportunity of replying to the criticism offered by Alderman Hornbrook, the former Chairman of the Committee, and other persons.

Mr. Tozer first dealt with an allegation that 1000 tons of coke had been sold at 10s. per ton, and explained that this was the best price they had received in response to an advertisement for tenders for the coke to be cleared by a certain time. Previously, he said, coke had been sold privately at nearly half the price. Proceeding to deal with the result of the inquiry last year into Messrs. Willey and Co.'s contract for the installation and maintenance of prepayment meters and cookers, Mr. Tozer said that over a hundred installations per month had been made under the contract ; but taking it at only eighty per month during the ensuing five years, they would have 4800 installations at the reduced price which the firm had agreed to accept. This meant that, instead of paying £20,640, as would have been the case under the original contract, the Corporation would pay £17,476 ; so that there

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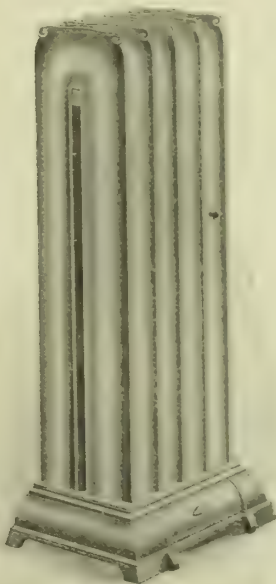


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For every other situation.



Products of combustion inside, but **WITH A FLUE** and no internal parts.

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The Radiator Experts,
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would be a saving of £3164. Messrs. Willey and Co. had also agreed to waive the payment, to which the Corporation were bound, of 4s. 8d. per annum for the maintenance of these installations; and on this item there would be a further saving of £3000. The inquiry had thus resulted in a saving of no less than £6000; and all that Messrs. Willey and Co. asked in return was that the Corporation should buy the goods they produced at the market prices. The Corporation were now buying goods more advantageously than under the former haphazard method. The Engineer had been able to manage the works with a larger output of gas at a saving in wages for the past six months, of £419. The capital account had been overspent by £1149; and many things which should be charged to capital were being done out of revenue. Still, he hoped that they would show a satisfactory balance at the end of the year. If the profits were as favourable as he hoped they might be, there was no reason why there should not be a reduction in the price of gas.

PROGRESS OF GAS SUPPLY IN MILAN.

In the annual report of Mr. J. H. Towsey, the British Consul at Milan, which has just been issued by the Foreign Office, the following particulars are given in regard to the quantity of gas sold, the number of consumers, &c.; showing the progress of gas supply in the city during the past ten years:—

Years, July 1 to June 30, inclusive.	Quantity of Gas Sold.	Prices Paid per Cubic Metre.	Number of Con- sumers.	Number of Street Lamps.	Coal Car- bonized.
	Cubic Metres.	Cents.			Tons.
1907-8	59,225,809	13 to 15	116,687	6464	220,867
1908-9	62,581,374	13 „ 14	124,771	6564	230,336
Increase . .	3,355,565	..	8,084	100	9,469
1898-99. . . .	32,031,600	14 to 18	60,647	5216	124,759

A tax of 2 c. per cubic metre is levied by the Government, and one reduced since February last to 1½ c. by the Commune of Milan. These taxes are in addition to the above-named charges. There are three manufacturing and two storage stations. The first section, having a productive capacity of 50,000 cubic metres (2,120,000 cubic feet) of gas per day, of the new works at Bovisa, and described in the "JOURNAL" for the 26th of January last (p. 236), was started last year; and a second section is now being constructed. The capacity of these two new sections is 400,000 cubic metres (14,126,800 cubic feet) of gas per day. Between 1200 and 1400 men are employed at the gas-works.

HIPPERHOLME GAS PROBLEM.

[From the "Halifax Courier."]

The problem of supreme interest in Hipperholme just now is the gas question. It has been the subject of much debate in the local Council, and of much correspondence with the Halifax Corporation throughout the year. Now matters appear to be coming to a head, for legal proceedings have been threatened by Halifax, and the Hipperholme Council seem disposed to fight the issue. It is a question of considerable complexity; and the negotiations of the next few weeks will be of the utmost importance.

For a full understanding of the matter, it is necessary to briefly sketch the history of the Halifax gas undertaking. In 1855, the Halifax Local Board of Health bought up the Halifax Gas Company's undertaking established in 1825; and under the Act of the former date, it was stipulated that the charge should not exceed 4s. per 1000 cubic feet. A further clause set forth that the price should be such (not exceeding the 4s.) as might be agreed upon between the gas undertaking and the persons supplied. The Corporation argument is that they have differential power of charging. Hipperholme is supplied by them individually, not collectively; and the charge has always been considerably higher than to borough consumers. In 1882, Halifax obtained parliamentary powers, among which their area was clearly defined; and the contention of Hipperholme is that they are part and parcel of the Halifax area, and that they should be treated as such, for, through this Act, they have not the power to obtain gas from any other public authority. The clause setting forth the area, named the townships of Northowram, Hipperholme, Southowram (the portion not included in the Elland gas supply), Copley (not included in Elland and Sowerby Bridge), and Warley (not included in Sowerby Bridge). These areas, with the exception of a portion of Southowram, are now in the borough. The charge to Hipperholme was at one time 1s. more per 1000 cubic feet than in the borough, then 10d., and now 7d. The question of the eastern portion (Bailiffe Bridge) of the Hipperholme area enters into the matter. The Halifax Corporation's powers extend to that district, but gas is not supplied there by them; a private company, charging 3s. 8d. per 1000, having the supply. The Hipperholme Council have been urging Halifax to extend their undertaking in that direction.

The present threatened litigation arises through the Hipperholme Council declining to pay the full amount of the last quarter's account. Their case is that there is no just claim upon them to pay more than borough consumers; and they tendered a cheque based on that rate. This has been returned by Halifax, and proceedings threatened; the intimation being given at the same time that they did not desire to cut off the Hipperholme supply, as that action would place the local Council in an awkward position.

A larger question is involved in the power of the Hipperholme Council to acquire their own gas undertaking under certain conditions; but this is a phase of the subject best deferred at the present juncture.

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require a system of heating which, besides being thoroughly efficient, will counteract the unpleasant effects of draughts caused by the opening and shutting of doors. A Richmond "Monarch" Gas-Steam Radiator is quite unaffected by an inrush of cold air, and is perfectly regulated. Any large building can be quickly warmed throughout without the fear of overheating, and this system is both economical, easy to maintain, and safe.

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"Richmond's post-card album contains 48 post-cards in eight different designs, and deals with the heating of places of worship, public buildings, schools, shops, &c. The idea is for the despatcher to use the particular card best calculated to attract the attention of the person with whom he is communicating. The cards have an attractive general appearance, and the illustrations are good. They should therefore prove useful missionaries in the cause of the Gas-Steam Radiators."—*Gas Journal*.

CO-PARTNERSHIP AT WATFORD.

At the recent annual dinner given by the Watford Gas and Coke Company to their employees, emphatic appreciation of the system of co-partnership, which has lately been adopted, formed an interesting feature of the speeches. The Secretary and General Manager (Mr. J. Duncan Royal), in proposing "Prosperity to the Watford Gas and Coke Company" said that since the last dinner they had passed through a steadily prosperous year. There had been two great achievements since they last met—first the reduction in the price of gas, and secondly the profit-sharing and co-partnership system. As to the price of gas he was certain there were few towns of the size of Watford that could boast of being able to sell gas at 2s. 6d. per 1000 cubic feet; and most of those that could were either situated close to coalfields or were seaports. It was a great achievement—one of which they might well feel proud; and it was all the more so because they had to face rate-aided opposition. They were also proud of their profit-sharing scheme. Speaking for the whole of the employees, he could say that for them nothing that had been done equalled the scheme. It was a magnificent thing. He was not speaking so much of the money in their pockets; there was something more to look at. A week's work well done was more satisfactory to a man than if he had shuffled through the week and lifted his wages at its close. If any of the older hands asked, "What use is it to me? it's a pity it wasn't started years ago," he would remind them of the youngsters at home. They would want them to start where they left off. It was well to know that, when they laid down the burden of the whole thing, they had handed on to their children something that would be a great reminder of the part they had taken in building up the Watford Gas and Coke Company. To the younger hands he would say there was nothing like this scheme that would make them feel so independent. It was something for each one to feel that he was a shareholder as well as an employee of the Company. They would have a fourfold interest in the Company—that of shareholder, co-partner, employee, and consumer. Mr. E. J. Slinn, the Chairman of the Company, who presided, in responding, complimented Mr. Royal on his speech. He alluded to the long connection some of the men had had with the Company; mentioning three whose records were 36, 35, and 30 years. He concluded by proposing "The Staff;" coupling with the toast the name of Mr. T. S. Godwin, the Works Manager and Engineer. He said the Company might endeavour to make everything as perfect as they could—they might pass rules everlastingly; but unless they had a good and loyal staff to carry them out, they would be of little use. He was glad to say the Company had a sound, loyal, and efficient staff. Mr. Godwin, in responding, thanked the Chairman for his kind words, and said he believed the Company had a staff second to none in England. At the call of Mr. Godwin, the health of the Chairman, Mr. Royal, and Mr. John Godwin was drunk enthusiastically; and to the toast of "The Directors" musical honours were accorded.

SHEFFIELD CORPORATION WATER-WORKS.

Completion of the Rivelin Tunnel.

At the Meeting of the Water Committee of the Sheffield Corporation last Wednesday, the following statement relating to the Rivelin Tunnel was submitted by the General Manager (Mr. William Terrey), and ordered to be entered on the minutes.

The construction of the Rivelin Tunnel was sanctioned by the Sheffield Corporation Act of 1903, which amended the line authorized by the Derwent Valley Water Act, 1899, and is for the purpose of conveying Sheffield's share of the Derwent water from the joint aqueduct of the Derwent Valley Water Board at Lady Bower to the existing works of the Corporation in the Rivelin Valley, about four miles from the City.

The length of the tunnel is 7652 yards, or 4 miles 612 yards, and the gradient is 1 in 3650. It has a semi-circular arch, with vertical side walls and dished invert; the height being 6 ft. 6 in. and the width 6 feet. It has been driven throughout without shafts, which is believed to be unique, having regard to the length. The ground tunnelled through consisted of millstone grit and hard shale, interspersed with bands of rock. With the exception of the Severn Tunnel, which is only 12 yards longer, it is the longest tunnel in England, and certainly the longest in the United Kingdom for water-works purposes. The lining is partly in cement concrete and partly in brickwork, varying according to the nature of the strata. The system of ventilation adopted has proved exceptionally efficient. The whole of the apparatus for driving, haulage, pumping, ventilation, and lighting has been worked by electrical plant, which has greatly conduced to the efficiency of working and the health and comfort of the workmen.

The driving was commenced from the two ends at Lady Bower and at Rivelin on July 24, 1903; and since that date the average rate of progress has, notwithstanding unavoidable stoppages and the fact that the lining has followed the driving, been 23·8 yards per week. It is satisfactory to report that the two headings met successfully on the 20th of September last, thus completing the driving of the tunnel. The junction was in every respect satisfactory; any discrepancy in alignment being practically imperceptible, and the levels agreeing at the points of junction within half-an-inch. The driving has thus occupied a period of 6 years 59 days. It is gratifying to record that no serious accident occurred in the tunnel during the progress of the work.

It may be added that Sheffield's share of the Derwent water, when the works are fully completed, will amount to 25 per cent. of the total available yield, which is equal to 6,833,333 gallons per day; and the tunnel is designed to convey, and is capable of conveying, this maximum quantity. The total amount expended on the tunnel so far is about £136,000; and it is estimated that the final cost will be £150,000. The Water Department of the Corporation are to be congratulated upon the success and skill with which the scheme has been devised and executed.

Richmond's "A.B.C." Gas Fires.

A series of eight similar Post-Cards, but dealing with the subject "Warmth in the Home" and the merits of our "A.B.C." Gas Fires, will shortly be ready.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Eastern District of the Scottish Junior Gas Association had a magnificent send-off upon their session's work this afternoon. The address of the President—Mr. H. Rule, of Falkirk—was framed upon a model which, considering that his hearers were a Junior Association, could not have been improved upon. But it is to the generosity of Mr. Herring, in coming to address them, that the members are indebted for so auspicious a start to their winter's work. Mr. Herring might well have taken as his text the well-known proverb—"Take care of the pence, and the pounds will take care of themselves." His inculcation to attend to small things was very appropriate; the youthful disposition being rather to dream of large accomplishments than to stoop to the mastering of details which very frequently have the appearance of being petty. The advice as to methods of investigation, in the search for defects in production, was most valuable. The members present cordially thanked Mr. Herring for his address, as they well might, because they may take it for granted that in what he told them there were quite clearly shadowed out the principles by the following of which Mr. Herring has found success in life. Mr. Herring's generosity to the Scottish Juniors went farther than the delivery of his address. It was an unexpected announcement, but none the less heartily received, that he was to begin the establishment of a library for the Association by handing over to them a number of up-to-date technical books. If a few other friends would make contributions, a library quite sufficient for the purposes of study could be founded—and the funds of the Association might be sufficient to enable the Council to add, year by year, any outstanding work which might be published. It will be observed that, following the policy adopted last year, two of the four meetings of the session are to be held away from Edinburgh. The meetings which were held out of Edinburgh last year were so successful that there was every encouragement to continue the practice. The joint meeting with the Western District, which was a great success last season, is also to be repeated.

The exhibition of gas lighting and heating, which is running its course in Dundee under the auspices of the Corporation, is noteworthy on more than one account. In size it is the largest exhibition we have yet had in Scotland. It is beautifully set, in the capacious drill hall. Ample gas-service has been provided, both at ordinary pressure and under compression. Since the last exhibition was held in the same place, three years ago, there has been considerable advance in lighting by gas. High-pressure gas lighting has developed greatly. Then the minds of lighting specialists were exercised over the devising of a lamp which would be self-intensifying; in this exhibition, there are no such lamps—all the augmented pressure being obtained by the use of compressors. A notable feature of the exhibition is the complete disappearance of the upright mantle. There is not a single upright mantle in use for lighting purposes, though there are one or two for

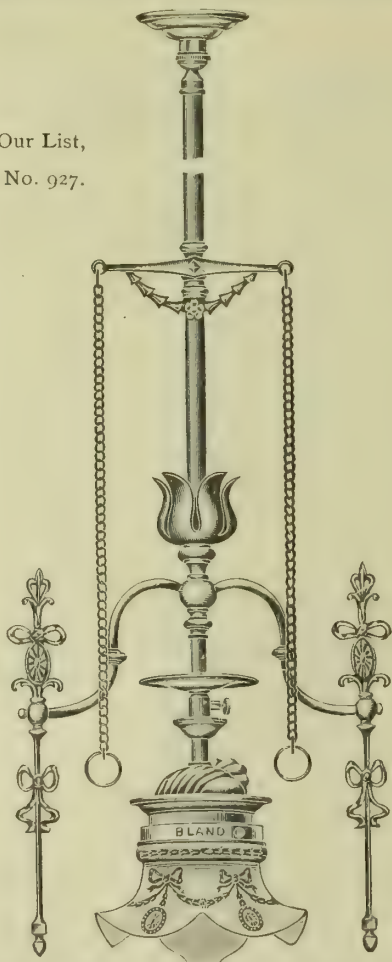
purposes of illustration. At the present moment, the inverted incandescent gas-mantle is universal in up-to-date lighting schemes. But the advance in lighting is not so apparent to the eye as is the advance in the department of heating. In their very appearance gas-heating appliances are improving rapidly; while in efficiency the improvement is not less pronounced. At the opening of the exhibition, Lord Provost Urquhart did good service to the community, as well as to the gas industry, in so highly commending the use of gas appliances, particularly by the humbler classes. His figure of 17,200 cooking appliances issued could easily be doubled in a community the size of that of Dundee, which bears out the remark of the Lord Provost that there is still plenty of room for more. This field, which has still to be overtaken, coupled with the fact that appliances for the use of gas are being continually improved, justifies the holding of the exhibition. The exhibition reflects the greatest credit on Mr. Yuill and his assistants; and it is to be hoped that it will meet with a gratifying response from the community. Experience in recent years has been that an exhibition on a large scale is of more effect in promoting gas consumption than a series of small ones. It may be mentioned that the Dundee Gas Commissioners fix fires and cookers free, and charge a very small rental for hire.

The Town Council of Tayport, having agreed to acquire the gas undertaking, have arranged to borrow £3700 for the purpose and the making of alterations upon the works. The cost to the town of the transfer is £78. The burgh has now been completely fitted up with new incandescent gas-lanterns, at a cost of £154.

At a meeting of the Watching and Lighting Committee of the Glasgow Corporation on Tuesday, the question of the inadequate lighting of private streets in the city was considered. After discussion, the Committee approved of a report upon the subject by the Inspector of Lighting—Mr. S. B. Langlands. In it, Mr. Langlands recommends that, pending legislation on the subject being obtained, wherever owners of property in a private street agree to provide and maintain an improved type of lamp and relative apparatus, and to pay the Corporation at the rate of 25s. per lamp per annum, as under the General Act of 1892, instead of 15s., as under the Local Act of 1866, the Corporation agree that this street be lighted in the same manner as public streets are. The Committee agreed to instruct the Town Clerk to communicate with the Glasgow House Owners' Association and the Glasgow House Factors' Association, with a view to bringing under their consideration the suggestions contained in the Inspector's report. The Committee further agreed to remit to the Inspector of Lighting and the Town Clerk the question of the inadequacy of stair lighting in the city and the remedying thereof, a report upon which is called for.

The palace of the President of Chili has been fitted up with Richmond's "Monarch" gas-steam radiators; and the greatest satisfaction has, it is said, been expressed by his Excellency at their successful working. The installation comprised some fifty large radiators.

Our List,
No. 927.



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20, FENNEL ST., MANCHESTER.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, Oct. 9.

Consumers continuing to abstain from making further purchases, and dealers evidently being in no hurry to cover any requirements they may have for October shipment, the market has remained idle all the week. Consequently prices have receded further; and the quotations now are £11 3s. 9d. per ton f.o.b. Hull, £11 5s. per ton f.o.b. Liverpool, and £11 7s. 6d. per ton f.o.b. Leith. The weaker tone in the near position has caused buyers to hesitate about operating for forward delivery; and though it is reported that there are second-hand sellers well into next year at a very moderate premium, little business has transpired.

Nitrate of Soda.

There is no change in this article; the market continuing quiet at 9s. 3d. per cwt. for ordinary quality and 9s. 6d. for refined, on spot.

Tar Products.

LONDON, Oct. 11.

The markets for tar products have been steady throughout the past week. Pitch has been quiet, but without much alteration in price. Manufacturers are realizing that they are very well sold to the end of the year, and in many cases are inclined to wait before placing any further quantity unless they can obtain good prices. Benzol 90 per cent. is firm in London. It is still rather quiet in the North for prompt delivery, but 5½d. would be accepted. Owing to the demand for toluol, 50-90 per cent. benzol is in good demand, both in London and the North. Toluol is very firm indeed, especially in the North of England. Solvent naphtha is firm, and London makers in particular are very well sold. Heavy naphtha is quiet, and there is not very much business doing. Creosote is steady, particularly in London and the Midlands; but it is quiet in the North, where there appears to be a fair quantity still to be disposed of.

The average values during the week were: Tar, 13s. 6d. to 17s. 6d., ex works. Pitch, London, 27s. to 27s. 6d.; east coast, 26s. 6d. to 27s.; west coast, 25s. 6d. to 27s. 6d. f.a.s. Mersey ports, 27s. to 27s. 6d. f.o.b. others. Benzol, 90 per cent., casks included, London, 6½d. to 6¾d.; North, 5½d. to 6d.; 50-90 per cent., casks included, London, 7d. to 7½d.; North, 6½d. to 6¾d. Toluol, casks included, London, 9d.; North, 8½d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 11½d.; North, 10½d. to 11d.; heavy naphtha, casks included, London, 10½d. to 11d.; North, 9½d. to 10½d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 2½d. to 2¾d. Carbolic acid, 60 per cent., casks included, east coast, 10½d.; west coast, 10½d. Refined naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been steady during the past week, though there is not very much business. The quotations are practically unchanged; the Gas Companies still quoting £11 10s. for prompt, and £11 15s. for forward. In Hull, business is reported at £11 5s. for a good make for prompt; and in Liverpool, makers are asking £11 6s. 3d. to £11 7s. 6d. In Leith, £11 10s. for prompt, and £11 15s. for forward, is quoted.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a fuller demand for coals; and the prices are in some cases firmer. In steam coals, the request is active for prompt shipment; and best Northumbrians are from 11s. to 11s. 6d. per ton f.o.b. For second-class steams, from 9s. 9d. to 10s. 3d., and for steam smalls from 5s. to 6s., is quoted. The production is now more regular at the collieries, but scarcely up to the normal, so that the output at present is well taken up. There is more negotiation for next year's supplies, and higher prices are asked in such cases. In the gas coal trade, there is a steady and growing demand, and one that must be expected to increase for two months to come. Durham gas coals vary in price according to quality; the quotations being from about 10s. to 11s. 3d. per ton f.o.b. for the usual classes, and up to 11s. 9d. for "Wear specials." There are negotiations for quantities of gas coals for shipment. Among the sales, there have been lots of about 40,000 tons for Italy, at a price that is expected to leave about 10s. 4d. per ton f.o.b. for best seconds; and of another at about 10s. 7d. for best sorts. These prices are, however, rendered a little uncertain by the fact that the ideas of the freights that may rule next year vary, and would thus modify the f.o.b. price. Coke is firmer; and this benefits gas coke, which is now in growing production. Good gas coke varies from 13s. to 13s. 6d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

Trade is in the peculiar position that dealers seem to have more faith in the future than in present opportunities. The current demand is much weaker than that for delivery months ahead. Forward prices rule higher than current, which has a very disturbing influence upon business. The prices now quoted are: Ell 9s. to 10s. 6d. per ton f.o.b. Glasgow, splint 10s. to 10s. 3d., and steam 9s. to 9s. 3d. The shipments for the week amounted to 330,923 tons—a decrease of 8826 tons upon the preceding week, and of 17,843 tons upon the corresponding week of last year. For the year to date, the total shipments have been 11,482,274 tons—an increase of 565,037 tons upon the corresponding period.

THE WILSON GAS FIRES.

THE "FIRE" OF THE CENTURY.

ALL IMPROVEMENTS ARE OURS.



The Wilson 'BIJOU' with Patented Reflector in position.

- (a) Pattern of present Universal Fuel.
- (b) The Upright Fuel.
- (c) The Double-Length Fuel.
- (d) The Shallow Fire.
- (e) Flames Burning inside Fuel.
- (f) The Gas and Air Adjustment.
- (g) The Tubular Top.
- (h) The "Venturi Tube" Burner.
- (i) The Duplex Burner.
- (j) The Regenerative Reflector.

&c., &c.

WE INVENTED AND PRODUCED THE FIRST
PORTABLE GAS FIRE IN 1878.

WILSONS & MATHIESONS, LTD.,

Carlton Works,
ARMLEY, LEEDS.

Water Consumers Summoned.

At the North London Police Court, quite recently, before Mr. Biron, upwards of 100 summonses which had been taken out by the Metropolitan Water Board against occupiers of premises neglecting to pay water-rates were heard. Orders were made in the majority of the cases. One of the summonses was against a tradesman in the Clapton High Road, who said that during part of the time the road was up for the electrification of the tramway the water was cut off, and the Board refused to reinstate it until he had paid 12s. 6d. He now asked that this amount should be set off against the rate. His Worship said he had no power to do this; but the defendant might bring an action against the Board for the recovery of the amount. In another case, it appeared that the money was paid before the issue of the summonses. The defendant said he had come up from Cambridge to answer the summons, and he asked for costs. Mr. Biron allowed the summons to be withdrawn on payment of 10s. costs.

New Issues of Gas and Water Capital.

As announced in the "JOURNAL" last week, Messrs. A. & W. Richards are offering for sale by auction at the Mart to-day, by order of Directors, new issues of shares and stock of the Ascot District Gas and Electricity Company and the Lowestoft and Southend Water Companies; and on the 26th inst. they will dispose of new issues of stock of the Aldershot Gas, Water, and District Lighting Company. Another issue of capital is being made by the Redhill Gas Company, who will receive up to the 1st prox. tenders for £3500 of ordinary "B" stock, in sums of £10 or multiples thereof, at a minimum rate of £101 per cent. The Company supply gas to an extensive district, 62 miles of mains having already been laid; and the additional capital is required for extensions. Under the Company's Acts (1865 and 1900), which embody the sliding-scale clause, the price now charged for gas enables a standard 5 per cent. dividend to be paid; and so far the distribution on the "B" stock has averaged almost this rate, which it is confidently believed can be relied upon hereafter as a minimum, seeing how progressive is the neighbourhood served by the Company. To-morrow week, Messrs. King and King will carry out instructions they have received from the Directors of the Portsmouth Water Company, and offer for sale 2000 new ordinary £5 shares in the Company—being the third portion of the capital authorized to be raised by the Act of 1906.

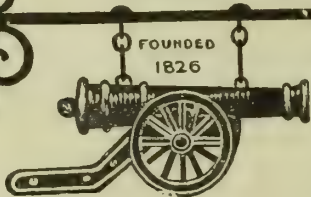
Messrs. Robert Dempster and Sons, Limited, of Elland, have recently completed the contract at the Briton Ferry Gas-Works, comprising a new retort-house, with roof and slating, four shallow generator settings of six retorts each, including all brickwork, floors, retort-mountings, bench-bracing, retort-house governor, foul-main, a set of four steel annular condensers, with foundations, washer-scrubber with bye-pass, remodelling of gas connections and tar-pipes, &c.

Penzance Water Supply.—The question of the water supply was under consideration at the last meeting of the Penzance Town Council. It was decided, on the recommendation of the Sanitary Committee, that the owners of the land at Bosiliack should be asked to allow the Corporation to sink a well, and that pumping apparatus be installed with a view to the augmentation of the existing supply. The Committee also suggested that, if the well gave satisfactory results, an artesian well should be sunk; but the Council deferred this proposal, on the ground that it could not be carried out in time to affect the present situation. It was stated that there was an abundant supply of water in normal seasons, but that the deficiency in the rainfall had caused a serious drop in the quantity in the reservoirs.

Inverted Incandescent Gas-Burners at Deptford.—The Deptford Borough Council resumed last Tuesday the consideration of proposals for improved street lighting by inverted burners. The Lighting Committee had recommended the installation of these burners in the whole of the public lamps in the borough; but they now submitted a modified proposal, dealing with the double and triple No. 4 burners and the lamps at the corners of the principal streets. There are 47 lamps with double and four with triple No. 4 burners; and the cost of the conversion of these will be £24 3s., while the adoption of the new type will result in a saving of £10 9s. in annual maintenance. With regard to the lamps at the principal street corners, there are 138 of these, and the cost of their conversion will be £20 14s.; the increase in the annual maintenance charge being £77 12s. 6d. Thus the cost of the scheme submitted will be £44 17s. for conversion, with an increased annual charge of £67 3s. 6d. for maintenance. The modified scheme of the Committee was accepted by the Council.

Local Government Board and Loans for Electric Lighting.—In the "Electricity Supply Memoranda" to-day, reference is made to the attitude of the Local Government Board in regard to applications made to them for loans for public electric lighting; the cases of Yarmouth and Finchley being specially mentioned. The latter was commented upon in the "JOURNAL" for the 17th of August last. There the Board are withholding their sanction to a loan of £2200 for electric arc lamps in the Great North Road and Regent's Park Road, Finchley, until the Council supply them with an estimate of the cost of lighting the same thoroughfares by gas. The Council have informed the Board that as regards the question of the illuminant to be used for the streets the Council consider they are the best judges. They submit that the point which the Board are called upon to decide is whether a loan should be granted for the necessary sum to enable arc lighting to be installed, and not as to whether gas or electricity should be used. The Board regard this letter as unsatisfactory, and adhere to their recommendation that the Council should carefully consider the relative cost of public lighting by gas and by electricity. The Council, in reply, say they have nothing to add to their previous letter, and a deadlock has followed. The Council have decided to expend out of the current rate £240 for electrically lighting Regent's Park Road.

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Suicide by Gas.—After frequently stating his intention to "do away with himself," William Tulloch, of Sunderland, finally carried his threat into execution, by means of an open gas-bracket, an india-rubber tube, and a pillow-case. Deceased, who was 56 years old, possessed private means, but had lost a lot of money, and was also a heavy drinker. He lived quite alone.

Stockport's Costly Water Litigation.—In accordance with the resolution passed at a previous meeting, a complete return of the damages, costs, and other expenses incurred by the Stockport Corporation in connection with the Kinder water-works litigation was presented at last week's sitting of the Town Council. Payments made by the Corporation in the two actions brought by the late Contractor, Mr. Kellett, totalled £62,563. This included loss of profit on uncompleted work, £29,400; amount for delay from November, 1905, to August, 1906, £3696; work on tongue trench, £6252; retention money, £7723. Contrary to expectation, there was no discussion on the accounts.

Teignmouth Public Lighting.—At a meeting of the Teignmouth Urban District Council last Tuesday, it was stated in a report by Messrs. C. F. Gettings (Surveyor) and J. A. Gray (Gas Manager) that the total number of lamps for public lighting of the town was 301, and that the annual charge was £938 10s. 4d. A sum of £725 9s. 8d. was received for the gas consumed; being at the rate of 2s. 6d. per 1000 cubic feet. When the present arrangements were made for public lighting, the price of gas to ordinary consumers was 4s. per 1000 cubic feet. A *pro rata* reduction on the public lighting charge would amount to £143 2s. 6d., which might now be brought down as follows: A reduction of £160, being the equivalent of a 1d. rate on the annual charge, thus lowering it to £778 10s. 4d., and a reduction in the charge for all additional burners from £2 17s. to £2 7s. per annum. The Committee recommended accordingly; and it was agreed to.

The Gas-Works Site Question in Belfast.—An adjourned special meeting of the Belfast County Borough Council was held on Monday last week to further consider the question of the selection of a site for the new gas-works. The outcome of a long discussion was the adoption of the following resolution, moved by Mr. McCullagh: "That, before proceeding further in the selection of a site for gas-works, three experts be appointed, consisting of an engineer and two building contractors, to give the Corporation a comparative estimate of the cost of foundations to surface level, cutting and filling, cost of gas and water mains, sewers, coal-handling plant, and carriage of coal by water, rail, or tram, and loss on sale of coke and other residuals, also any other items which they may consider necessary to make the sites in every way suitable for a gas-works; that it be an instruction to the Town Clerk, City Surveyor, and Gas Manager to hand to the experts all estimates, plans, sections, borings, and other documents relating to these sites prepared since July, 1908, and any other documents or information they may call for; and that this Council now adjourn until the experts furnish the Corporation with the report." The selection of the experts was left with the Gas Committee.

Rochdale Gas-Coal Contracts.—At last Thursday's meeting of the Rochdale Town Council, it was stated that the gas-coal contracts had been given out at an average reduction of between 8d. and 9d. per ton as compared with twelve months ago. But the price to-day is 2s. 6d. per ton higher than was paid at one time, and 1s. 6d. more than it was two years or so ago.

Bacup's Water-Works Scheme.—One of the reasons urged by the Bacup Town Council upon Alderman J. H. Maden to accept the mayoralty for the eleventh term in succession, was that he should be in office as Chief Magistrate when the Coupe water scheme was completed; he having taken a very active part in the executive work. The water-works have entailed an outlay of over £230,000, and have been in course of construction since March, 1901. It is expected they will be formally opened early next year.

Reducing the Candle Power of Rochdale Gas.—The Rochdale Town Council last Thursday adopted a resolution authorizing application to the Local Government Board for consent to the substitution of the No. 2 "Metropolitan" argand burner for the burner prescribed in the Rochdale Improvement Act of 1872. It was explained that the object of the resolution was to do away with the necessity of artificially enriching the gas, as was the present practice, and to enable the Committee to take advantage of those modern methods of carbonization which would secure large reductions in the cost of manufacture. The present parliamentary standard for Rochdale is 16 candles, tested by the No. 1 "London" burner. During the short discussion, it was stated that in the borough the old flat-flame burner was rapidly giving way to the incandescent system.

Newport (Mon.) Gas Company's Garden Allotments.—The prizes to the successful competitors in the cultivation of allotments and gardens at Crindau, by the employees of the Newport (Mon.) Gas Company were recently distributed by the Directors, who were accompanied by Mr. T. H. Hazell (Secretary), Alderman T. Canning (Engineer and Manager), and Mr. J. H. Canning (Assistant Engineer and Manager). In the absence of the Chairman (Mr. R. Laybourne) through illness, the Vice-Chairman (Dr. H. M. Brewer, J.P.) presided, and congratulated the men upon the excellent report sent in by Mr. Grant (the judge), which showed that good work had been done on the allotments and gardens. He said he was pleased to note that there had been keen competition for the prizes, and hoped this would be the case on future occasions. He then distributed the awards as follows: Champion Class—Allotments, W. Phillips and C. Hallett; gardens, T. Lacey and S. Bryant. Ordinary Class—Allotments, H. Rumsey, J. Webley, and T. Canning; flowers, J. Whitefield. A special prize for excellence of crops and cleanliness was awarded to F. Church (Caerleon Gas-Works). At the close of the distribution, Sir Thomas Firbank congratulated the men upon the excellent display they had made of flowers and vegetables. On behalf of the men, a hearty vote of thanks was passed to the Directors; regret being expressed at the absence of Mr. Laybourne, who was wished a speedy recovery.

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The "AGATE."
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The "SAVOY."
A New Art Stove with distinctive
Features.

THE PARKINSON STOVE COMPANY, Ltd.

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BIRMINGHAM: Stour Street, Spring Hill.

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The Salary of the Chairman of the Metropolitan Water Board.—At the meeting of the Metropolitan Water Board last Friday, a motion to rescind the resolution granting the Chairman (Mr. E. B. Barnard, M.P.) a salary of £500 per annum was submitted by Mr. W. I. Burns, who maintained that it was hardly to the honour or the dignity of the Board to grant a salary to the Chairman. After some discussion, the motion was rejected by 32 votes to 16.

Plumber and Assistant Injured by a Gas Explosion.—By an explosion of gas at an unoccupied house in Chorlton-cum-Hardy, Manchester, last week, a plumber named David England and his assistant were injured. They were engaged in connecting up the gas-meter when the explosion occurred. The meter was blown to fragments, and part of the metal struck the assistant about the face; while England was badly burned. After medical treatment at a neighbouring surgery, the injured plumber and youth were removed to their respective homes. It is surmised that the accumulation of escaping gas spread to the blow-pipe, and thus caused the explosion.

New Joint-Stock Companies.—The Tickhill Gaslight, Coal, and Coke Company, Limited, has been registered with a capital of £1300, in £2 10s. shares (252 being 5 per cent. cumulative preference shares), for supplying gas to Tickhill, near Rotherham, and carrying on the business indicated in the title. The Simplex Coke-Oven and Engineering Company, Limited, has been formed with a capital of £5000, in £1 shares. The Irish Lighting and Heating Company, Limited, has been registered in Dublin with a capital of £1000, in £1 shares, to carry on the business of manufacturers of, or dealers in, incandescent lights or other apparatus, appliances, fittings, accessories, and materials for illuminating or heating by means of gas, spirit, &c.

Public Lighting of Swansea.—At a meeting of the Swansea Streets Committee, the Surveyor said he had been considering modifications in the street gas lighting. The improvement he sought to obtain was the conversion of all the flat-flame lamps in the borough to incandescent, without involving any increase in cost. If this were done, the result would be a gain in illumination of 200 per cent. The conversion would involve some outlay in the installation of the new burners, mantles, &c.; but there would be a saving in the smaller consumption of gas, and further economy might be effected by automatically lighting and extinguishing the lamps. He recommended that the Gas Company be approached on the matter; and this was agreed to.

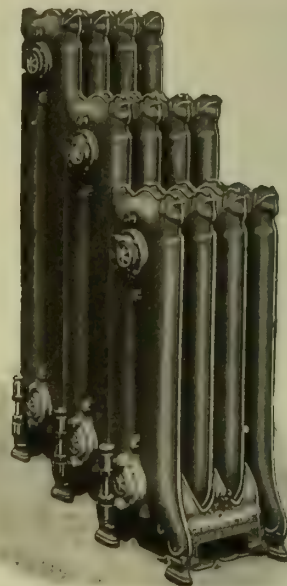
Fire Risk of Electric Wires.—An outbreak of fire which it was believed was due to a fused electric light wire occurred some days ago in a Battersea draper's shop, causing damage to the extent of £700. Only the skilful operations of the fire brigade, it is said, prevented a conflagration of great magnitude. The first intimation of anything wrong, was a bright light in one of the shop windows, which proved to be caused by the goods displayed there taking fire. A few moments after the blaze started, the large sheets of plate glass cracked, and fell with a loud crash; and the flames immediately spread right through the shop. About half-past five in the evening, it appears, one of the assistants switched on the electric light in the window in question (the lace window); and less than three minutes afterwards the flames were noticed breaking out.

Engineers and Surveyors as Territorials.—The Municipal Engineers and Surveyors' Association have formed an "Imperial Defence Committee," and have framed a memorandum of recommendations in regard to the nature of the assistance they could render in peace and war. Their duties, as embodied in the proposals forwarded, would be: (1) To maintain or destroy communications and arteries of supply—such as gas, water, and electric power mains; (2) To assist in transport, by arrangement as to the use of motors, &c., now at the disposal of municipal bodies; (3) To act as a special intelligence department; and (4) To assist in the large-scale detailed survey of their particular municipalities and as a part of the surrounding rural area. They estimate that they can place at the disposal of the authorities a force comprising 2000 technical officers and 28,000 mechanics and skilled labourers. They suggest that applications for enrolment should be received by (1) municipal corporations, (2) county, urban, and rural district councils, (3) Scottish Royal, parliamentary, and police burghs, (4) authorities, corporations, and companies supplying water, gas, electric, and hydraulic power, or controlling piers, harbours, docks, tramways, &c.

APPLICATIONS FOR LETTERS PATENT.

- 21,999.—RAMSAY, Sir W., HEHNER, O., BINNIE, Sir A. R., DEACON, M., and BINNIE, W. J. E., "Prevention of corrosion in iron or steel water-mains, tanks, or the like." Sept. 27.
 22,016.—CARTER, J., and TEMPLE, E., "Suction gas producers." Sept. 27.
 22,050.—SUTHERLAND, J. C., "Wet meters." Sept. 28.
 22,060.—SHARPE, W. C. & W. C., JUN., "Petrol gas." Sept. 28.
 22,074.—ALEXANDER, A. E., "Incandescent inverted lamps." A communication from M. H. Fischer. Sept. 28.
 22,193.—THRESH, J. C., "Purification of water." Sept. 29.
 22,225.—BENNIS, A. W., "Cooling devices applicable to coking stokers and the like." Sept. 29.
 22,253.—KOENIG, J., "Ball-joint for piping." Sept. 30.
 22,257.—CROSSLEY, K. I., and WEBB, W. LE P., "Internal-combustion engine." Sept. 30.
 22,267.—CHIPPERFIELD, W. H., "Gas-heated ironing." Sept. 30.
 22,290.—RICHARDS, R. S., and PRINGLE, R. W., "Distillation of coal." Sept. 30.
 22,308.—BROWN, T. W., and TILLEY, F. C., "Air or gas compressors." Sept. 30.
 22,421.—RICHARDS, R. S., and PRINGLE, R. W., "Carriers for use in apparatus for the distillation of coal." Oct. 1.
 22,433.—STUBBS, L., "Pressure regulators for suction plant." Oct. 2.
 22,471.—WEST, J., "Discharging and charging machine for gas-retorts." Oct. 2.

RADIATORS



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WHEN A TRAVELLER TELLS
YOU HE IS SELLING THE BEST
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AUTOMATIC GAS REGULATOR,
FIXED CAST-IRON BASE,
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R & A MAINL^{LD}

LONDON, GLASGOW, FALKIRK.

Quality of the Truro Water Supply.—Great satisfaction has been caused at Truro by the result of an analysis of the water supply made recently by Dr. J. C. Thresh. Some months ago, alarm was caused by the Doctor's report that there were indications of a certain amount of pollution of the water, and that he had found in it the *bacillus coli*. Since then the Water Company have had the sources carefully examined, and have done a good deal of work with a view to preventing all possibility of pollution, while the filter-beds have been put into thorough working order. Dr. Thresh now reports that the water from the wells and filters contains comparatively few bacteria, and these not such as to indicate pollution; while the water has evidently been efficiently filtered. In the water from a tap on the Company's mains, there were more bacteria than in the other sample, but their character was similar. Multiplication of bacteria always takes place in traversing long lengths of main; and doubtless, says Dr. Thresh, this is the cause of the increase in the number. However, the number is small for tap water; and as there are no signs of pollution of a dangerous character, the water is good and wholesome. The bacteria were not of the *bacillus coli* type, nor of a closely allied organism. On the receipt of the original disquieting report, the consumers were recommended to boil the water before using it; but in view of the result of the present analysis, this is no longer recognized as necessary.

Owing to the extraordinary number of incandescent burners stolen from lamps at Great Eastern Railway stations, the Company have had to fix small padlocks on the lamps.

A new general catalogue, for the season 1909-10, is being issued by Messrs. J. & W. B. Smith, of Farringdon Road, E.C. Everything in the gas-fitting line appears to be illustrated in it; and there are many novelties for use in the home, factory, shop, church, &c. Among the large number of big power lamps of which particulars are given, are noted the "Graetzin" high-pressure lamps and compressors, for the illumination of streets, railway stations, shops, and all extensive areas. These lamps have already been described in the "JOURNAL." The firm, of course, make quite a speciality of lighting glassware; many of the patterns shown being exclusive designs.

The Salford Corporation Gas Committee have contributed £200 towards the cost of the extension of the Salford Royal Hospital. This is the second contribution made by the Committee to the fund.

The Directors of the River Plate Gas Company, Limited, have resolved to declare an interim dividend at the rate of 7s. per share (7 per cent. per annum), free of income-tax, for the June half year.

One of Mr. John Young's advertisements in the Hull newspapers reads: "Why be in the dark when for 1d. you can have 60-candle power light for 10 hours? Full details from the British Gaslight Company, King Edward Street." Mr. Young writes: "The other day a woman with a shawl over her head, and a baby wrapped in a portion of the shawl, went into the show-rooms, produced a newspaper, and, pointing to the advertisement, said: 'Mister, I've come in for a pen'orth of that stuff. I'm sick of lamps and candles.'" Another correspondent writes that the unpunctuated contents of a post-card delivered at a provincial gas-works last week, read: "Please send a man to attend to our gas; it is so bad we can hardly see to tell the truth." Of course, the addressee meant: "To tell the truth, we can hardly see;" but the gas-works manager rushed off a fitter in fear that delay might lead to a perversion of the truth.

The Employees' Social Club which was formed a few weeks ago in connection with the East Hull Gas Company was opened last Thursday evening with a reunion at the Holborn Hall. Mr. D. Wood, the Vice-President of the Club, occupied the chair; and among those present was Mr. J. J. Runton, the Chairman of the Company. The programme included an address by Mr. T. E. Boynton, the Chairman of the Club, setting forth its objects, which are to bring the workmen together for the purpose of spending a pleasant evening—thus fostering friendly feeling between them—and also to enable them to train themselves in gas manufacture and supply by attending lectures and demonstrations, a course of which will be given during the coming season (the first on the 10th prox.) by Mr. Nelson, the Assistant-Engineer. An interesting item in the programme on Thursday was a lecture by Mr. John Holliday, the Company's General Manager and Engineer, who is President of the Club, entitled "Ten Days in Belgium and Holland," illustrated by lantern slides; and musical items were furnished by the Lyric Quartette. The Company have provided a room at the works for the use of the Club; and lectures will be delivered in the drawing office.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations, &c., Vacant.

AGENTS (MANTLES). No. 5144.
WASTE-WATER INSPECTOR. Mansfield Corporation.

Situations, &c., Wanted.

SECRETARY, MANAGER, AND ACCOUNTANT. No. 5115.

Plant, &c. (Second-Hand), for Sale.

DRY METER (300-LIGHT). No. 5146.
GAS PLANT, ENGINES, BOILERS, MACHINE TOOLS, &c.
Firth, Blakeley, Sons, and Co. By Auction, Oct. 13.
IRONWORK (INCLUDING GASHOLDERS), Chelmsford Gas Company.
SULPHATE OF AMMONIA PLANT. Greenock Gas Department.

Plant, &c. (Second-Hand), Wanted.

STATION METER. No. 5145.

Patent Licence.

GAS MUFFLE KILNS OR OVENS. Haseltine, Lake, and Co., Southampton Buildings, W.C.

Stocks and Shares.

ALDERSHOT GAS, WATER AND DISTRICT LIGHTING COMPANY. Oct. 26.
BARKING GAS COMPANY. Nov. 2.
HERTS AND ESSEX WATER COMPANY. Nov. 2.
PINNER GAS COMPANY. Oct. 26.
REDHILL GAS COMPANY. Nov. 1.
SOUTH AFRICAN LIGHTING ASSOCIATION. Oct. 26.
THE GAS METER COMPANY. Oct. 26.

Meeting.

IMPERIAL CONTINENTAL GAS ASSOCIATION. Cannon Street Hotel. Nov. 2. 2.30 o'clock.

TENDERS FOR

Benzol.

BRIDGEWATER COAL OFFICE. Tenders by Oct. 25.

Fire-Clay Goods.

SHEFFIELD GAS COMPANY. Tenders by Nov. 1.

Sulphuric Acid.

CARLISLE GAS DEPARTMENT. Tenders by Oct. 19.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.

Payable in advance. If credit is taken, the charge is 25s. a year.

Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to
WALTER KING, II, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE

For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 183, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

J. & J. BRADDOCK (Branch of Meters

Limited), Globe Meter Works, Oldham, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

DONALD M'INTOSH,

110, CANNON STREET, LONDON.

TAR WANTED.

National Telephone 7002. Telegrams: "UPRIGHT."

Apply, THOMAS HORROCKS
Albert Chemical Works, BRADFORD,
MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Sulphate of Ammonia.

OXIDE OF IRON.

(NATURAL.)

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.,

with which is amalgamated WM. PEARCE & SONS, LTD.
36, MARK LANE, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 941 AVENUE.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
and ELEVATING and CONVEYING PLANT, ROSE
MOUNT IRON-WORKS, ELLAND.

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
NYMEGEN, HOLLAND.

General Manager (for England and Wales)—

CHARLES E. FRY, LEAMINGTON,

General Manager (for Scotland)—

J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

BROTHERTON & CO., LIMITED.
Offices: City Chambers, LEEDS.
Correspondence invited.

"HALLITE" Asbestos High-Pressure
Sheeting.
HALLITE DOUGLAS, LIMITED, 106, Leadenhall Street,
LONDON, E.C.

LUX'S GAS PURIFYING MASS.
See Advertisement on p. 83.
FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER
WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Re-
pairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS,
BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

METER INDICES

WITH AND WITHOUT DIALS.

A. ROUX & CO., Limited,
9, SOUTHAMPTON STREET, HOLBORN, W.C.
MOVEMENTS FOR CLOCKS, PHOTOMETERS AND
BAROGRAPHS, WHEELS, PINIONS, AND WORMS.
WORKS, HANDSWORTH, BIRMINGHAM.

J. E. C. LORD, Ship Canal Tar Works,
Weaste, Manchester. Pitch, Creosote, Benzols,
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
Carbolic Acid, Sulphate of Ammonia, &c.

AMMONIA.
Consumers in any form are invited to correspond
with CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.

APPLY TO THE

CHAIN BELT ENGINEERING CO.
DERBY, ENGLAND,
FOR REALLY RELIABLE
ELEVATORS AND CONVEYORS

ALSO

DRIVING AND CONVEYOR CHAINS.

"NUGEPE" GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.

For all Joints in connection with Oil-Gas Plant
and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
WORKS: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
WAKEFIELD, AND SUNDERLAND.

**KRAMERS AND AARTS WATER-
GAS PLANT.**

K. & A. WATER-GAS COMPANY, LTD.
89, VICTORIA STREET, S.W.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
WORKS: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
WAKEFIELD, AND SUNDERLAND.

GAS OILS.

MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Re-
fineries in America; also Petroleum Spirit for Gas
Enrichment, 18, EXCHANGE STREET, MANCHESTER, and
11, OLD HALL STREET, LIVERPOOL.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND
CONTRACTORS,
18 & 20, FARRINGTON ROAD, LONDON, E.C.
Telegrams: "DAGOLIGHT LONDON,"
Telephone: 2836 HOLBORN.

"FORTO" Incandescent Gas Mantles
Combine Brilliancy and Strength. British
Made. Send for List.
ISAAC EALES AND CO., Howard Street, BIRMINGHAM.

AMMONIACAL Liquor wanted.
CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

**"GAZINE" (Registered in England and
Abroad). A radical Solvent and Preventative
of Naphthalene Deposits, and for the Automatic
Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West
Moor Chemical Works, KILLINGWORTH, or through his
Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-
TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National
Telephone No. 2497.**

**BRISTOL RECORDING GAUGES
AND THERMOMETERS.**

**J. W. & C. J. PHILLIPS, 23, COLLEGE HILL,
LONDON, E.C., and 25, BRIDGE END, LEEDS.**

**GAS PLANT for Sale—We can always
offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.**

SPENCER'S PATENT HURDLE GRIDS.

**THE very best Patent Grids for Holding
Oxide Lightly.**
See Illustrated Advertisement, Oct. 5, p. 77.

SULPHURIC ACID.

**SPECIALLY prepared for Sulphate of
AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
WORKS: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY,
WORCS.
Telegrams: "CHEMICALS, OLDBURY."**

**PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS
ACT, and Decisions thereunder," 1s.; "TRADE
SECRETS AND PATENTS," 6d.; "DOCTRINE OF
EQUIVALENTS, Mechanical and Chemical," 6d.;
"SUBJECT-MATTER OF PATENTS," 6d.
MEWBEURN, ELLIS, & PRIOR, Chartered Patent
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-
grams: "Patent London." Telephone: No. 243 Holborn.**

**JOHN RILEY & SONS, Chemical Manu-
facturers, Hapton, near Accrington, are MAKERS
of Special SULPHURIC ACID, for Sulphate of Am-
monia Making. Highest percentage of Sulphate of
Ammonia obtained from the use of this Vitriol, which
has now been used for upwards of 50 Years. References
given to Gas Companies.**

**HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.**
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

**SULPHURIC ACID for Sale, specially
suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers,
WORKS: BIRMINGHAM, LEEDS, WAKEFIELD, AND SUNDER-
LAND.**

**APPLICATIONS for Appointments
arranged effectively. Greatly appreciated by
Recipients. Numerous unsolicited Testimonials. Write
Now for Particulars.
HERBERT GREATOR, Upper Hackney, MATLOCK.**

**MR. W. B. MIMMACK, for many years
Secretary, Manager, and Accountant of the Crays
Gas Company (111 Millions), now in Amalgamation,
seeks APPOINTMENT in any or all of these Offices.
Address No. 5115, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.**

**MERTHYR TYDFIL GAS COMPANY.
THE Directors Thank the very
numerous Applicants for the Position of AC-
COUNTANT, and beg to Inform them the APPOINT-
MENT HAS NOW BEEN FILLED.**

**MR. W. J. WARREN, of 11, Chatfield
Road, Croydon, REPRESENTATIVE of The
Bland Light Syndicate, Limited, for a considerable
time over Southern and Eastern Counties, has now
RESIGNED HIS APPOINTMENT.**

**WANTED, a Steady and Reliable
Young Man as WASTE-WATER INSPECTOR.**
One accustomed to Deacon's Meters and who thoroughly
understands the Testing of Water-Fittings.
Apply, stating Age and Wages required, to ARTHUR
GRAHAM, Gas and Water Engineer, MANSFIELD.

**AGENTS wanted in every large Town
by First-Class English Works to REPRESENT
their ALL BRITISH INCANDESCENT MANTLES
on a fair Commission basis. Every help given to en-
courage Business. Good Connection with Factors and
Wholesalers absolutely essential.
Apply, in confidence, giving References, to No. 5144,
care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.**

STATION Meter required (second-hand).
About 2000 Cubic Feet per hour capacity.
Particulars to No. 5145, care of Mr. King, 11, Bolt
Court, FLEET STREET, E.C.

**SMALL Gas Companies desirous of
Purchasing GAS APPARATUS Cheap are re-
quested to Note AUCTION SALE on Wednesday,
Oct. 13, of GAS PLANT STOCK of Firth Blakeley,
Sons, and Co., Ltd., Dewsbury.
Particulars and Catalogues on Application.**

300-LIGHT Dry Meter for Sale.
Good Condition. Makers, George Glover
and Co.
Offers to No. 5146, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

**GASHOLDERS—Splendid, 45 feet dia-
meter, and New STEEL TANK fixed complete,
to Plan and Specification. Also 50 feet Single-Lift
and 50 feet Double-Lift. Cheap, with STEEL TANKS.
Can be seen temporarily erected.
FIRTH BLAKELEY'S, Thornhill, DEWSBURY.**

**SMALL GAS-WORKS PLANT FOR SALE.
THE Chelmsford Gaslight and Coke
Company have FOR SALE the Whole of the
IRONWORK (which includes Two GASHOLDERS) of the
Writtle Gas-Works, which is shortly to be dismantled
and removed.
Particulars from the undersigned.
Er. W. SMITH,
Chelmsford, Gas Engineer.**

**CORPORATION OF GREENOCK.
(GAS DEPARTMENT.)
TENDERS wanted for the Purchase
and Removal of Sulphate of Ammonia Plant.
Capacity, about 30 cwt. per 24 Hours. Dempster's
Still. The Saturator is new, and has only been in use
Six Months. The Reason of Sale is to make room for
Plant of larger capacity. Plant may be seen at any
time at the Works.
Inchgreen Gas-Works,
Greenock, Oct. 4, 1909.**

**FIRE-CLAY GOODS.
THE Directors of the Sheffield United
Gaslight Company invite TENDERS for the
Supply of SILICA and FIRE-CLAY GOODS required
at their Works during the next Twelve Months.
Specifications and Forms of Tender may be obtained
upon Application to the Company's Engineer, Mr.
J. W. Morrison.
The Directors do not bind themselves to accept the
lowest or any Tender.
Sealed Tenders, marked "Tender for Fire-Clay
Goods," must be delivered by post to Mr. Hanbury
Thomas, Managing-Director, not later than the first
post on Monday, Nov. 1.
Commercial Street,
Sheffield, Oct. 6, 1909. WM. HAMBY,
Secretary.**

**BRIDGEWATER COLLIERIES COKE WORKS.
(THE EARL OF ELLESMERE.)**

**TENDERS are invited for the Crude
BENZOL produced at the above Works (estimated
at 8000 to 10,000 Gallons per Month) testing 80 per cent.
at 120° C., during the next Three, Six, Nine, or Twelve
Months, delivered into Contractor's Tanks at the
Bridgewater Colliery Siding, Wharton Hall, on the
Pendleton and Hindley Branch of the Lancashire and
Yorkshire Railway, or at the Brackley Siding on the
Little Hulton Mineral Branch of the London and North
Western Railway.
Tenders, endorsed "Tender for Crude Benzol," to
be addressed to Mr. Thomas M. Brown, Bridgewater
Coal Offices, 4, Chapel Walks, Manchester, not later
than the 25th inst.
Manchester, Oct. 5, 1909.**

**CITY OF CARLISLE CORPORATION
GAS-WORKS.**

**SULPHURIC ACID.
THE Carlisle Gas Committee are pre-
pared to receive TENDERS for the Supply of
from 50 to 100 Tons of SULPHURIC ACID suitable for
the Manufacture of Sulphate of Ammonia. The Price
to include Free Delivery into Works.
Contractor to state whether the Acid offered is Pyrites
or Sulphur Acid, and give Specific Gravity.
The Material to be delivered over a period of Three
Months from date of Acceptance.
Tenders, endorsed "Sulphuric Acid," to be addressed
to the Chairman of the Gas Committee, and delivered
at the Gas-Works not later than Tuesday, the 19th inst.
The Committee do not bind themselves to accept the
lowest or any Tender.
W. J. SMITH,
Gas-Works, Carlisle, Engineer and Manager.
Oct. 8, 1909.**

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS AND SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS AND WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ALDRSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY.

NEW ISSUE OF £5000 FIVE PER CENT. "C"
CONSOLIDATED ORDINARY STOCK,
AND
£5000 FOUR PER CENT. CONSOLIDATED
PREFERENCE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 26, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
PINNER GAS COMPANY, LIMITED.

NEW ISSUE OF 400 £5 "B" SHARES
AND
£700 FIVE PER CENT. PERPETUAL
DEBENTURES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 26, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

SOUTH AFRICAN LIGHTING ASSOCIATION, LIMITED.
30 £10 ORDINARY SHARES.

THE GAS METER COMPANY, LIMITED.
74 £10 ORDINARY SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 26, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HERTS AND ESSEX WATER-WORKS COMPANY.

NEW ISSUE OF 500 £10 ORDINARY SHARES
AND
£1000 FOUR PER CENT. MORTGAGE
DEBENTURES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 2, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BARKING GAS COMPANY.

NEW ISSUE OF 600 £10 SIX PER CENT.
PREFERENCE SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 2, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

WEDNESDAY, OCTOBER 13, 1909.

TO GAS ENGINEERS, GAS COMPANIES,
MACHINERY DEALERS, AND OTHERS.

WHEATLEY KIRK, PRICE, AND CO.
have received Instructions from Messrs. Firth Blakeley, Sons, and Co., Limited, whose Lease of Premises shortly expire, to Offer for SALE BY PUBLIC AUCTION, piecemeal in the Lots of the Catalogue, upon the Works Premises, situate in Thornhill, Dewsbury, Yorks., on Wednesday, October 13, 1909, commencing at Eleven o'clock prompt, the
SURPLUS STOCK OF NEW AND SECOND-HAND
GAS PLANT, ENGINES, BOILERS, MACHINE
TOOLS, &c.

The Catalogue will include:—

Dowson's Gas-Producing Plant for 300 B.H.P. Engines; 16 Exhausters, steam-driven and otherwise; 2 Livesey Washers; Pipe and Annular Condensers; Clapham and Cutler's Condensers; several Sets of Purifiers; Belt and Steam-Driven Pumps; Station Governors; Test Meters and Holders, from 16 ft. to 50 ft. diameter; Large Stock of Pipes and Valves, from 2 inches to 18 inches diameter; Shafting and Pulleys; 4 Lathes; Drilling, Planing, Punching, and Shearing; Plate-Edge Planing, Screwing, &c. Machines; Horizontal and Vertical Steam-Engines, Boilers.

The whole may be viewed on Monday and Tuesday, October 11 and 12, and Morning of Sale.

Catalogues may be obtained (gratis) from the AUCTIONEERS, Albert Square, MANCHESTER; 46, Watling Street, LONDON, E.C.; and 26, Collingwood Street, NEWCASTLE-ON-TYNE.

REDHILL GAS COMPANY.

SALE OF ORDINARY "B" STOCK.

NOTICE is Hereby Given, that it is the intention of the said Company to SELL BY TENDER £3500 of ORDINARY "B" STOCK of and in the Redhill Gas Company. The last day for the reception of Tenders will be Monday, the 1st of November, 1909, at Twelve o'clock at noon.

Forms of Tender, with Particulars of Sale and Conditions of Tender attached, can be had upon Application at the Company's Office, Brighton Road, Redhill.

By order of the Directors,
HORACE LONG,
Secretary.

Redhill, Surrey,
Sept. 30, 1909.

IMPERIAL CONTINENTAL GAS ASSOCIATION.
(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association will be held at the City Terminus Hotel, Cannon Street, London, E.C., on Tuesday, the 2nd day of November next, at 2.30 p.m. precisely, when a Report will be made to the Proprietors; a Dividend declared for the Half Year ended the 30th of June, 1909; and the usual Ordinary Business of such Meeting transacted.

NOTICE is HEREBY ALSO GIVEN, that, with a view to regularizing the payment of the Directors' and Auditors' remuneration free of Income-Tax in the same manner as the Dividends, a Resolution to that effect will be moved at the Meeting.

NOTICE is HEREBY FURTHER GIVEN, that the REGISTER OF TRANSFERS OF CAPITAL STOCK WILL BE CLOSED from the 19th inst. to the 2nd prox., both days inclusive.

By order of the Board,
ROBERT W. WILSON,
Secretary.

Offices: 21, Austin Friars,
London, E.C., Oct. 11, 1909.

BUENOS AYRES (NEW) GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the Directors have this day declared an INTERIM DIVIDEND at the rate of 6 per cent. per Annum for the Six Months ending June 30, 1909 (being Six Shillings per Share), free of Income-Tax, payable on and after the 21st inst.

And **NOTICE** is HEREBY FURTHER GIVEN, to Holders of Share Warrants to Bearer of this Company, that Coupon No. 39 will be paid by the Company's Bankers, The Union of London and Smiths' Bank, Limited, 50, Cornhill, London, E.C., on and after the 21st inst., at the rate of Six Shillings per Coupon.

Coupons must be left with the Bankers Three Clear Days for Examination.

The TRANSFER BOOKS WILL BE CLOSED from the 6th to the 19th inst. inclusive.

By order,
J. M. MACMORRAN,
Secretary.

1, East India Avenue,
Leadenhall Street, E.C.,
Oct. 5, 1909.

THE Proprietors of the Patent No.

6921 of 1900, for "IMPROVEMENTS IN CONTINUOUS GAS MUFFLE KILNS OR OVENS," are desirous of entering into Arrangements, by way of LICENSE and Otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its Full Development and Practical Working in this Country.

All Communications should be addressed in the first instance to HASSETTINE, LAKE, AND CO., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, London, W.C.

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JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large Stock in London)

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NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

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Above the Average in Weight and Quality
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Makers of Cast-Iron PIPES and CONNEC-
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COLUMNS of every description, Hydraulic,
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MAIN LAYING.

Paper by PERCY GRIFFITH, M.Inst.C.E., and BRUCE MCGREGOR
GRAY, Assoc.M Inst.C.E., before the Association of Water Engineers.

A. The Authors used Flanged Pipes for the Rising Main up the
Steep side of the Barff, and their experience proved that this was
not an advantage, as the rigidity of the Joints involved considerable
difficulty in regard to the depth of the Trench, and a good deal of
Cutting to make the final Connections at each end of the Pipe-Line.

B. In the case of the Delivery Main, the Joints were Ordinary
Socket Joints, but made with Lead only. The only difficulty met
with here was the necessity for pouring the Lead in at a suitable
temperature to prevent it melting the Solid Lead Fillet, and running
through into the Pipe.

C. In some of the Smaller Branch Connections, Lead Wool
was used, and proved highly successful.

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THE LEAD WOOL CO., LTD., SNODLAND, KENT.

EVERITT'S Patent TAR-FOG EXTRACTOR AND NAPHTHALENE REMOVER.

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Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES,
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GRAETZIN LIGHT

Important Improvements.



BURNERS.

1. 20-Candle Power more light without increase in the consumption of gas.
2. Patent Gas Adjuster; cannot get out of order.
3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. Accurate Regulation of the Air Supply.
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

From Lamps with more than one burner, the burners can be removed from the outside, without taking the lamps to pieces.

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<p>LARGE CAST IRON OR STEEL OIL, LIQUOR OR WATER TANK.</p>	<p>CONDENSERS VARIOUS TYPES.</p>	<p>GAS AND WATER VALVES.</p>	<p>ROOFING STRUCTURAL WORK M.S. & C.I. PURIFIERS.</p>	<p>GAS EXHAUSTER & GAS ENGINE COMBINED.</p>	<p>ROTARY GAS EXHAUSTER.</p>
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<p>Bewer and Fireman's Boots.</p>	<p>Telegrams: "Airproof, London."</p> <p>THOMAS BUGDEN & CO., <small>India-Rubber and Airproof Manufacturers and General Contractors,</small> 116-118, GOSWELL ROAD, LONDON, E.C. <small>Largest Manufacturers of Gas Main Bags.</small></p>	<p>Telephone: 743 City.</p>	<p>Contractors' and Mine Jackets.</p>
<p>Gas Bags for repairing Mains. All Seams Stitched and Taped.</p>	<p>Patentees of the DENMAR BAG, <small>Impervious to Main Liquor and Climatic Influences.</small></p> <p>Oilskin Clothing, Diving and Wading Dresses, Sewer Boots, Tar Hose, Stokers' Mitts, Bellows, &c.</p>	<p>Gas Bags for repairing Mains. All Seams Stitched and Taped.</p>	

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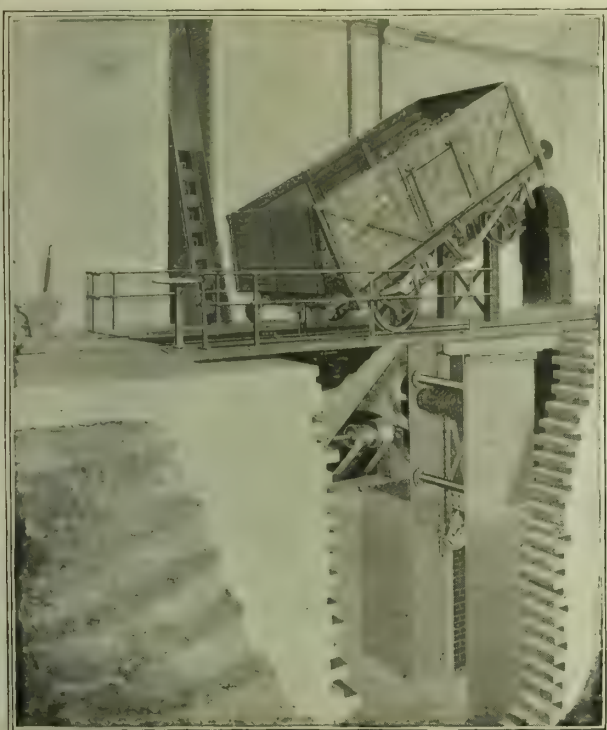
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THE "DARWIN" PATENT INVERTED BURNERS.



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Have been remodelled, and we now offer you

BETTER BURNERS
AT

REDUCED PRICES

And guarantee the highest finish and Workmanship.

Independent Test by a well-known Gas Manager of
No. 3 Burner.

CONSUMPTION . . . 3.55 ft.
of Gas at 15/10ths Pressure,

CANDLE POWER . . . 122.76

These figures speak for themselves.

Breakage of Mantles and

MAINTENANCE CHARGES

Reduced to a minimum.

Made in 3 SIZES and 8 PATTERNS

BY

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Of our Manufacture

STOP WASTE AND LEAKAGE

They are guaranteed not to contract and do not readily split and fracture but retain apparent wholeness after a long period of work.

Top Quality FIRE-BRICKS, QUARRIES, &c.

High Grade Silica Bricks and Blocks for Combustion Chambers and Special Work.

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Stoking Machinery

HYDRAULIC COKE PUSHERS

(HUNTER and BARNETT'S PATENT).

WILL DISCHARGE A RETORT IN ONE OPERATION
LARGE NUMBERS IN USE.

Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
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[See Illustrated Advertisement, Sept. 21, p. 792.]

GAS WORKS APPLIANCES, TOOLS, &c.

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Coke Barrows.
Forks and Shovels.
Service Cleansers.
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Gas and Liquor Valves.
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Street Lanterns.
Main Laying Tools.
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See Special Catalogue No. 153.

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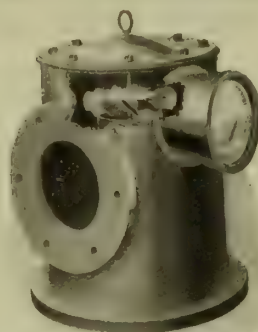
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PATENT "SURPRISE" PENDANT,

WITH PATENT SHADE.

OVER 65,000 NOW IN DAILY USE.



The ONLY GAS-PENDANT
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a room 18 ft. by 14 ft. being
beautifully illuminated with
one Incandescent Burner.

*Used in the private apartments of their
Majesties the King and Queen
at Sandringham.*

Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

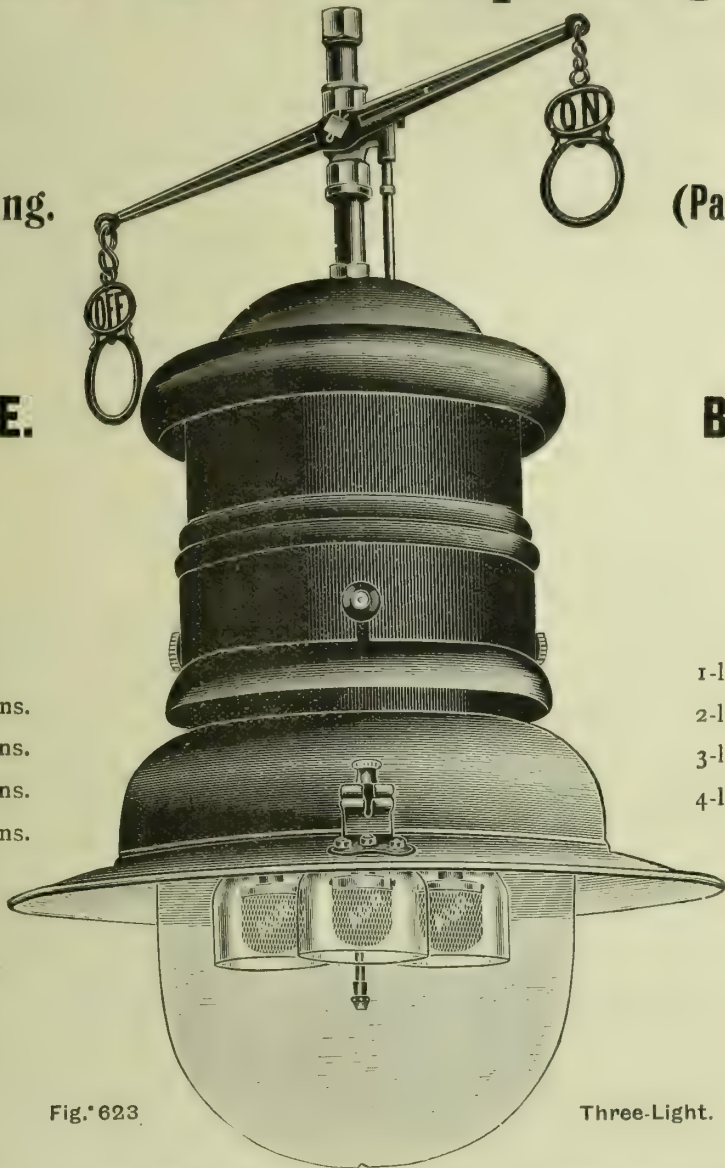


Fig. 623

Three-Light.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Mag-nesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52 6	6/- extra.
2-light	8 feet	260	47 6	6/- extra.	4-light	16 feet	550	72 6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3 6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2 3	5 9	5 9	9/-	Wired Globes, extra	each	2/-	2/-	2 9 3 6
" " " " In Case lots per dozen.	19 6	57 9	57 9	93/-	Parabolic Reflector, extra	"	3 6	6/-	7 6
Case contains	80	18	18	12	Welsbach Mantles, each		6d.	subject as usual.	Not made

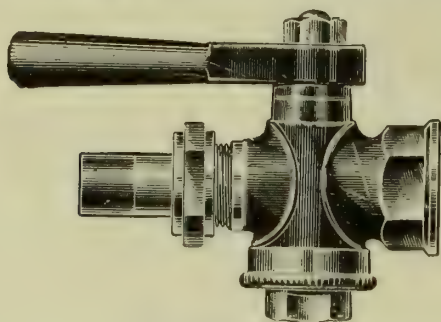
The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

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Telegrams and Cables: "WELSBACH LONDON."
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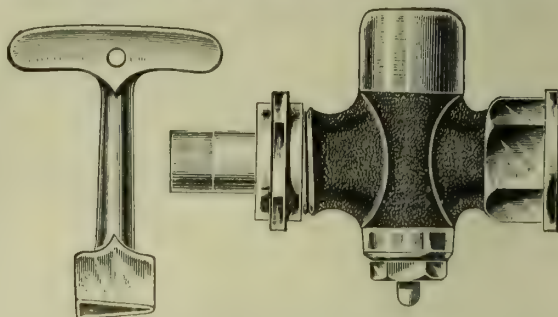
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FULL-WAY GUN-METAL GAS-MAIN COCKS A SPECIALITY.



D1 PATTERN.



G1 PATTERN.

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*Brass Gas-Fittings, Wrought-Iron Gas and Steam Tubes, Coke Forks and Shovels always in Stock.
Coke Barrows, Tools of all Descriptions.*

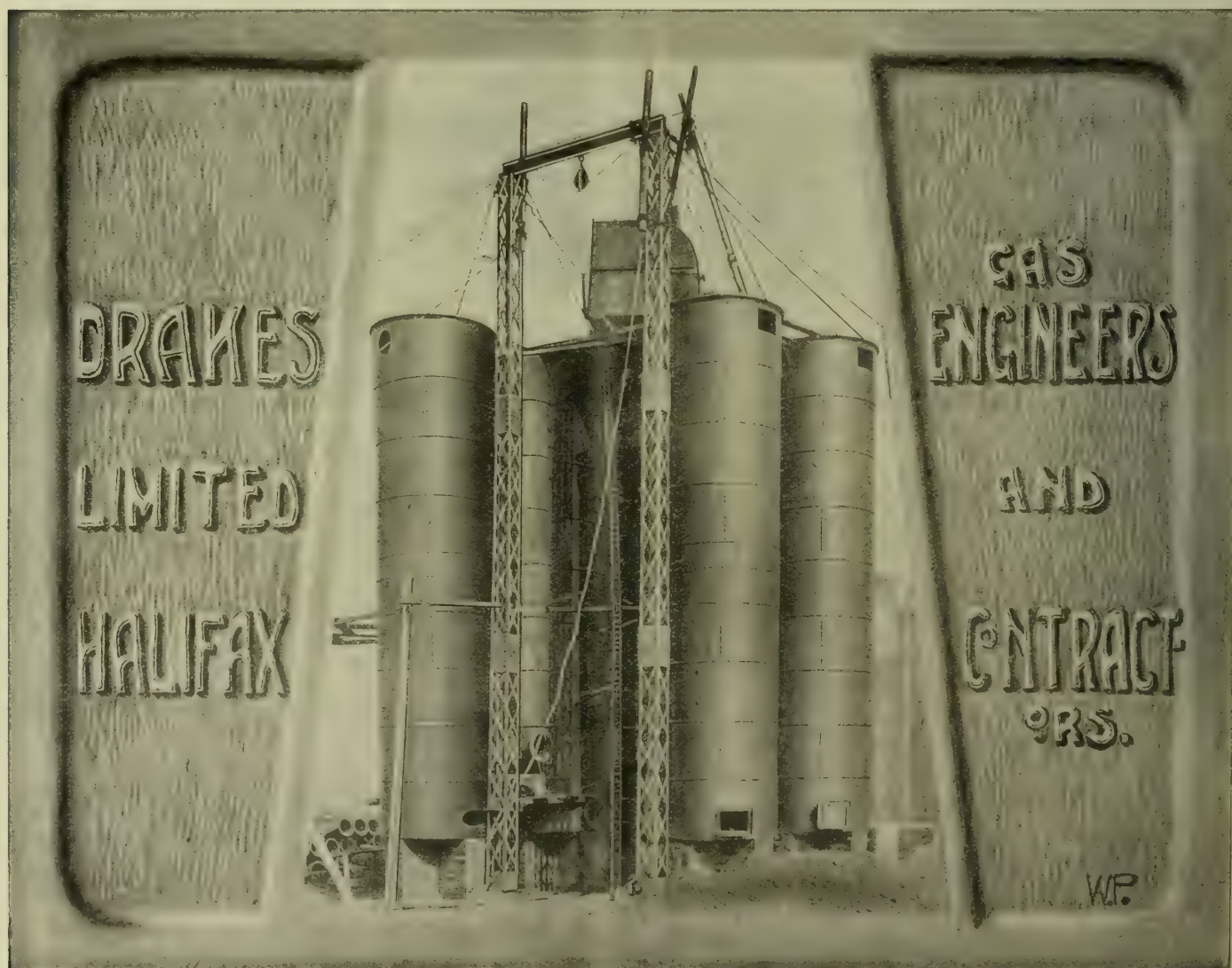
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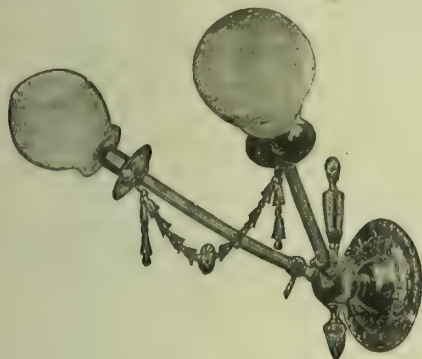
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NEAREST
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Call at our Show-Rooms in Drury Lane
where a Good Selection is Displayed.

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MECHANICAL COAL HANDLING PLANTS

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BY

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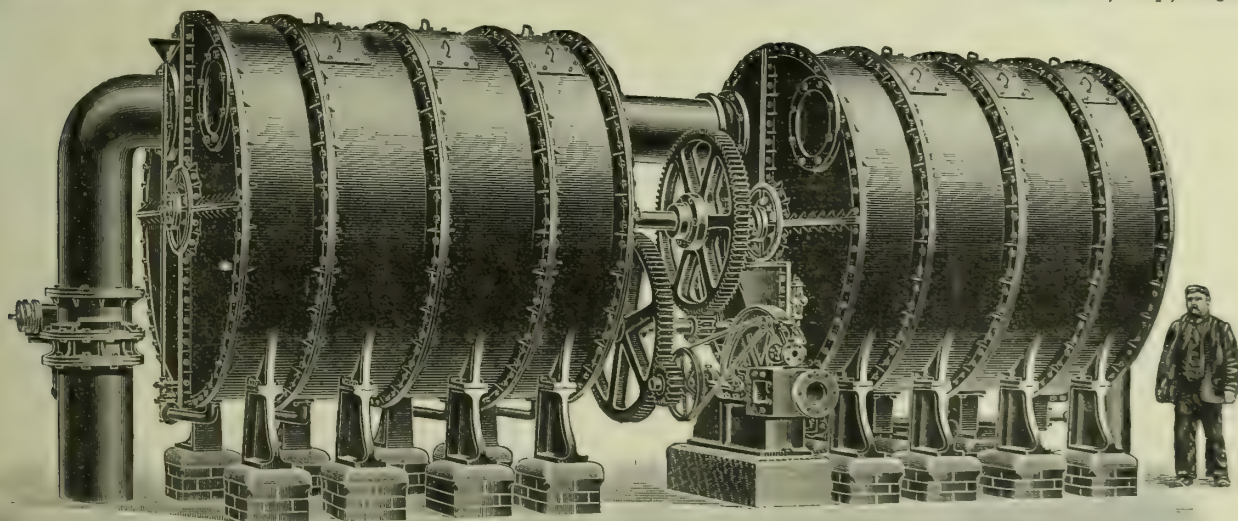
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ROTARY WASHER SCRUBBER.

Capacity **2,500,000** cubic feet per day,

For Gas-Works, **KINGSTON-ON-THAMES.** H. W. Packham, Esq., Engineer.

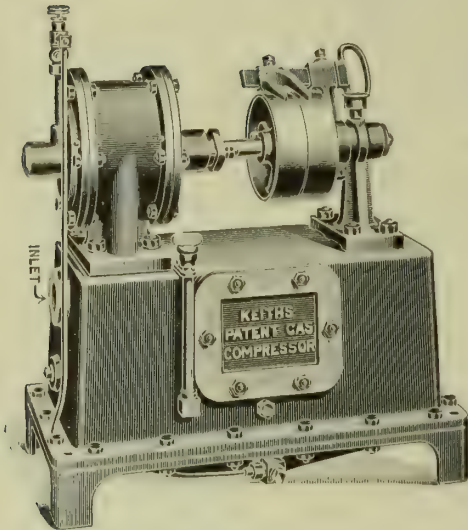


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The KEITH LIGHT.

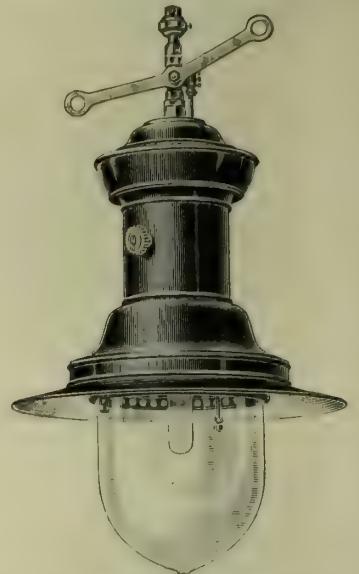
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Rotary Compressor.

**60-CANDLE POWER
PER FOOT.**

Sizes from
100 c.p. to 1500 c.p.



500 to 1500 c.p. Outside Lamp.

JAMES KEITH AND BLACKMAN CO., LTD.,
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AWARDED
DIPLOMA
OF
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FRANCO-
BRITISH
EXHIBITION.

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P. and A.
Tar Extractor,
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Valves, &c.

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Sole Makers: **CLAPHAM BROS., LD., KEIGHLEY, Yorks.**

THE JOURNAL OF GAS LIGHTING

WATER SUPPLY & SANITARY IMPROVEMENT

Vol. CVIII. No. 2423.] LONDON, OCTOBER 19, 1909. [61ST YEAR. PRICE 6d.

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PATENT ANTIMONY PAINT & PARKER'S IMPERIAL BLACK VARNISH,
 OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

SAFETY GAS-MAIN STOPPER,
 FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS.



GAS-LEAK INDICATORS,
 With all Latest Improvements.
 SHORT'S IMPROVED
 AND ANSELL CLOCK FORM.
 For Ground Use, Flush Boxes, &c.
 For Purifier Blow-off Valves.
 Highly Sensitive. Long Range.
 For Hard Usage.

GAS AND WATER PIPES
 1½ to 12 in. BORE.)



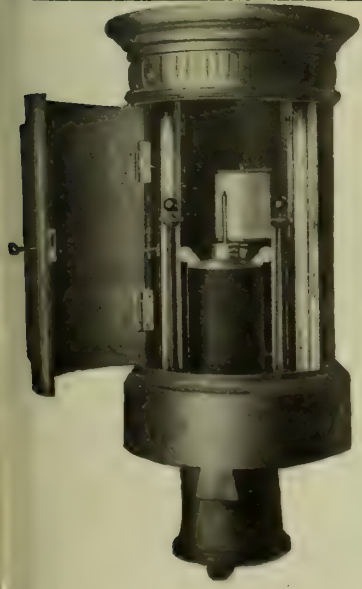
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Bonlea Foundry,
 THORNABY-ON-TEES.
 Formerly Springbank Iron-Works, Glasgow.
 ESTABLISHED 1848.
 Also Manufacturers of
 Sanitary and Rain-Water Pipes, Hot-Water Pipes, Stable Fittings, and General Castings.
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 And at PHAROS WORKS, HACKNEY WICK.
NAPHTHA AND GASOLINE DISTILLERS AND PETROLEUM IMPORTERS,
 Specially distil Carburine Spirit, specific gravity .680, or of any other grade suitable for Enriching Gas; also Gas Oil best adapted for injecting into the Retorts, as in the Herring Process.
 Importers of Petroleum for Carburetting Water Gas, or for Manufacturing Oil Gas. Distillers of Pentane, Petroleum Ether, and Naphtha for clearing the pipes of Naphthalene, &c.
 Samples and Prices may be had on application.

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ENGINEERS & CONTRACTORS.
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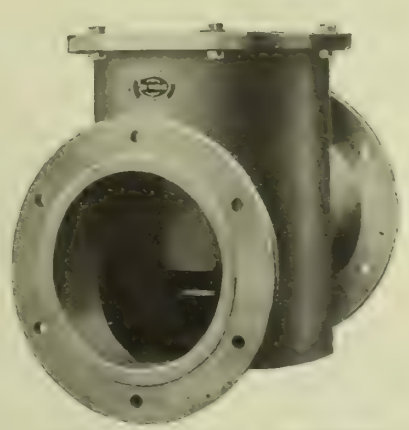


LARGE CAST IRON OR STEEL OIL, LIQUOR OR WATER TANK. CONDENSERS VARIOUS TYPES. GAS AND WATER VALVES. ROOFING STRUCTURAL WORK. M.S. & C.I. PURIFIERS. GAS EXHAUSTER & GAS ENGINE CONDENSED. ROTARY GAS EXHAUSTER. GASOMETER AND C.I. OR S.W. TANKS.



PEEBLES & CO., LTD.,
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PATENT DISTRICT GOVERNOR
 FOR
 Ordinary or High Pressure.

PILLAR BOX contains Air-Pressure Holder for Loading the Governor from a distance also Recording Gauge and Inlet and Outlet Pressure Gauges.



LARGE MERCURIAL GOVERNOR.
 From a Photo. of 24 in. Size.
 May be Loaded by Weights or Air Pressure from a Distance.



Complete Telpher Track with Screens showing Coke Storage Heap and Telpher travelling round Curve.

"TELPHERAGE"

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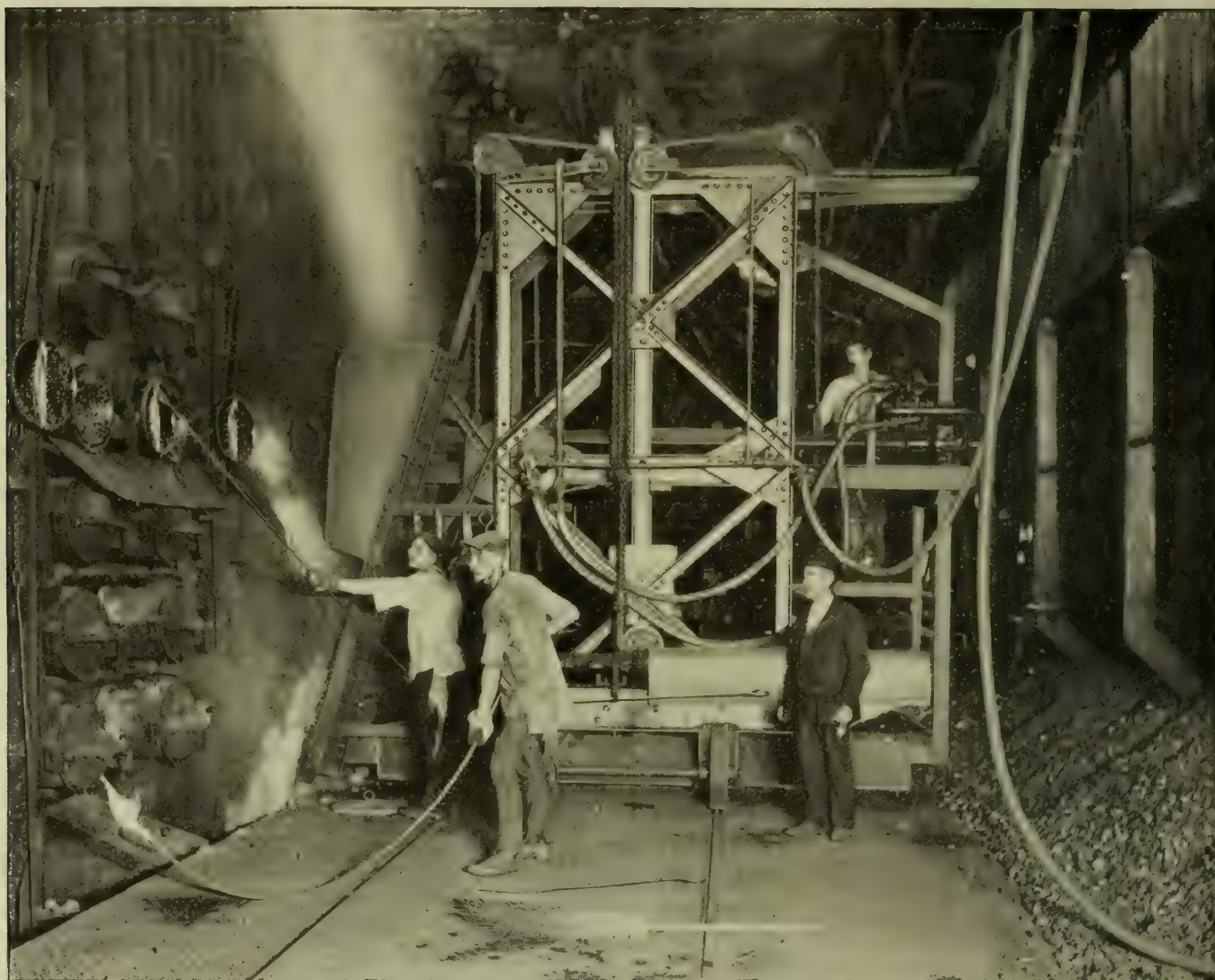
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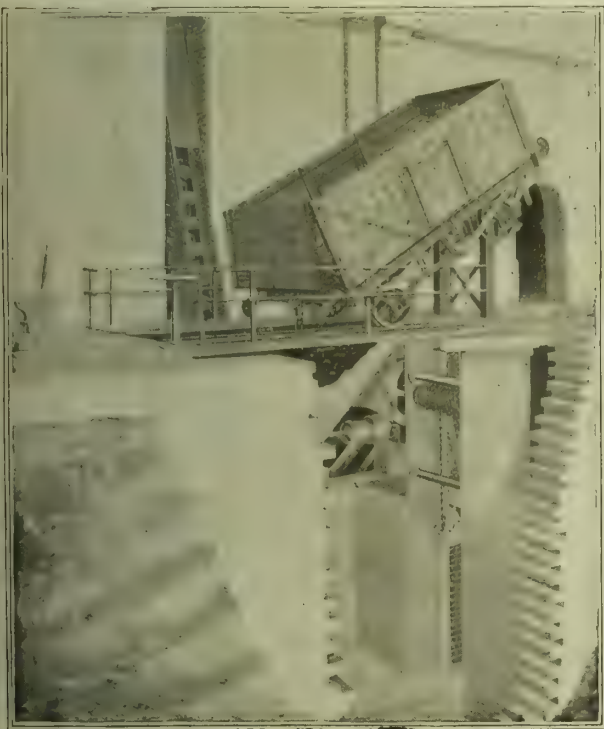
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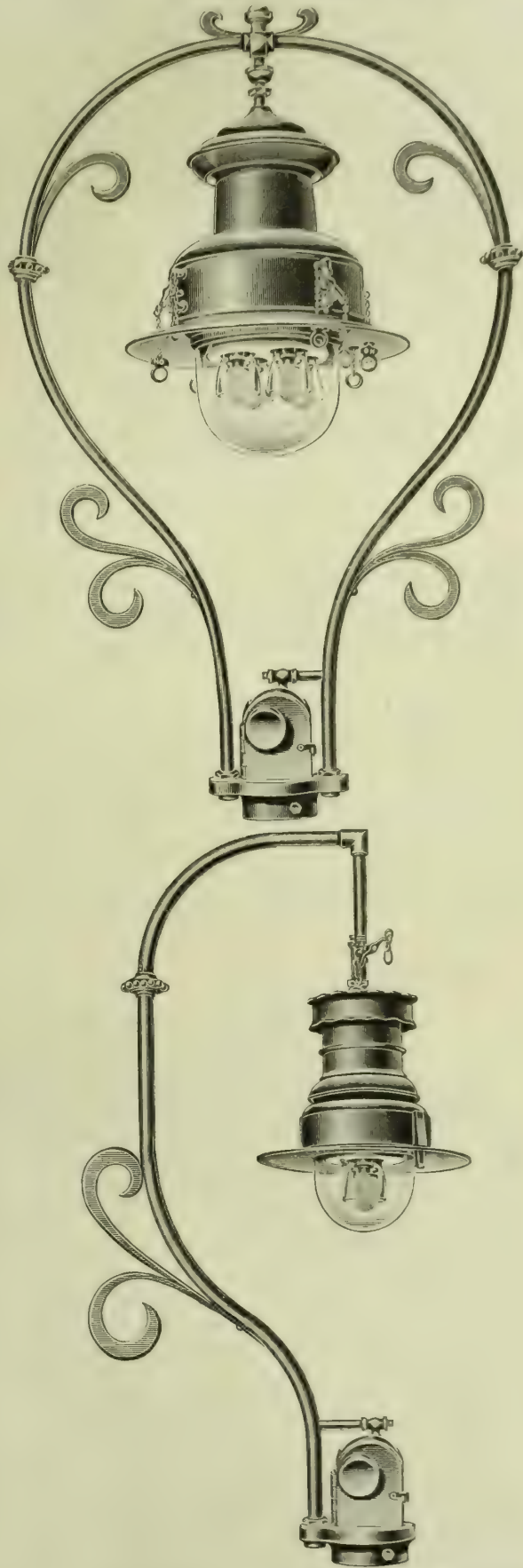
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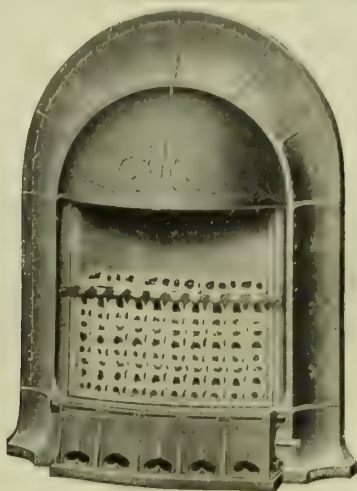
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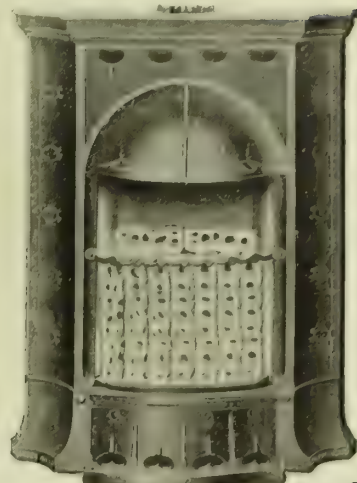
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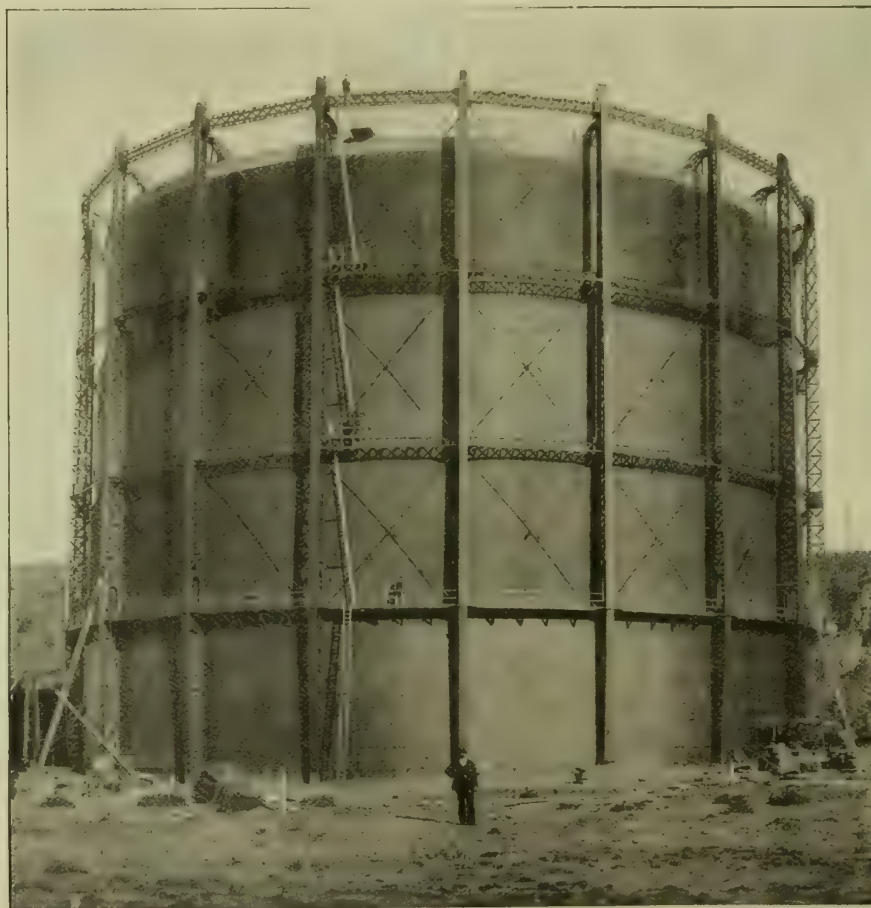
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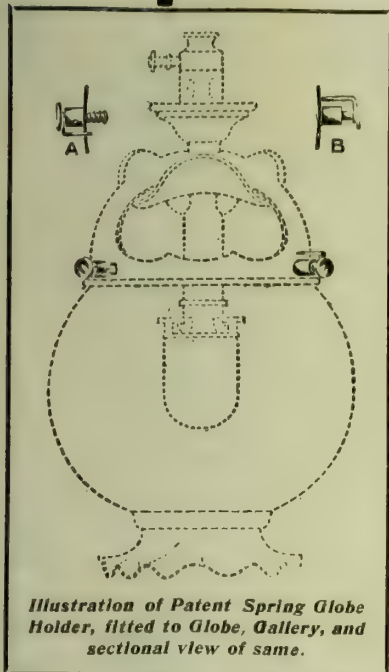
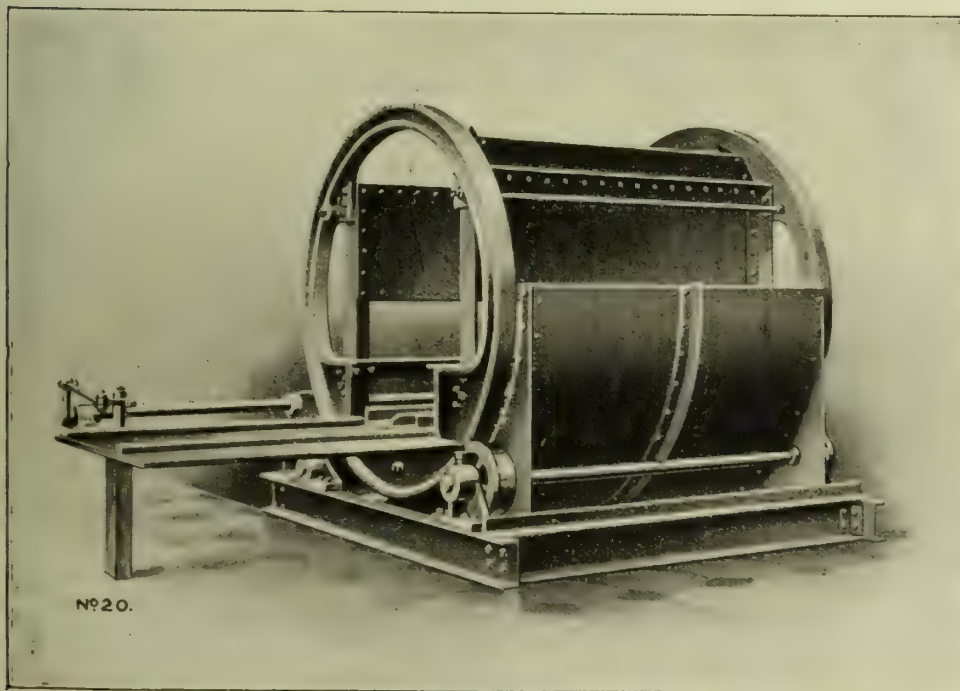


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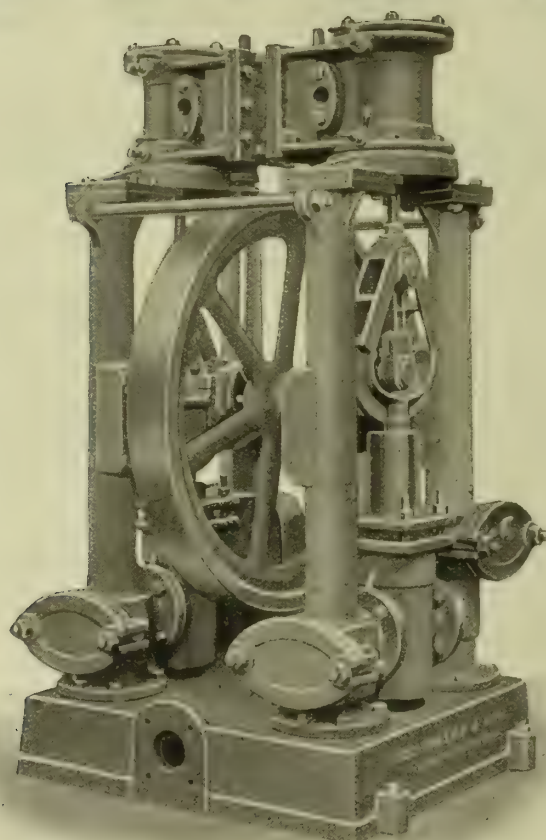
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EDITOR & PUBLISHER: WALTER KING.

OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CVIII., No. 2423.—TUESDAY, OCTOBER 19, 1909.

EDITORIAL NOTES—GAS, &c.

Mutual Responsibility in the Heating Field.

REFLECTION upon the position at which the business of the gas-supply industry has arrived leaves no question in the mind that its larger development in future in the matter of domestic consumption will be in the fields offered by cooking, heating, and hot-water service. In lighting, the work of investigation is directed to the production of still further economy and higher efficiencies. There has been a vast supersession of the old forms of wasteful burner; and there is not a grain of doubt in the mind of anyone critically observant of the industry's affairs, that the uneconomical burner will be subject to the law applying to material things, which provides for the survival of the fittest. So sure as night follows day, so sure will the crude and uneconomical means of obtaining light from gas become extinct, and the scientific means will prevail. The interest of the gas industry is, in the face of a competition which (though not on the same high level of economy and light efficiency as gas) has admittedly been strengthened, to do all in its power to hasten the day when the utmost economy and efficiency is derived by every customer from the gas that he consumes. This must have its effect upon consumption; and we have not yet reached finality in economy in relation to efficiency, which again must have progressive influence in the same direction. This, and the gains of competitors (whose progress in economical aids must, in some undefined measure, be to their advantage and to the disadvantage of those with whom they strive for business), must on the gas consumption chart have effect in lowering the lighting line, unless the new and additional consumers of gas for lighting are sufficient to balance the sacrifices to more economical and efficient means of lighting. Nevertheless, the gas industry has shown the remarkable record of having doubled its gas business in twenty years; and its business still continues its upward course. We have merely to go back to 1888 to find the year when the statutory gas undertakings of the United Kingdom were only doing half the gas business that was being negotiated by them in 1907 (the year of the last Board of Trade returns), when the gas sold amounted to 172,889,147,000 cubic feet. Throughout this period, the incandescent burner has been having its effect on the individual account for gas for lighting only; but, concurrently, the day consumption has been steadily rising, until enlightening figures from Norwich, Yarmouth, and elsewhere show that in such two vastly differently constituted towns as those named, the ratio of day to night consumption is now between 40 to 50, which means that the consumption for cooking, heating, and power purposes (having consideration for the overlapping of these purposes into the lighting hours) has proximate relationship with that for lighting.

Yet in heating and hot-water service, the business already picked up represents nothing more than the fringe of that which is possible. There are great potentialities here for the gas industry if properly, thoroughly, and deliberately worked, and if the industry fittingly shapes itself. Of the total quantity of household coal raised in the United Kingdom in 1907, no less than 51,543,000 tons were retained for home use, as against 18,594,000 tons of gas coal. These figures are significant, and are worth keeping well in mind by the gas-stove and the gas-supply industries, in considering the future lines of greatest development for both. The larger the development of the sales of gas for any heating purpose, the better for the gas-stove manufacturers. It is clearly seen from this that, in the attempt to carry this development to the extreme limits, there is mutual responsibility. Without all possible conducive aid on the part of the one, the efforts of the other will be very largely

negated. So far as the maker and vendor of gas is concerned, his work is clearly defined in obtaining as much gas as possible from a ton of coal containing the maximum of constituents that will give the gas consumer the highest number of heat units for the money he expends. That is one, and the most important, part of the responsibility resting upon the gas supplier; and there is another part to which we will presently refer. Having produced the best gas so far as conditions and knowledge will allow, the stoves and other appliances are required for utilizing that gas for heating and hot-water service. For all purposes there is no lack of stoves and heaters on the market about of an equality in the combination of economy and efficiency. But there are others that possess neither the one nor the other as an inherent quality, and that are of very indifferent construction. The greatest inefficiency may be masked by a somewhat prepossessing exterior. The responsibility of the gas-stove manufacturers comes in here; and if they would serve the gas-supply industry and themselves in the best possible way, they will guard against the production and the placing on the market of anything that is inefficient or ill-constructed. The inefficient gas-fire, the gas radiator that creates smell and is unhealthy, the water-circulator that is wasteful, that gets choked up, and in which there is no provision for cleansing without disconnection and removal, can do endless harm by scattering obloquy widely and undeservedly upon the gas industry. It is as senseless a proceeding to produce the inefficient and ill-constructed gas-consuming article for trade cheapness, as it is to make temporary gain by trading upon ignorance. The reputations of both gas supplier and stove manufacturer can soon be damaged, and irretrievable harm be done to both industries. It is the big future as much as the more moderate present that has to be kept in view. We are not pointing the finger at anyone; but there is a desire at this time to seriously impress the lesson of general and mutual responsibility in connection with future development.

There is another aspect of this particular matter. Little use will come from the condemnation of the production of inefficient gas-heating appliances when gas suppliers can be found who are foolish enough to encourage their production by dealing in them, and, in fact, by insisting upon having them. The demand creates the supply. If an injudicious economy did not so largely influence some—the qualifying word may be emphasized—gas suppliers in buying cheap goods, and in screwing the makers down to the narrowest of profit margins, inefficient goods would soon be swept completely out of the market. There we have the second point of responsibility, having regard to future business development, for the gas supplier; and a second point of responsibility for the gas-stove maker is to go to the utmost extreme in ensuring maintenance of quality of production and in unremittingly working, each firm on its own lines, to score still greater efficiency. In this work the aid of Science (as is shown by an article in another column) can be brought in, by each firm, to a much greater extent than it has been hitherto. There must not be reliance solely upon the Leeds University in this respect. From that seat of learning and research may come direction; but the lines of application will rest upon the makers. Whether the lines of application are the most successful will not be certified by Leeds; and the makers must themselves provide the means for scientific approval, and for guaranteeing that there is no slipping back from any point of advance brought to their credit through their private and persevering work. Accepting the view that the heating field for any and every purpose is, owing mainly to the progress in economy and efficiency of gas lighting, the most extensive one open for future development in the domestic line of business, then there will be no difficulty in agreeing as to the mutual responsibility and interest that exist between the suppliers of gas and the manufacturers of gas-stoves.

Justification by Result.

To deliver two Inaugural Addresses within eight days is a feat that is perhaps unprecedented in the annals of technical organizations in the gas industry. The precedent has been set by Mr. W. R. Herring; and the task, we venture to say, has not been an uncongenial one to a man with such a large stock of material at hand drawn entirely from personal experience. Last Saturday, he was addressing the Yorkshire Junior Association; the corresponding day the preceding week, the Eastern Section of the Scottish Juniors. Two such invitations coming from the juniors is an honour, and a mark of regard that cannot be lightly esteemed by the most eminent men in the profession. The Yorkshire address is one that is not without very special interest to all students of works economics, and of the financial issues of new engineering structures. The Granton works—both design and equipment—have been criticized up and down in engineering circles; but the confidence of the designer from the time he laid his plans, and had applied to them all the tests that discriminating estimate would allow, has never been the least shaken. And year by year, estimate and the bold scheme of works abandonment and concentration, have had endorsement in result. But what Mr. Herring did for Edinburgh and Leith would not necessarily apply to all other cities and towns. This he made abundantly clear to the Yorkshire juniors. Judgment in an engineer is an inestimable quality; and judgment under the conditions with which the designer of Granton was faced before he staked his professional reputation and future on his advice, has been the means of producing an economy represented by, in six or seven years, an increase in gross profits from £38,000 in 1896 to £122,000 in 1909, with the commercial conditions as to the price of coal practically the same, rates of labour higher, and a lower price for gas than was ever charged in the district before.

The figures that are given in this address as to working costs and maintenance are supplementary to those that have been previously published; and they are more valuable, inasmuch as they cover the past five years' working, and with that period added to the age of the plant. We never hear anything now about the memorable "spring clean" at Granton. The operating costs given with such detail and without reserve, open to the criticism of all and the checking of those who care to take the trouble, have wholly silenced the premature critics, both in respect of working costs and maintenance. The figures now published are notable; but we prefer not to quote them here, as in the address there has been care in stating precisely the constituent elements of the charges. But we may note this point, that the improvement in manufacturing costs, including all the items specified, has been progressive. If the contribution on manufacturing costs, by Mr. Herring, to the Institution proceedings in 1905 is referred to, and the figures are compared with the average ones in the address for the past quinquennium, it will be seen that—taking costs from coal handling to gate-keeper and messengers—there is a further gain upon the 1905 statistics equal to 0.435d. per 1000 cubic feet of gas made. The figures published in 1905 and those now given afford on the one hand the amplest justification for works' scrapping and abandonment at Edinburgh and Leith, and on the other the design of Granton—more particularly in the matter of mechanical operation.

In respect of works' scrapping and design, there are no golden rules that can be referred to and followed as being correctly and universally applicable. If there were, engineering would be much simplified, and responsibility lightened. On this head and that of design, Mr. Herring gave the Yorkshire juniors some philosophic advice that will assist their considerations whenever they are confronted by the problem of what is best to be done under a given set of circumstances. In regard to both scrapping and new design, there is one cardinal point to bear in mind. "It is not a question of how much a thing costs; but how much will a certain capital sum, judiciously expended, enable you to save, as compared with your present system of working." It is the result—present and prospective—of expenditure, and not the amount of the expenditure itself, that is the test of the wisdom of any given scheme of procedure; and applying that test to Granton, as representing the end of the complete transformation of the gas-manufacturing system of Edinburgh and Leith, is there ought to say by those who at one time doubted, other than that their doubts were altogether misplaced?

Gas Coal from Nova Scotia.

It will be remembered that, at the last meetings of the Gaslight and Coke and South Metropolitan Companies, Mr. E. Kimber besought the Directors—in view of the unsettled state of labour in the home coal-fields—to consider the expediency of investigating the alternative source of coal supply offered by Nova Scotia. It was mentioned by Mr. Kimber, who seriously believed in his figures, that Nova Scotian gas coal could be put on board for 5s. 3d. per ton, and be brought to this country for 5s. per ton, which would give the London Gas Companies coal in the Thames at 10s. 3d. per ton. We have the best of grounds for now saying that Mr. Kimber was speaking upon imperfect information. Following his advocacy of investigation being made into the price and gas-making quality of the coal, the Agent-General of Nova Scotia in this country (Mr. J. Howard), upon our suggestion, instituted inquiry into the matter. As a result, he finds that such representative owners as the Dominion Coal Company, Limited, would not, for a contract of 100,000 tons or upwards, consider a price lower than from 9s. to 10s. per ton f.o.b. Sydney or Louisburg; and this again would be conditional to some extent on the time of the year at which the shipments would have to be made. It would be necessary to add to this the cost of conveyance to England in steamers of large capacity; and then the freightage, the Company estimate, would in all likelihood not be less than 6s. per ton. From this it will be seen the cost would be higher than the price at which English coals can be delivered in the Thames. Some years ago when the General Sales Agent of the Company referred to (Mr. Alexander Dick) was in England, he went very closely into the question of exporting coal to London, with the result that he found, under normal conditions, it would be quite impossible to compete from Nova Scotia. Distance between the source of supply and destination also adds to the risks. In the event of a strike of British miners, or any other emergency, however, probably Nova Scotia would be in a position to overtake any business offering.

Looking at the matter from the qualitative point of view, Nova Scotian gas coal appears to have commendable properties, judging from the certificate of an analysis made by Messrs. J. & H. S. Pattinson, of Newcastle-on-Tyne, in 1902. Using coal-testing plant, a yield of 10,650 cubic feet of gas was obtained per ton of coal. This had an illuminating power of 17.5 candles, tested by the No. 1 "London" argand. The illuminating value of the coal per ton, expressed in pounds of sperm, was 639 lbs. The percentage amounts of coke and volatile matter were respectively 60.5 and 39.5. A complete "ultimate" analysis of the coal yielded these percentage results: Carbon, 77.51; hydrogen, 5.22; oxygen, 6.72; nitrogen, 1.27; sulphur, 3.07; ash, 4.10; water, 2.11. The figures justify the assertion that the coal is a very good one for gas-making purposes; but the expense would be against its use here excepting for emergency purposes, and there, again, the impossibility of getting "prompt" delivery, through distance, would restrict the value of its service in that regard. The point is rather accentuated by recent happenings in Nova Scotia. The ground of Mr. Kimber's recommendation at the meetings of the two London Gas Companies named was the threatened national strike of miners just previously. But Nova Scotian coal workers are not above the ordinary level of British miners in their recourse to militant tactics to gain their ends. A cablegram from Nova Scotia on the 4th inst. gave information as to a strike of miners then in progress, as to warrants for the arrest of coal operators who are accused of conspiracy, of the trial of officers of the United Mine Workers on a charge of criminal libel, and of retaliatory measures against the editor of a paper on the same ground. Nova Scotia is not immune from coal miners' troubles; so the placing of a contract there would be subject to all the contingencies of a similar contract at home—and more, owing to the great distance.

Irrational Labour.

THE conditions of labour have so vastly improved in gas-works of late years that it is rarely now one hears of a strike of the men. As a matter of fact, contrasting conditions with other industries, there is every occasion for general contentment. The statement applies equally to the works of the Union des Gaz as to those of other owners—private or municipal; for if the concessions, privileges, and consideration that have over a number of years past been surrendered

by the Board of the Company were catalogued from the details supplied from time to time by Mr. Arthur Lucas, at the meetings of the Continental Union Gas Company, it would be seen that there is cause for nothing but gratification on the part of the men. But the contrary obtains. There seems a continuous seething discontent at Milan, which, through the agency of Trade Union organization, extends to the other works. If we were asked to pick out, guided by our knowledge of the labour conditions in the world's gas industry, the gas-works in which discontent—and unreasonable discontent—had chief home, our finger would fall, without the slightest hesitation, upon Milan. And yet the men there are not conscientious and disciplined as gas workers of the times are generally found. Their ideas as to a fair day's work for a fair day's pay are of the vaguest; and, such as they are, they are based upon an utter and despicable selfishness, such as would be spoken of in the most reprobative terms alike by British, German, and French gas workers. The men make dishonest demands, and will not listen to any reasoning in regard to them. They decline to accept the decision of arbitrators, and they spurn co-partnership, as though it were some evil thing. They are a law to themselves, and will, if they cannot have their own way, accept none of the conventional means of settling disputes, other than the one of direct conflict.

They are now memorializing the Directors in respect of further claims, with which we can hardly think—having in view the already excellent position of the “workers,” and the extraordinarily little work they do—it will be possible for the Directors to comply. So it appears likely that there are further troubles in store for the Company. What may happen if the men maintain their intolerable and unreasonable attitude has already been foreshadowed by a small and short-timed, but inconvenient, strike by the retort-house men at St. Celso. But there are indications that it will be the right course for the Company to stand firm. We know full well the strong leaning there is in Italy towards the worker in any questions between capital and labour; but there is at least one influential local newspaper that sees that the attitude of the men is altogether irrational, and that they have been treated with liberal hand by those who employ them. A spread of general knowledge of these matters will do much to alienate public sympathy from the men; and alienation of public sympathy would clearly weaken their position. Among the men themselves, there are signs of schisms. The St. Celso retort-house men tried to steal a march upon the general body of the workers by taking an independent course. They mistakenly consider themselves indispensable; and they have become more despotic than ever. They want the largest share of any plunder that demand and action hostile to the Company's interests can secure. The other men do not like these acts of independence and arrogance; and they have occasioned some resentment. The retort-house men have returned to the general ranks, but they want to be the dictators. If they push this rôle too far, they will have opposed to them all the other workers. There must be sympathy with the Directors and officers of a Company working under such implacable labour conditions. We wish them well out of their troubles; but that happy event will not be until the men have been converted to the opposite of their present demeanour, which is intolerant of all discipline and fair dealing.

Gas-Works and their Water Supply.

Whatever advantages or disadvantages may be held from a general point of view to have followed on the supersession of the London Water Companies by the Metropolitan Water Board, it is quite clear that the transfer has in certain individual cases resulted in very great hardship; and one such instance was made evident by an action which last week occupied the attention of Mr. Justice Neville in the Chancery Division of the High Court of Justice. The action, which is reported fully in our “Legal Intelligence” to-day, was brought by the South Suburban Gas Company to determine whether the Metropolitan Water Board are entitled to charge a gas company 5 per cent. on the rateable value of their property, as in the case of an ordinary domestic supply, for water used on their gas-works, or whether such a company are entitled to a supply by meter, as for trade purposes; and the arguments make interesting, and it may also be added instructive, reading. Besides this, the case is of general importance; for it was pointed out by the Company's leading Counsel

(Sir Alfred Cripps) that the question raised would affect all water and railway companies, as well as factories. The Company urged that they should be supplied by meter; but in giving his decision, the Judge held that in this respect they had failed in their contentions. He, however, decided in their favour to the extent that they were entitled to a “domestic supply” under certain sections of the Metropolitan Water Board (Charges) Act, 1907, which provided that the Board should, at the request of an owner or occupier of any house or building, or part of a house or building, occupied as a separate tenement, or of any person entitled to require a supply of water for domestic purposes, furnish such supply at a rate per annum not to exceed 5 per cent. on the rateable value; also that where a supply of water for domestic purposes was afforded to any building occupied solely for any trade or business which was assessed at a sum exceeding £300 per annum, a certain rebate or discount should be allowed, not being less than 20 or more than 30 per cent. on the water-rate (the rebate not to have the effect of producing a charge of a less amount than 5 per cent. on £300); and that the rateable value of any house or part of a house should be determined by the valuation list in force, there being a proviso that if no rateable value were shown in the list it should be determined in manner provided by section 68 of the Water-Works Clauses Act, 1847. The hardship of the transfer of the water supply to the Board so far as the South Suburban Gas Company are concerned will be gathered from the fact that, while under an agreement originally entered into with the old Lambeth Water-Works Company, the payment had been something like £50 a year, the Board ultimately gave notice to terminate this arrangement, and stated that henceforth they would only furnish a supply on the rateable value, as for a domestic supply—this value, including the mains and other appliances, being £17,693. The Company thereupon intimated their intention to discontinue taking a supply from the defendants. A demand was later received by them for two quarters, at the rate of £221 per quarter, or no less than £884 per annum; and it was to decide the true basis of charge for this period that the action was brought.

The Arguments.

It will be seen that the case for the Company was that, as one of the obligations put upon them under the Factory Acts was to provide proper sanitary appliances for the workpeople, they should be charged by meter, and not on the rateable value of the premises. Alternatively, they claimed that, if defendants were able to charge 5 per cent. on the rateable value of the property, they were entitled to a certain rebate under one of the sections; and this was one of the heads on which they succeeded. It was pointed out that the Company were rated, in the charge made, not only in respect of their works, but also of their mains. Further, Sir Alfred Cripps argued that a gas company's premises did not come within the words “house or building” as referred to in the section relating to domestic supply, and that it was not using water for domestic purposes to merely provide such sanitary arrangements—closets, urinals, and washing taps, &c.—as were necessary in the case of any factory. The section which enabled an occupier to require a supply of water for domestic purposes, he submitted, only applied if any person lived on the premises, which was not the case at the Company's works. The Judge, however, said that if the words “domestic purposes” meant what he had always understood them to mean—drinking, washing, and sanitary arrangements—then the purposes for which plaintiffs wanted the water were “domestic.” It did not follow, however, that the Board would be entitled to charge on the annual value of £17,500, because one must have the buildings in which these conveniences were placed; and it might be that what the plaintiffs had to pay would depend on the rateable value of these buildings. As they were not found in any valuation list, the value would have to be ascertained under section 68 of the Water-Works Clauses Act. Sir Alfred Cripps admitted that this might perhaps be a solution of the difficulty, and said if this view were adopted he did not think it would make much difference to the Company. The subsequent judgment, it will be seen, was to this effect.

Domestic Supply.

In the main, however, the arguments resolved themselves into the question as to whether or not the Company's supply was a “domestic supply;” and as to this the Judge remarked that the test seemed to him to be not whether the house or building was

a domestic one, but whether the water supplied was used for domestic purposes. To this Sir Alfred Cripps replied that surely the Act could never have intended that, because there was a public convenience at a railway station, the railway company should be charged on the rateable value of an enormous station for the trifling quantity of water used there. It seemed to him a *reductio ad absurdum*, and that "domestic purposes" really meant domestic as connected with residential purposes. In his evidence, the Engineer (Mr. S. Y. Shoubridge) pointed out that there was no resident caretaker on the premises, which were used solely for business purposes. Two of the taps were in stables, and the water was used for washing the horses and carts, as well as for drinking. The whole of the water required for manufacturing objects was drawn from a river which ran through the works. For the defence, Mr. Danckwerts argued that, with the exception of the horses and carts, the water was all employed for domestic purposes; and, this being so, it was quite immaterial to consider the nature of the premises on which use was made of the water. There were the houses or buildings in which there were certain conveniences; and the Company were entitled to a supply of water to them on the rateable value, subject to the rebate condition; the amount being fixed according to the rateable value of the buildings in which the things were actually placed, the value of which would have to be apportioned in accordance with the provisions of the Act. He pointed out that the main purview of all water legislation was to secure that there should be no incentive to stint the use of water for sanitary purposes; and therefore the overall charge was imposed for the domestic supply. The same principle was intensified in the case of the Water Board, who were a public body, not trading for profit, but supplying water for the use of the public; any deficiency in the revenue being made up out of the rates on the whole area. Though the Company did not succeed in their contention that the supply should be by meter, they are at all events, it seems, freed from the necessity of paying for the water on the magnificent scale in the first place desired by the Board.

Yorkshire Juniors Make a Good Start.

The members of the Yorkshire Junior Gas Association opened their seventh session on Saturday under most favourable auspices. Like their colleagues beyond the Tweed, whose inaugural proceedings for the session were reported in the "JOURNAL" last Tuesday, they had reason to congratulate themselves on having present among them Mr. W. R. Herring, of Edinburgh—not merely to show his approval of, and hearty sympathy with, the work that the juniors are doing, but to give them advice which cannot fail to be of immense value to them in their after-life. At the meeting in Edinburgh, as pointed out last week, he laid stress upon the importance of paying attention to the little things about gas-works, which tend so much to their successful management. On Saturday, he showed the Yorkshire juniors how the experience he gained when he was fulfilling an engagement in their county had been applied in carrying out the important scheme of gas-works construction with which his name will always be associated. It has been said that the life of a professional man consists of three periods. In the first he learns his profession; in the second he practises it; and in the third he teaches it to others. Without for a moment saying that Mr. Herring has passed out of the second period, he has entered the third sufficiently far to earn the gratitude of a large number of the gas engineers of the future. It was due to Mr. W. Cranfield, a member of the Council of the Yorkshire Association, that Mr. Herring was invited to Leeds; and in seconding the vote of thanks to him, he pointed out that the two addresses he had delivered formed an "harmonious whole," and could not fail to be of wide usefulness. In the course of his remarks, Mr. Cranfield referred to the value to juniors of the accessibility to good technical works, and suggested that authors should send copies of their books to the lending libraries of the Junior Associations. He also mentioned that the Council had cast a "longing eye" on the abstracts that are published in the "Transactions" of the Institution, which they would like to see appended to those of the Junior Associations. Both are subjects of interest which will bear further consideration. On the whole, the meeting must be regarded as having been a very successful and profitable one.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 201.)

THE Stock Exchange had a decidedly chequered time last week. For the first half of the period, it was much depressed—almost wholly due to the monetary outlook. But as soon as the position was cleared by the resolute action of the Bank on Thursday, relief was felt, and a smart recovery (a little over-smart, perhaps, in one or two lines) set in, and the close was cheerful. The flatness began on the opening day, with dearer money here and a rise in the German rate. Consols fell $\frac{3}{8}$; and all the leading markets were depressed. The same influences on Tuesday brought everything down. Consols touched $82\frac{1}{2}$. Wednesday started miserably; all looking for lower prices, which, of course, came. Consols were done at $82\frac{1}{2}$ —the lowest figure marked for a very long while, and quite an Arctic degree of frost. Everything else was very chilly too. The worst was past, however, before the close; and in the afternoon a recovery set in. On Thursday, when all uncertainty was removed by a rise in the Bank rate to 4 per cent., a more comfortable feeling was imparted. Home Government issues did not seem to feel it; but Railways were brighter, and Americans, worked from New York, were loud and pushful. The improvement continued on Friday, and reached the gilt-edged division. Many speculative lines were active and buoyant; but Railways were much overcast by the bad weather. Saturday was quiet, but pretty steady. Consols were unchanged; Railways not quite so bad; and the buoyancy in the other departments not quite exhausted. In the Money Market, terms for short loans and for discount were much stiffer. It is nineteen months since we had a 4 per cent. Bank rate. Business in the Gas Market was a little quieter than the week before. Prices actually marked did not show much advance (if any); but a fair number of quotations were put up a moderate degree. In Gaslight and Coke, the ordinary was a good deal less active, but quite steady. The range of prices realized was exactly similar to that of the preceding week— $106\frac{1}{2}$ -7. In the secured issues, the preference was rather busy at from 104 to 105, the maximum marked $88\frac{3}{4}$, and the debenture $85\frac{1}{2}$. In South Metropolitan, there were dealings at from $120\frac{1}{2}$ to $121\frac{3}{4}$; and the debenture was done at 85. In Commercial, the 4 per cent. changed hands at $110\frac{3}{4}$; and the $3\frac{1}{2}$ per cent. at 104 and 105. Among the Suburban and Provincial group, Alliance and Dublin new marked $13\frac{1}{2}$ cum div., British $42\frac{3}{4}$ ex div., Brentford old $254\frac{3}{4}$, ditto new $190\frac{1}{2}$, South Suburban $120\frac{1}{2}$ and 121 , ditto preference $120\frac{1}{2}$ and 121 , ditto debenture $122\frac{1}{2}$, and West Ham $125\frac{1}{2}$. In the Continental companies, Imperial was quiet at from $180\frac{1}{2}$ to 182 , ditto debenture marked 95 and $96\frac{1}{2}$, Union from 96 to 98 (a rise of 1), European fully-paid $24\frac{1}{2}$ and 25, and ditto part-paid $18\frac{1}{2}$ and 19. Among the undertakings of the remoter world, Bombay changed hands at 6, ditto new at $4\frac{1}{2}$, Buenos Ayres at $13\frac{7}{8}$ and $14\frac{1}{2}$, ditto debenture at $97\frac{1}{2}$, Monte Video at $12\frac{3}{4}$ and $13\frac{1}{2}$, Oriental at 140, Primitiva at from $7\frac{1}{4}$ to $7\frac{1}{2}$ (a fall of $\frac{1}{8}$), River Plate at $16\frac{1}{2}$ and $16\frac{3}{4}$, and San Paulo debenture at $51\frac{1}{2}$.

ELECTRICITY SUPPLY MEMORANDA.

Victims of the Metallic Filament Lamp—Domestic Electrification Required—New Conditions and Stimulated Effort—High Voltage Low Illuminating Power Metallics—Miners and Electricity in Mines—Wholesale Transfer.

THE penetrating groans of the electrical plant manufacturer cannot go unheeded. We sympathetically referred to them a short time ago. They continue. Things all round seem to have conspired to oppress the manufacturers through their businesses. The country is wrong, trade is wrong, the open-door competition is wrong, and the metallic filament lamp—well it is not wrong, it adds to the miseries of the time. The Managing-Director of Messrs. Willans and Robinson, Limited (Mr. J. C. Peache), has been addressing the shareholders in mournful tones. The half-year's working results have been bad; and there has had to be short-time working. The principal business of the Company is the production of machinery for the generation of electricity; and Mr. Peache gives it as his firm opinion that this is a line of business that has been adversely affected to a greater extent than perhaps any other. That is bad. To sink to the bottom-most level in this way is not encouraging. Distinct from the common adverse business influences, there are causes confined to the electrical industry that have been accentuating, in its case, the effects of the general depression in trade. That is where the metallic filament lamp comes in. Says Mr. Peache, its introduction and the great economy in current that is realized by its use is having a serious effect indeed on the revenues of electric light stations. In all parts of the country, the output of current is falling off; and electricity concerns, instead of having to order new plant, are finding that their existing plant is in excess of their present requirements. The hope that the cheapening of electric light would lead to a great extension of its use and a renewed demand for plant has still place in the deferred list. For the present, new construction is at a standstill; and the business of building electric-generating plant, for this country at all events, is in a state of stagnation. The number of orders for generating plant to be obtained at home is small; and owing to excessive

competition, prices have been driven down to a level that leaves only a narrow margin for profit.

That is a picture of the position on one side of the industry. Another is found, on the other side, in the waning revenues of electricity supply stations, owing to like cause. The only way to fatten revenues, and make the wheels in the plant manufacturers' establishments go round again with more regularity and a greater velocity, is by selling additional electricity. The electrical press constantly pegs away at the central station engineers to adopt a forward policy, or what the optimistic "Meteor" of the "Electrical Times" describes as "a whole-hearted domestic electrification campaign." Our contemporary has come out with a double number on "Domestic Electrification." But the result does not advance the stock of information on the subject, or bring before us anything particularly noteworthy to which attention has not been drawn in electrical advertisements and catalogues, and in central station literature. Misrepresentation and the foam of frivolity affected by this particular paper run plentifully through the issue. Not many central station managers would care to face the ridicule that would meet them by having recourse to much of what is presented for their guidance and use in this domestic electrification issue. If they do not know their business better than the "Electrical Times" gives them credit for, the sooner they resign their official positions the better for the undertakings they are supposed to serve. But why take all this trouble, when the prophets of the "Electrician" have only recently announced that the time draweth nigh when even cooking by gas will be near vanishing-point? It looks as though the "Electrical Times," on the other hand, is privately of opinion that the final suppression of the gas industry is going to be a thing somewhat difficult of attainment. However, the announcement heralding the special domestic electrification issue of the paper was as interesting as the issue itself. The time has arrived, in "Meteor's" opinion, when electricity can make a bid not only for the entire lighting of the private house, but for much of its business in cooking, heating, ventilation, and so forth. Then follows a little flow of lofty praise for the present condition of things in the domestic electrification line: "Thanks to the conjunction of three things—the wire lamp of to-day, the improvement in quality and reduction in price of heaters, cookers, and subsidiary appliances; and lower costs of supply—we, for the first time, find ourselves in a position to go boldly for the private house on the grounds of cheapness as well as convenience and all other virtues." There is about this the peculiar ring of a harvest thanksgiving at the end of a rain-saturated and sunless summer.

While "Meteor" returns thanks for the conjunction composing the particular trinity to which he refers, the central station engineer is heartsore and wearied over his unrequited efforts at making the householder believe all that has been written about the cheapness and the other virtues of electricity for domestic application. Many householders who have ventured upon a trial spread abroad a tale of experience contrary to the testimonials of the few who write at the request of the canvasser; and such tales travel to the discomfort of the canvasser and his chief. However, the time is thought to be ripe for an aggressive commercial policy for getting not only more electric light customers, but "the biggest possible revenue out of every possible house." The final injunction of the decalogue does not, by common consent, apply to business; and so we read "many station engineers are pleased and satisfied when they have snatched the lighting of a house from gas. But if they look at the consumer's bills, they will generally find that for every £1 he pays the electric supply concern, he is still paying 30s. or more to the gas company." Central station engineers are advised that it is a good rule, therefore, to remain discontented until his private house bills are at least double what they would be for lighting alone. If an electrical engineer takes this advice, he will go to his grave a miserable fellow. A further combination of pretence and advice is found in the sentence: "Recent developments have so materially improved the position of electricity as compared with its competitors that every supply undertaking should reconsider its entire programme of business-getting. "Meteor" may not have read, before he wrote these cheery words, a sentence in the recent presidential address of Mr. John Young to the Eastern Counties Gas Managers' Association, which gave the information that, in the lighting of tradesmen's premises at Hull, there were on the maintenance system 1254 lamps, representing 5016 burners, nearly the whole of which have superseded electricity. It is not only the metallic filament lamp, but well-directed competition, in which the use of the more modern inverted gas-burners are brought to bear, that is causing a decline in the lighting units.

The troubles of central station engineers are not yet at an end with the metallic filament lamp. In many quarters, they have been congratulating themselves that it seemed probable the line of descent in the units of illuminating power of this class of lamps for the higher voltages, would be only a short one; but their congratulations have been premature. It has been pointed out in the electrical contemporary to which reference has already been made that, in rapid succession, 50, 40, and 32 candle power lamps for voltages of 200-260 have been introduced; and now the General Electric Company announce that they can give immediate delivery of 25 Hefner unit (22-candle) power Osrams for 200-260 volt circuits. These lamps are credited with an efficiency of 1.42 watts per candle. There is a 22-candle power high-voltage "Metalik" lamp on sale now; and predictions are being made that lamps of this make down to 10-candle power will

be available by next Christmas. Further statement is that the 10-candle lamp will consume no more than 15 watts; and "such a unit may well bring to despair the supply engineer whose revenue depends upon his lighting load." But lamps of such poor illuminating power will not be extensively tolerated for domestic purposes in these "more light" days, other than for the meaner situations. Still there they will count in consumption reduction. Central station managers are urged to look upon these conditions cheerfully, and to regard lighting as the proverbial sprat to catch the cooking and heating mackerel. There is another matter to be recognized; and it is that electricity supply managers have to—or should—run their stations on commercial lines, with the view of making a profit. If the lighting business is to fall to the undignified level of mere bait for cooking (at odd hours) and for winter heating units on sale at 1d. apiece, then the central station will soon find itself in a deplorable financial position, with capricious demands upon it violating all the revered principles on which electric tariffs have been constructed.

There have been so many accidents and fatalities in coal mines through the use of electricity that the miners have lost confidence in it; and their attitude is causing some alarm in electrical circles, as much on account of the influence their protests and demands will have upon the minds of the general public as on account of the effect in retarding the further adoption of electricity in mines. The "Electrical Review" has devoted more than one leading article to the subject; and the other electrical papers have had their turn. The first leader in the "Review" on Oct. 8 was headed "Electricity and Miners' Panic." There is a remark in the article to the effect that "a straw shows which way the stream is running;" and we think the article indicates that the peace of mind of the electrical industry is somewhat disturbed over this matter. The members of the Durham Miners' Association recently had before them a resolution calling for the removal of electrical apparatus from mines on the ground that it was considered a great source of danger. But owing to the question having been regarded as a suitable one for consideration by a Parliamentary Select Committee, the resolution has been allowed to stand aside for a time. But the miners are taking the question very seriously. It was on the agenda for the annual meeting of the Miners' Federation. This persistence has significance, and danger is scented. Says the "Review": "The confidence of the miner is a thing to be striven for; and in these days, when business-getting methods in electricity supply are so loudly advocated, such a simple and necessary matter as going to some trouble and expense to convince the actual users of electricity of its safety under proper conditions should hardly require advocacy. Probably, however, it will not be done because it is so obvious." In the "Electrician" issued the same day, a new hand shield-plug is described, which has been invented to give protection to the plug-user against "all shocks and burns."

A question of ethics crops up in connection with the transfer from West Ham to the Marylebone Borough Council of the services, as Electrical Engineer, of Mr. A. H. Seabrook; and the point has a wider application than between West Ham and Marylebone. Following Mr. Seabrook's appointment to Marylebone, Mr. H. H. Holmes, the West Ham Sales Manager, migrated to the same quarters as his chief. Now the head clerk in the general office of the West Ham Electricity Department has trodden the paths that lead to Marylebone; and four other members of the sales department have shaken from off their feet the dust of the socialistic territory, and have gone into the more congenial surroundings of Marylebone. We do not know how it came about that there should have been such an exodus from West Ham, and that the wanderers should all have found asylum at Marylebone. Is it that the Chief could not do without his faithful old henchmen; is it that their past services deserved a good turn at his hands; or is it that there is such reverence on the part of the West Ham staff for the Chief that they could not live without him? If these new members of the staff at Marylebone represent replacements, then there must be some of the old Marylebone staff among the unemployed. But to say the least, such wholesale transfer at the present time is hardly fair to the West Ham Corporation and to the new Chief there, who has to carry on Mr. Seabrook's work under the disadvantage of promoted assistants and (we suppose) new hands, instead of aided by those who have hitherto borne the chief responsibility in their several spheres, and have ripe experience.

Mr. F. W. Taylor, son of Mr. F. C. Taylor, of Shanklin, has been appointed Engineer, Secretary, and Manager of the Harpenden Gas Company, and will enter upon his duties on the 1st prox. On leaving school at Shanklin, Mr. Taylor was for two years in the service of the Gas Company, of which his father is the Engineer and Secretary. He was then articled to Messrs. Edward Cockey and Sons, Limited, of Frome, and worked through the shops and drawing office, and went to many places throughout the country erecting gas-works plant. He studied chemistry under Mr. Norton H. Humphrys, F.C.S., of Salisbury. He holds first-class certificates in both the Ordinary and the Honours Grade of the City and Guilds of London Institute; also the Royal Life-Saving Society's medallion and certificate. In August, 1906, he was appointed Assistant-Engineer and Secretary under his father. Since then the reconstitution of the Company has taken place, the works have been remodelled, and additional plant, including coal-handling and sulphate of ammonia plants, erected.

THE AID OF THE LABORATORY IN GAS-STOVE WORK.

A Visit to the New Laboratories of Messrs. John Wright and Co., Limited.

OBSERVATION can render much assistance in effecting improvement in industrial operations and the resultant products; but science can do more. This fact is slowly—all too slowly—worming its way into the beliefs of the manufacturers of the country. Recognition is growing regarding the economies and the efficiencies to be obtained from plant, materials, and productions, by applying to treatment and use the counsels and rules and the protection offered by chemical examination and test. Progress in industrial or other operations is largely baffled by want of knowledge; and the knowledge can only be obtained by systematic and painstaking research by the methods that science provides. It is an industrial advance to obtain the recognition of this; and in self-protection the component members of any industry one after the other will have to not only recognize but, recognizing, apply.

For some time this has been fully appreciated by Mr. H. James Yates, F.C.S., the Managing-Director of Messrs. John Wright and Co., of gas-stove fame. Training and inclination exercised their persuasive powers; and for years, in the operations over which he has had control, there has been the application of scientific rule, but not with that degree of methodical completeness that he has desired. The idea of thoroughness in this regard, however, has been there; and the idea has germinated, and has grown, until now, at the Birmingham works, there are to-day to be seen

laboratories fully equipped for having a controlling influence over the whole operations of the huge establishment, and for throwing light upon the ways and means for raising the peaks of improvement to higher altitudes. As chief of these laboratories, the firm have retained the services of Mr. Arthur Forshaw, M.Sc., who is now well known in the gas industry as the first Institution Research Fellow in the Department of Fuel and Gas Engineering at the Leeds University.

IN THE FOUNDRY AND FITTINGS SHOPS.

But we would not have it imagined that rule-of-thumb and rude crudity have persisted without amendment up to now in the manufacturing methods, design, and products of our gas fire and stove manufacturers. They have not. Proof obtrudes on every side in the character of the goods that have become so popular. The gas-fire manufacturers, however, are of the first to admit that there are blanks in their knowledge, and that there is much more to be accomplished, much more gain to be placed to their credit, by an extension of that knowledge through scientific research. Let us glance into the workshops, at the same time carrying the memory back to pre-existing conditions. The custom of a bygone day was simply to take the castings from the foundry, and hand the various parts to the fitter for the primitive routine treatment. By the aid of emery-wheels, he brought them to the



Furnace End of the Chemical Laboratory, looking through to the Physical Laboratory.

proper condition, he drilled and tapped holes, and then fitted the parts together. As a piece of workmanship produced under such conditions, the stove which resulted was a good example. But there it was, a stove for good or ill, and incapable of ready repair and maintenance. That was a defect of the system which produced drawbacks in subsequent use. The old order has changed. It has been found that the only proper system is founded on elaborate precautions in the foundry, and by the employment of special plant to prevent castings varying. From the foundry the castings go to the machine shops, where everything is machined to templates and in jigs. The parts then merely require assembling by the ordinary workpeople. The result is that every part in a single class of production becomes absolutely interchangeable. The importance of this to the gas supplier and to the gas consumer is obvious. It produces an economy which benefits both the purchaser and user. It does not mean that the gas-stove can be produced any cheaper. It is a merit of production that scores in the cost of subsequent upkeep. This is a point that is not always recognized, as it should be, by buyers.

THE RAW MATERIAL AND THE MIXING OF THE METALS.

In another respect there has been change. The day of the old cumbrous, weighty gas-stove is past. But because castings are lighter, it must not be inferred that they are not as strong, nor that there is not as great value in them as in their predecessors. The writer had many object-lessons in this and other matters in visiting the works of Messrs. John Wright and Co.,

when inspecting the new laboratories. Noted was the great attention that is paid to the handling of the raw materials, and to the mixture of the different metals. Iron alters with age; and the conscientious maker, the maker jealous of his reputation, does not want to get into his mixtures iron that is very much oxidized, and which will become weak, and produce dissatisfaction by the heaviness of the roll of breakages. It is common knowledge, too, that there is pig-iron and pig-iron; and it is not the purchase of the least expensive that enables the production of light castings, consistent with strength. Stoves made with light castings are less expensive to convey from place to place. Herein is seen how chemistry comes to the aid of the gas-stove manufacturer, in enabling him to produce in his metals those characteristics that are best suited to the purposes in view.

GAS-FIRE BURNERS AND THE FLAMES.

Again, the old idea in the early days of the gas-fire was that, so long as one obtained a blue flame for heating up refractory material to warm an apartment, or for heating a kettle and so forth, that was all that was required. Satisfaction began and ended there. The scientific construction of burners in days past was not thought of. Careful calculation of apertures, of capacities, and of form of injector, the question of perfect mixtures of gas and air, the rates of the velocities of gas to the burner under varying pressures and calorific powers, were never bothered about. That has been changed. Good level bunsen flames are now obtained; and the improvement in this respect is partly responsible for the diminution of gas consumption in relation to



The Opposite End of the Chemical Laboratory.

effective work. Even to-day, however, there are gas-stoves on the market in which there is the evidence of full appreciation not having been driven home as to the important part the injector plays in efficiency, and as to want of knowledge regarding the requirements in relation to the creation of a proper mixture and the regulation of the velocity of the gas.

FUEL AND RADIATION.

Then there is the refractory fuel and its construction for the gas-fire. That is the direction in which we have to look to get the greatest radiation efficiency. It was high time the matter was taken up very seriously. There was a time when the gas-fire maker knew absolutely nothing about the fuel he used. He simply got what is commonly known in the trade as asbestos fuel, made by people whose notions were absolutely unfashioned as to what was essential for the special purpose. This fuel, made in the most haphazard style, was placed in the basket of the gas-fire without any proper idea as to how to arrange it so as not to interfere with combustion. Further, misconception abounded in the idea that the heat of the fire should be drawn as much as possible round the structure, in order to heat the cast-iron casing to a high temperature; and in this way radiation suffered mate-

rially. The result was that the larger proportion of the heat was convected; and, under the conditions prevailing, it is not at all surprising that condemnation was rife as to fumes and dryness of the atmosphere. The writer was shown, on the occasion of the visit to Messrs. J. Wright and Co.'s new laboratories, how they have paid special attention to the question of fuel, and how the constitution has been so altered that it is altogether different from that which preceded it in the days to which reference has been made. When it is considered that to-day a 17-inch fire consumes less gas than the old 10-inch types, that the percentage of radiated heat is far in excess of anything that obtained in the case of the predecessors of to-day's productions, that now the frame of the gas-fire in use is at such a low temperature that the hand can be placed upon it practically at any point without being burned, and that the escaping products are below 200° Fahr., it shows conclusively not only that gas has been saved, but that the heat units of the gaseous fuel are utilized to a much greater extent than ever before. This increased knowledge and enhanced efficiency has had another effect. Apart from the question of the dryness of the atmosphere and smell, the heat-wasting character of the old crude gas-fires led to complaint on the part of users that they did not properly heat their apartments. When one



Part of the Physical Laboratory, looking through to the Chemical Laboratory.

comes to consider that these embodiments of inefficiency, with their narrow grate openings, replaced 18 to 20 inch coal-grates, there can be no wonder, looked at from the stage of present-day knowledge, that there was grumbling. The idea of Messrs. John Wright and Co. has been in the last few years to get their gas-fires as wide as possible in relation to their maximum consumption of gas. They are now making them up to 21 inches wide; and yet the consumption of gas has been considerably reduced, in contrast with the narrow fire openings of a past period. The biggest radiating surface that can be secured in relation to the consumption of gas is the aim of the firm's present designing.

THE COOKER.

In the gas cooking-stove, a fair state of efficiency was reached a number of years ago, and so there has been less scope for improving the efficiency of the cooker, other than from the points of convenience, maintenance, and facilities for ensuring cleanliness. This is largely due to the fact that, the jets being situated at the base of the oven, and free burning, all the heat units possible (according to the construction of the stove) are extracted before there is a passing away of the products by the flue. Therefore, the loss is not so great in the oven as it formerly was in the gas-fire. Regarding the boiling-burners on top, there have been considerable improvements. Careful calculations of the capacities of the burners, and the improved construction of the injectors, so that they are injectors actually as well as nominally, have added to efficiency. Another thing which was at one time largely ignored by makers was the distance of the boiling-ring flames

from the pots and pans placed on top of the stove. They were either too far off to enable them to do their proper amount of work, or they were too near, with consequent imperfect combustion. By guarding against these defects of arrangement, greater efficiency has been ensured; and by having gas and air adjusters to every burner, they can be regulated so as to give efficient results with varying pressures and calorific powers.

HOT WATER SUPPLY.

In the judgment of Mr. Yates, the great fields for development to-day are the gas-fire and water-heating; and as much is this true for the gas-supply industry as for the gas-stove industry. In his opinion, however, the forms of apparatus brought out for heating water are memorials to an ignorance of requirement, and of the application of scientific laws. This is seen especially, he points out, with circulating water-heaters for connecting up with the ordinary flow-and-return pipes of houses. In such apparatus, economy should be the first consideration. But in some such conveniences, there is no thermostat connected; and it is left to servants to light and turn down or extinguish the flames at their own sweet will, and on their neglect of this, frequent great waste of gas ensues. This points to the necessity of sensitive automatic control; so that, however small a quantity of hot water is drawn off and cold water rushes in, there will be an automatic turning on of the gas, and, when the water has been heated to the desired temperature, an automatic closing-down again. Furthermore, investigations by the firm point to the correct arrangement being, in the cause of household economy, for the



Principal Laboratory Testing-Room.

[The Heat Efficiency Tests are carried on in the Room through the Open Door.]

reservoir of hot water to be immediately over its source of heat, as this ensures the least possible loss of heat in circulating through the hot-water system. Then there should be no narrow interstices through which the water has to pass; so that, if the water be hard, chalky deposits, such as, at the high local temperatures necessarily prevailing in apparatus of this circulating type, are inevitable, will do the minimum of harm by loss of heat and waste of gas. Moreover, there should be means provided whereby an apparatus can be easily opened, *in situ*, and the chalky deposit be removed, without having to take the apparatus apart. A great advantage of a controlled hot-water supply of this kind, with an application of scientific principles and intelligence in the design, is that the water need not be raised beyond a temperature of 150° Fabr.; and, at this temperature, the amount of deposit is comparatively small. On these lines Messrs. John Wright and Co. are working.

CASE FOR THE NEW LABORATORY COMPLETE.

All this information and improvement over which we have so lightly passed in works' methods, in design, and in product, the firm have been able to get together, and much more besides, by the aid of the moderate amount of chemical work that they have hitherto been in a position to bring to bear on their operations. But this accretion of good result from a comparatively small extent of scientific work, showed that the only proper way of compassing greater advantageous result was to lay out a laboratory fully equipped with the best obtainable apparatus, put a first-class man at its head, and treat the new department as an integral part of the works, but

as having an altogether distinct sphere, with systematic investigations going on from day to day and hour to hour—so keeping the works' operations up to the level of a standard scientific efficiency, and making progress by tracing deficiency, superfluity, and rescuing from present obscurity the means to greater efficiency. It all points to a recognition by the firm that unguarded effort is not so good as that which is guarded, and that indeterminate procedure without any sure basis is not so good as that which is settled and attested authoritatively by scientific aid.

To this conclusion the firm came a number of years ago—even long before the Leeds University scheme was in the embryo state; and although the buildings for the present laboratories and testing-rooms were only erected in February this year, the former laboratory has been in use for a period of years, and during that time, as opportunity has permitted, rearrangements of works have been in progress so as to provide a site, and give the new laboratories their destined inclusion in the works' procedure.

In the New Laboratories.

The new laboratories, with their splendid equipment, are now completed; and Mr. Yates is enthusiastic over them and the value of the work they will permit. From the comparison already made of the old style and the new in the constructive operations of gas-stove manufacturers something will have been gathered as to the character of the work that will be carried on in the new scientific centre of Messrs. John Wright and Co.'s works. Let us, however, epitomize it. There is research work to be done on the combustion of gas under varying conditions, both

normal and abnormal. Then there are investigations to be made as to the best modes of utilizing the different constitutions of gas. The search is to be continued for the ideal refractory material, and the best configuration for the various types of fires, so as to secure the maximum of radiant heat. There is the ordinary analytical work going on to enable determinations to be made as to the best compositions of metals and other materials for the various purposes. Certain standards are fixed; and there are the tests to ascertain that there is adherence to these standards. The quality of material purchased has to be examined, in order to see that no weakness is introduced through any changing conditions in respect of them. Experiment has to be made with the object of improving the mixtures, with the view of reducing weight and yet increasing strength. Continuously, samples of air are being sent by representatives from various places throughout the country so as to ascertain the effect (if any) on the atmosphere of rooms and other enclosed places of the combustion in the various stoves on the market. And, wherever possible, a sample of the air prior to the use of the stove or other apparatus is also taken, so as to secure comparative results. The calorimeter, too, is continuously in use, so that at any time corrections can be made in respect of experiments going on in connection with the consumption of gas. All the various parts of new apparatus are also taken, in their first stages, from the works to the main testing-room, where elaborate tests are made, and adjustments effected before the apparatus is passed as being in an eligible condition; every detail of the burners is specially studied and tested for the separate classes of fires; and all this scientific supervision is continued until it is determined that the sample—whatever it may be—is in form suitable for issue from the works on a commercial basis. But that does not finish the supervision. The first complete samples produced are brought into a second testing-room, where they are subjected to a prolonged series of tests, night and day, with the consumptions controlled, and the temperatures continually recorded, so as to ascertain precisely

their capabilities. The temperatures of the products of combustion are measured; the air that is passing in is measured; the radiant heat is measured; and the external temperatures of the casing in the various parts are tested in order to see that there is no undue loss. Thermometric tests are taken in every part; and, what is also of importance in the detail, all the thermometers are readjusted—their correctness is not taken for granted on the *ipse dixit* of anybody. The work is scientific; and it is controlled by the niceties of scientific rule. From material and the inchoate stages of manufacture to the completed article, there is seen scientific regulation and supervision. Thus, it is obvious, there is plenty of profitable work to be done in a specially organized chemical department in a gas-stove manufactory.

A GLANCE ROUND THE LABORATORY EQUIPMENT.

The new laboratories (on which, from all aspects of view, we heartily congratulate the firm) consist of a suite of five rooms. The building is of red brick, with plenty of window space, and with walls lined with white enamelled tiles. No complaint can be made here of want of light, or of inappropriate conditions. On the upper floor, there are the physical research room, the analytical room, and the store-room. On the ground floor, there is a large testing-room fitted with all kinds of apparatus for measuring and testing under various pressures and thermal values of the gas. The second testing-room is for carrying out prolonged temperature observations, when all the adjustments have been made that have been determined upon by the observations carried out in the main testing-room.

THE ANALYTICAL ROOM.

In the survey of the equipment, we will take first the chemical or analytical room. In the general arrangement of the fitting up, everything has been done for convenience and cleanliness. At the back of each bench, there is a continuous trough, with water taps within reach of the hand of the worker at any part of the



A View in the Principal Foundry at Messrs. John Wright and Co.'s Gas-Stove Works.

bench. The gas supplies are all controlled from a handy position in front of the benches. This is a great convenience, as it saves leaning over the benches, which is a fruitful source of accident resulting in the spoiling of many an experiment in less favoured laboratories. On the window side of the room, there is a teak-topped bench with drawers and cupboards, stocked in manner that delights the heart of the chemist. On the other side, one portion of the bench is topped by a stone slab on which stand the muffles and furnaces, over which is a spacious hood for carrying away the fumes and products of combustion. It is interesting to notice the arrangements made to supply the furnaces with oxygen for combustion analyses, the precautions that have been taken to ensure that the gas is perfectly pure and dry before entering the furnaces, and the way the tubes are arranged for absorbing the carbon dioxide. By-the-by, one of the muffles has been in use for several years for research work in connection with refractory media for increasing the radiation in connection with gas-fires. Another furnace is for melting small quantities of pig iron, in order to arrive at the right proportions in a mixture for making various goods which have to stand varying strains under varying conditions. Continuing from the stone slab, there is a large slate slab, on which are placed various drying-ovens, and the apparatus for supplying the laboratory with condensed water. The stone and slate slabs are supported on brick piers. Further on, is to be found a well-fitted and large fume cupboard, in which are placed all the necessary gas and water appliances together with hot-plates, sand-baths, &c. At the end of the laboratory is a special table, devoted to a Bone and Wheeler gas analysis apparatus. On the teak-topped bench are arranged all the various apparatus used in connection with analytical work. Among the minor details, it was noticed that all the sinks are fitted with catchpots underneath, so that any escaping mercury can be recovered. Telephones are also fitted up, to give communication with any part of the works. In short, here we find all the refinements of a first-class laboratory.

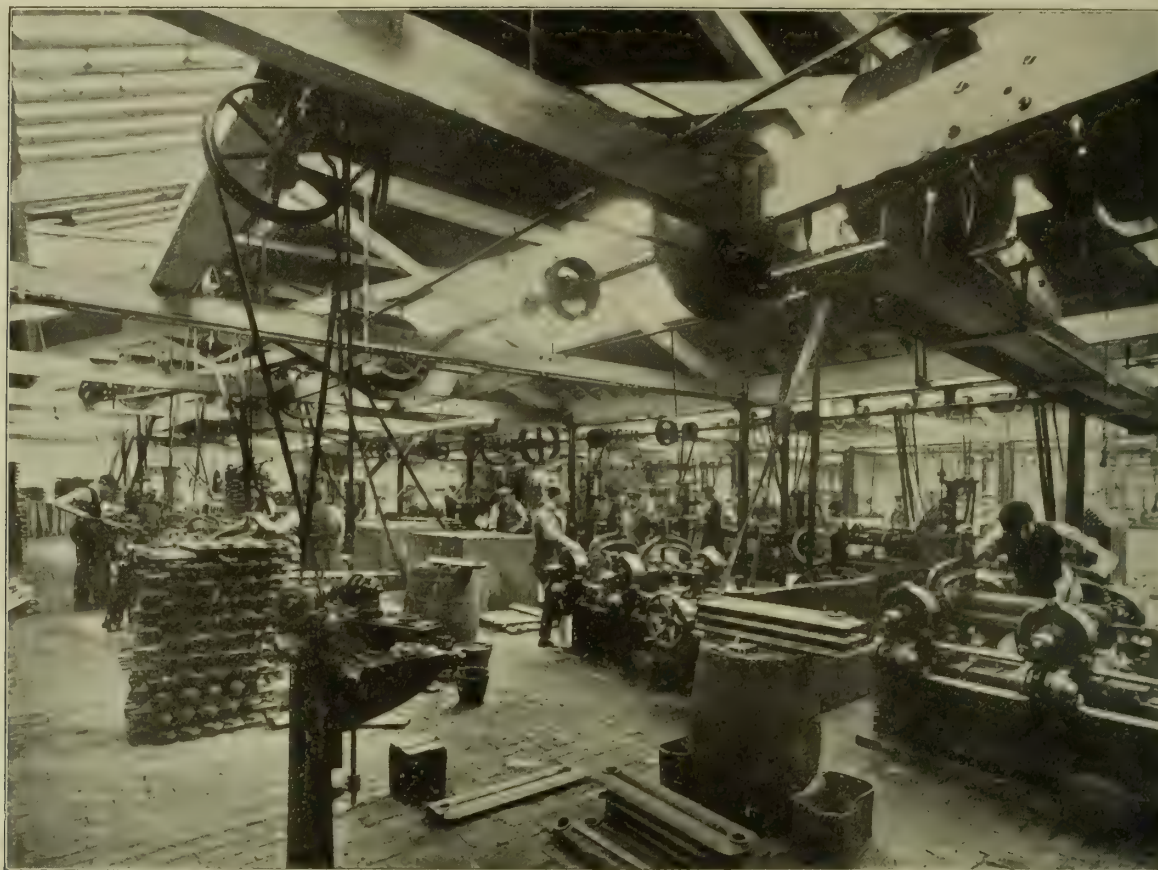
THE PHYSICAL ROOM.

Centrally in the division wall, a doorway leads to the physical room. Here again, on the window side, is a teak-topped bench, with back continuous trough and water-taps, front gas-taps, and underneath a liberal supply of drawers and cupboards. On the opposite side of the room, the top of the bench is composed of slate slabs supported on piers. Here are found the balances of different kinds; and the necessary apparatus for testing the vitiation of air under varying conditions, both by volumetric and gravimetric methods. On the occasion of the visit, it was interesting to observe the amount of work of this kind that was going on. Among them is a short-beam balance of the Bunge type, the advantage of which is that one can weigh quite as accurately and much more rapidly than with the old type of long-beam balance. There is also in this room an elaborate switchboard for comparative electric tests, so that the operators have control of voltages of 250 downwards. A Gas Referees' sulphur testing apparatus is installed here; and there arrests attention a very interesting type of barometer such as is essential in all well-ordered laboratories. There is no intention for the work to be carried on in any slipshod fashion; there will be correction of gas volumes both in respect of atmospheric temperature and pressure. A Boys' calorimeter forms part of the equipment; and in this connection there was noted an ingenious device for securing a more constant water-level than is possible with the apparatus as supplied. In this room, too, were observed the various desiccators, in one of which were samples of carbon—the results of an analysis of a delivery of pig iron. The artificial lighting of the rooms, it was remarked, is by inverted gas-lamps.

Leading from the physical room is the store-room for chemicals and apparatus; and a safe is installed here to store records.

MAIN TESTING-ROOM.

Proceeding to the main testing-room on the ground floor, the equipment is for the testing of burners, parts, gas-fire, radiator,



A View In One of the Machine Shops.

and cooker temperatures, and so forth. Close by the door is a Boys' calorimeter, and a sink with supplies of water and gas. At one end are a couple of 11-foot test-holders. On the back wall of the room are four gas-pipes, provided with frequent connecting points. The top one is for a supply of gas under pressure from pumps; so that any desired abnormal pressure can be obtained for testing purposes. The next pipe is a governed supply from the ordinary works' gas-system. The third and fourth pipes lead from the test-holders. These pipes are all connected up to one another in such manner that any piece of apparatus can be attached; and, after it has been adjusted from the holder pipe,

it can be linked up at will to the ordinary or high-pressure pipes for burning under varying conditions. In this way, tests of consumptions at all pressures and under all conditions, can be made while the apparatus is actually working, with simultaneous tests of the calorific power of the gas. It was observed that there is a nice battery of pressure-gauges connected up to the various mains, so that the testers can see at a glance the conditions under which they are operating. Ranged under the supply-pipes is the testing-bench, on which stoves, in an unfinished state, are placed for testing. Over this bench is a large main flue, with a number of adjustable orifices, so that the products of combustion can be carried away while testing is proceeding. Passing to the end of the room, there is a test-meter, with pressure-gauges on either side, which can also be connected up to the various supply-pipes; so that, in every conceivable or useful way, in lengthy tests of heating apparatus, full knowledge is obtained of all the conditions affecting results. Noticed here were also the cookers upon which the pre-heating experiments were made, which gave Mr. Yates the basis for the article he wrote in the "JOURNAL" for Sept. 7 last. Lying around, too, was apparatus of other makers, which has been tested to ascertain the advances made by them; it being recognized that brains and progress are not the property of any single manufacturer.

THE SECOND TESTING-ROOM.

Passing from the room in which so much critical examination is conducted for information and direction in perfecting work, we enter the second test-room, wherein fires undergo prolonged testings for heating efficiency, so that, under the fixed conditions imposed by the limits of the apartment, the effects of a certain sized heating stove can be precisely determined. It is a room with a wooden floor and ordinary ceiling, and an open fireplace, in which are stood the fires up for testing. From which, it will be remarked, there is an approximate relationship with an ordinary room, other than the distinction of an absence of furniture. In this room, too, the conditions of the atmosphere during the burning of the stove can be tested. Interesting, however, as they are, we must here leave the new laboratories and their equipment, to carry on the useful and influential work that it is certain will be conducted therein.

A Run Round the Works.

The new laboratories cannot be visited without taking a run round the famous and extensive works in which are produced annually such a multitude of gas-heating appliances of all sizes, for all purposes, and of all forms. An inspection, however hastily made, is a perfect education. A casual question elicits from Mr. Yates the facts that the works of the firm cover some 15 acres, and that in them are employed about 1500 men. The scheme in the laying out of the works and in the conduct of the operations is to avoid as far as possible any article going over the same ground twice—from raw material to the packing and dispatching rooms. The foundry is a busy place; and the vastness of the



Radiator Loop Testing-Shop.

operations will be better appreciated when it is mentioned that it covers no less than 5 acres. The scene is impressive. We go to the railway sidings, and see where the raw material comes in, and is weighed; and the weights taken here are compared with the weights of goods leaving the foundry, so that a running check is maintained that enables judgment as to whether there is any waste of material. The weighing-floor where the raw material is received is also the floor from which the two large cupolas are fed, each of which is equal to a "melt" of 12 tons an hour. On one side of the foundry is the sand house, into which the sand for moulding is delivered by a shoot from the railway waggons. Here five disintegrators are seen for dealing with the sand for the different classes of castings. The elaborate means taken in mixing and drying the sands are of interest; and here, as elsewhere, all the evidences of a belief in the importance of detail on result are witnessed. The power room—containing a steam-engine, Keith compressors, blower arrangements for the cupolas, electric dynamo, &c.—is of interest to the mechanical engineer. The forms of power used in the different operations are steam, hydraulic, pneumatic, and electric—the last-named being for the moulding machines, which are one of the economical attractions of the foundry. The core and pattern-making departments are full of instructive point. From the foundry the castings are sent to the fettling and passing rooms; then into the testing-rooms.



One of the Radiator Store-Rooms.

We cannot go into details; and it would be hardly fair to do so. But, in passing, it may be said it was striking how at every stage in the evolution of the gas stoves and radiators, the most rigorous tests are applied in the workshops to every part, quite distinct from the supervision exercised in the laboratory. For instance, it was noticed that loops of radiators are tested under hydraulic pressure immediately they leave the foundry; and then, when assembled, the completed radiator undergoes still further searching test. In the case of the steam and water radiators, they have to stand (as was seen) a hydraulic test of 120 lbs. per square inch, cold. The machine shop is replete with machine tools of all kinds; and here we get an insight into the perfecting of the production of parts that gives them the necessary exactitude and qualities for interchangeability, and that clean fit and uniformity in diameters that are vital in the production of efficiency. Here there are boring, shaping, drilling, tapping, planing, milling, and other machines—everything being done in jigs, and gauged to ensure absolute accuracy and interchangeability of parts in all stoves of a size. It was noticed that new machinery has been designed by Messrs. Wright themselves for the manufacture of the push nipples for assembling the radiator tubes and boilers. These nipples are of malleable iron and not steel, as with certain waters the life of the latter is so much shorter than the former. By the aid of these machine-surfaced nipples, all the joints are brought securely metal to metal. In passing, it was noticed that the Company make many of the parts and tools required for their machines. The parts of stoves or radiators that are to be enamelled are then sent to the enamelling rooms, and the parts that require to be ground, polished, or plated are forwarded to the respective departments, and subsequently on to the stores, from which they are taken for erection as required. As erected, they are submitted to a final testing before being packed for dispatch or put into store. All the operations were inspected with interest, from the weighing-in of the raw material to the cupolas to the assembling of the parts, the finishing, and the testing, on to the warehousing. The considerable stocks kept (which are necessary for promptly executing the exigent orders of customers, particularly at this season of the year) could not fail to strike one. But, as this is being written, dominating the whole of the impressions gathered during the inspection is the one as to the elaborate precautions that are taken to ensure all mixtures of metals being to the right standard for the various purposes; and the rigorous testing treatment meted out to every

part of the firm's products throughout the various stages of manufacture. The scenes in the foundry and shops all go to compose a striking and fascinating picture of vast change in operations and results; and, in the future, through the new laboratories, there will issue those other refinements that will find expression in the words "greater efficiency," and will enhance the reputation of the firm who have taken this important step of asking from Science additional aid.

GAS ACTS FOR 1909.

[FIFTH ARTICLE.]

By the Prestatyn District Council Act, authorization is given to the purchase (by notice within three months after the passing of the Act) of the private gas-works belonging to Lady M'Laren, from which the urban district is supplied with gas. Failing agreement, the purchase is to be by arbitration, in which event the sale is to be deemed by compulsion. In addition to the sum to be paid to the vendor for the works, her Ladyship is to receive £250 towards the costs and expenses incurred by her in the promotion of a Provisional Order this session, and her opposition to the Bill for this Act so far as it relates to the gas-works. The area of supply is to include the urban district and the parishes of Meliden and Dyserth in the county of Flint. The price to be charged for gas is limited to 5s. 6d. per 1000 cubic feet, which is 6d. less than was named in the Bill. Appended to the ordinary prepayment clause is a provision similar to the one in the Heywood Act:

The Council shall be entitled, if they think fit, to require the deposit of 1s. in each quarter for a prepayment meter, provided that the amount collected from the prepayment meter during such quarter shall be applied in the first place in [to?] refunding the said deposit to the person who has paid the same, and subject thereto the deposit shall belong to the Council. Notice of the effect of this subsection shall be printed on a card to be attached to every prepayment meter.

The standard quality of gas is to be 14 candles, tested by the "Metropolitan" No. 2 burner. The Council are given power to borrow the money required for the purchase of the works, and for the acquisition of land for the extension of the works; for improvement and extension £9100; and further money with the sanction of the Local Government Board. The loan for purchase is to be repaid in 40 years, the money borrowed for land in 60 years, and that borrowed for extensions in 30 years. [Parliamentary Agents: Messrs. Baker and Co.]

The Risca District Council have obtained, in their Act, confirmation to an agreement arrived at in April last (therefore subsequent to the promotion of their Bill) in respect of the transfer of the undertakings of the Western Valleys (Mon.) Water and Gas Company. From the sale of the water and gas works, there are to be excepted cash balances other than consumers' deposits in the Company's hands or in those of their bankers and agents on the day of transfer, all rents and profits and all book and other debts due to the Company, all rates accrued due prior to the day of transfer, and the books and papers relating exclusively to the shareholders in, and the constitution of, the Company. The consideration for the sale of the water and gas concerns is to be the payment by the Council of the sum of £70,000, an amount equal to the actual capital expenditure on proper capital account from Jan. 1, 1909, until the day of transfer, as ascertained by an accountant or valuer nominated by the Council and one nominated by the Company, together with the value of the stocks and stores—the Council taking over all payments in advance or held by the Company in trust for the payment of consumers' accounts, and for laying or constructing mains, pipes, and fittings, and carrying out other works, and belonging to depositors. The limits of gas supply are to be the urban district and a defined part of the urban district of Mynyddislwyn; but the powers in respect of the latter will cease and determine if not exercised within three years. All necessary powers for the conduct of a gas-works are conferred. In dealing in fittings, or in carrying out work in connection therewith, the charges are to be adjusted so as to meet the expenditure; but the provision as to the work being executed through contractors does not appear in the Act. The price of gas is limited to 5s. for a prescribed quality of 14 candles, using the "Metropolitan" No. 2 burner. After the expiration of three years, the Mynyddislwyn District Council may give not less than two years' notice of their desire to purchase such portion of the gas undertaking (including goodwill) of the Council as is contained in their district. The Risca Council are given all the necessary financial powers required. The money borrowed for the purchase is to be paid off in 40 years. [Parliamentary Agents: Messrs. Lees and Co.]

In pursuance of the purchase clause inserted in the Swinton and Mexborough Gas Company's Act last session, the Act now under notice has been passed, constituting a Gas Board, authorizing the transfer to them of the gas-works, and empowering the supply of gas in the Swinton and Mexborough districts and the parish of Adwick-upon-Deane. The Board is to be composed of six members of the Swinton Council and six of the Mexborough Council. Purchase is to be by agreement or arbitration; and all the powers necessary for the conduct of the business are embraced in the Act. The new fittings clause applying to local authorities appears, save the provision as to the work being carried on through contractors. The price of gas is to be limited to

4s. per 1000 cubic feet, for gas of a standard power of 14 candles, tested by the "Metropolitan" No. 2 burner. The Board are authorized to borrow the requisite money for purchase, compensation, and other purposes connected with the transfer; for extension and improvement of the works, such sums as the Local Government Board may sanction; and for the costs incidental to the Act, including £400 part of the taxed costs of the opposition of the Mxborough Council to the Company's Bill of last year. A period of 35 years is given for the repayment of the purchase money. [*Parliamentary Agents: Messrs. Lees and Co.*]

[Two Local Authority Bills containing gas provisions—the Bury and Mountain Ash—remain for notice as soon as prints are available.]

STANDARDIZATION.

THERE was a large attendance at the St. Bride's Institute, E.C., last Wednesday evening, on the occasion of the opening meeting for the present session of the Association of Engineers-in-Charge, whose President, Mr. Henry Adams, delivered his Inaugural Address. This proved to be of a highly acceptable character to his audience; for though it dealt with a single subject, it was a subject of concern for all who are engaged in engineering work, and one which seems to the President to be the keynote of the present age—namely, "Standardization."

The first standard dealt with, as being probably the oldest, was the unit of length; and the members were told that down to 1824 the only legal measure of length was "three barleycorns round and dry make one inch, twelve inches one foot, and three feet one yard." In the year named, Parliament legalized two copies of a yard length which had been marked on a brass rod about eighty years previously by a mechanic named Graham. When the Houses of Parliament were burnt down, these standards were destroyed; but from accurate copies that were in existence, others were made. In form, these are all bronze bars, 1 inch square and 38 inches long. Near the ends of each bar there are two holes, in which are inserted gold plugs, with fine lines engraved upon their surfaces, which lines are exactly a yard apart at a certain stated temperature. The Act legalizing these standards was passed in 1855. The first notable and practically successful effort at standardization, as we now understand it, said the President, occurred when Sir Joseph Whitworth introduced his standard screw threads for bolts and nuts (1841-1857). The formation of the Engineering Standards Committee by the Institution of Civil Engineers in 1901 was the first combined effort at standardization. The main Committee was made up of members connected with various branches; and in addition, twelve Sectional Committees and twenty-four Sub-Committees have up to the present been formed to carry on the work. As a result, much has been done to simplify the work of designing and to aid the manufacturers. The standard specification for portland cement was cited as being of far-reaching importance, and as having done more than anything else to raise the quality of this article; but this, of course, is merely one of a large number of instances quoted to show the excellent character of the work accomplished.

Touching upon the different standards in turn, Mr. Adams came in time to the standard candle, which, he explained, is a sperm candle, six to the pound, $\frac{7}{8}$ inches diameter, and burning at the rate of 120 grains of spermaceti per hour. The Harcourt pentane air-gas flame and the "London" argand No. 1 burner were also described, but mention was not made of the "Metropolitan" No. 2 burner. In France, the President said, the standard illuminant is the Carcel lamp, burning 648 grains of pure oil per hour, and equal to about $7\frac{1}{2}$ candles; while the German (Hefner) standard candle power is only 88 per cent. of the English standard, so that German lamps are rated too high compared with English. On the subject of the suggested use of a body of glowing helium gas as a standard of light—a suggestion which originated with Mr. Nutting, of the Bureau of Standards of the United States—Mr. Adams quoted the particulars from the "Engineering Record," as reproduced in the "JOURNAL" for Sept. 15, 1908 (p. 725).

Referring to the various kinds of horse power that one hears about—indicated, brake, nominal, actual, &c.—the opinion was expressed that it would be an advantage to use the term brake-horse-power alone, as being the actual power the engine can give out. As to the standardization of catalogues (in which direction a certain amount of work has been done), it was suggested by Mr. Adams that the handiest sizes for catalogues and circulars are 8 in. by 5 in., 10 in. by 8 in., and 13 in. by 8 in.—really corresponding with note, letter, and foolscap sizes of writing paper. Other branches touched upon by the President included the proposal for standard notation for algebraic formulæ and the standardization of modes of measurement for builders' quantities. The Quantity Surveyors' Association have issued No. 1 of their "Uniformity of Measurement" pamphlets; and it was after alluding to this that Mr. Adams remarked: "There is every advantage upon the score of uniformity of procedure in producing such works; but the publication of a good text-book in any subject tends to standardize the work in that subject, and to some extent to cramp the minds of the students by giving the impression of finality. Though there are undoubted advantages

in standardization, it chiefly helps the average man, and aids economical production; while the man of intellect is more or less hampered by having a rigid model set up for him beyond which he may not pass. The whole tendency of modern education and official regulation is to make one man as much like another as possible, to stamp out individuality, and to discount common sense. I have had not a little to do with technical education, and in a small way have attempted to stem the tide of the current reliability on rules and formulæ. I have always advised students to try to understand the principles, and then the formulæ would follow of their own accord, without being a burden to the memory."

WAGES AND HOURS OF LABOUR IN 1908.

IF proof were wanting of the fact that 1908 was not so good a year for wage-earners as was 1907, reference might be made to the sixteenth report on wages and hours of labour issued by the Labour Department of the Board of Trade—and which on this occasion bears the signature of Mr. G. R. Askwith. The report gives the result of all the ascertained changes in the rates of wages and hours of labour of an industrial population of nearly 10,000,000—excluding agricultural labourers, seamen, and railway servants—and thus, as the compiler remarks, it constitutes a most valuable record of the fluctuations in the market rate for labour. Were it not for the prevalence in this country of collective bargaining as to wages and hours of labour, the preparation of such statistics as are now before us would be impracticable. Going back to 1896 it is noticeable that there were five years of rising wages, followed by a similar period of falling wages, ending in 1905. Then came 1906 and 1907 when the rise was resumed; and now there is 1908, with a fall again. It seems that the resemblance will be completed; for the first six months of the present year have witnessed a continued fall. Altogether 1,091,586 workpeople are reported to have had their wages changed during the first half of 1909; the net effect of all the changes in that period being a reduction of £67,744 per week.

At the end of 1907, wages stood at a higher level than at the end of any year since 1893, when the statistics as to changes in rates were first systematically collected. During the first two months of 1908, wages continued to rise; the advances, in the majority of cases, being based on prices and conditions which had ruled in the latter part of 1907. Before that time, the depression in trade had fairly set in; and in due course wages naturally followed in the same direction. For the remainder of the year, therefore, the general movement was downwards, though even thus the level remained higher at the end of December than at the end of any of the years from 1893 to 1906. So far as could be ascertained, over 963,000 workpeople (exclusive of agricultural labourers, seamen, and railway servants) had their rates of wages changed during the year. Of these, 119,000 received advances amounting to over £7200 per week, while 464,000 sustained decreases amounting to £66,400 per week. The remainder had upward and downward changes which left their wages at the same level at the end as at the beginning of the year. Thus the net result of all the changes was a decrease of £59,200 per week. This compares with an increase of £201,000 per week the previous year. Of the lucky ones on the present occasion who experienced an increase, practically 50 per cent. were in the employment of public authorities—that is to say, 57,000, out of 119,000; and 52,000 of these were in Government Departments. The textile, printing and allied, and building trades furnished the remainder. The chief sufferers have been those employed in coal mining; their partners in misfortune being persons engaged in other kinds of mining, in engineering and shipbuilding, and in the manufacture of pig iron and iron and steel. Calculating the effect of the changes in 1908 from the date at which they took place to the end of the year, the aggregate decrease in wages due to the changes made is computed at £873,800, as compared with an increase of £5,821,000 in 1907, and one of £1,419,000 in 1906, and decreases of £114,000 in 1905, £938,000 in 1904, and £500,000 in 1903.

In spite of the decrease that has to be recorded when comparing 1908 with 1907, it should be pointed out that at the end of 1908 wages were nearly £408,400 per week higher than at the end of 1895; while at the end of 1907 they were about £467,500 per week higher, 1906 nearly £267,000 per week higher, and 1905 about £209,000 per week higher than at the end of 1895. In fact, the changes in the thirteen years from 1896 to 1908 have resulted in a net rise of wages in each group of trades, except quarrying, which shows a trifling decrease. Of the total gain in this period of £408,400, no less than £218,600 appears to the credit of coal mining; the textile trades coming next with £47,700, then the building trades with £40,500, and the engineering and shipbuilding trades with £35,400.

The proportion of people affected by changes in wages in 1908 was again largest in the coal-mining industry—71.5 per cent. Miners in every coalfield except South Wales had their wages changed, though in Lancashire, Yorkshire, the Midlands, and the Bristol and Radstock districts upward and downward changes resulted in wages being at the same level at the end as at the beginning of the year. In the other districts, there were net decreases. The total number of workpeople in the coal-mining industry for whom changes in wages were reported was 661,750;

the net amount of decrease in their weekly wages being estimated at £47,085. During the past twelve years, the industry has witnessed both rises and falls; but it may be noted that the aggregate amount of the increases has been considerably in excess of the aggregate of the decreases. The districts in which the decreases took place during last year are: Northumberland, 6½ per cent.; Durham, 6½ per cent.; Cumberland, 2½ per cent.; Forest of Dean, 10 per cent.; Fife and Clackmannan, 31¼ per cent.; West Scotland, 31¼ per cent. In a number of districts, advances in wages were given during the first two months of the year, and were retained, or partly retained, until September, when wages were reduced to the same level as at the end of 1907.

In the textile trades in 1908, the changes in rates of wages affected 12,760 workpeople, whose net weekly wages were increased by £1132. There were no general district advances in 1908 such as took place in the three preceding years; and consequently the number of workpeople and the net increase in wages are small when compared with 1905, 1906, and 1907. In the iron mining and quarrying trades, 14,310 workpeople had their wages changed; the net result being a decrease of £2936 per week in the wages of those affected. The metal, engineering, and shipbuilding trades record a decrease of £13,913 per week, affecting 175,908 workpeople, as compared with increases of £9124 per week in 1907, £14,292 per week in 1906, and £677 per week in 1905. It is pointed out that employment in the engineering and shipbuilding trades in 1908 was very bad, even when allowance is made for the great disturbance to these industries caused by the prolonged disputes. The mean percentage of Trade Unionists unemployed in the engineering industry in 1908 was 10·3; and in the shipbuilding industry, 23·2. The corresponding figures for 1907 were 3·8 per cent. and 9·2 per cent. respectively.

The numerous cases of advances to employees of local authorities include 1s. per week to lamplighters at Bradford, making the amount paid 25s. and 26s. a week. Pipelayers in the employ of the Sheffield Corporation Water Department get an increase of 1s. per week to 30s.; and meter-repairers, a similar increase, to 27s. to 39s. per week. Bolton gas-works labourers have gone up ¼d., to 5½d., per hour. In the Birmingham Gas Department, exhaust engine drivers have had an increase of 4d. per shift (to 5s. 4d.); hot patchers, scurfers, and coal-crusher attendants, 6d. per shift (to 5s.); and boiler stokers, 2d. per shift (to 4s. 6d.). A fairly general rise took place in the Nottingham Gas-Works, as the result of which wages of stokers and firemen were brought up to 5s. 8d. per day, coal and coke wheelers to 4s. 8d., pipe-cleaners to 5s. 6d., purifier men to 4s. 8d., sulphate plant men and labourers to 4s. 5d., 4s. 10d., and 5s., other labourers to 4s. 5d., meter-fixers to 7½d. per hour, stove-fixers to 7½d. per hour, and meter-readers to 28s., 30s., 34s., and 40s. per week. As to men in the employ of gas companies, the report does not contain any record of increases in wages having taken place within the period under review.

With reference to the methods by which the changes in wages were arranged last year, 6·5 per cent. were under sliding-scales, against 5 per cent. in 1907; 62·4 per cent. were by conciliation boards, mediation, arbitration, &c., against 58·8 per cent. in 1907, and 37·2 per cent. in 1906; and 31·1 per cent. were by other methods (direct arrangement, negotiation, &c.), against 36·2 per cent. The diminution shown within recent years in the number of persons whose wages were regulated by sliding-scales is almost entirely accounted for by alteration in the method of arranging the changes in rates of wages of the South Wales coal miners. The increase in the numbers included under conciliation, arbitration, &c., in the last two years is mainly owing to the fact that coal miners in the Federated Districts (Lancashire, Yorkshire, the Midlands, North Wales, &c.) had changes in wages in those years; whereas no general change in these districts took place in 1906. It is pleasing to note that, as in previous years, the number of persons whose changes in wages were preceded by a stoppage of work formed only a small fraction (1·9 per cent.) of the whole. In this calculation, however, no account is taken of strikes for increased wages that failed, or of threatened strikes or lock-outs that may have influenced the changes in wages made.

Changes in hours of labour recorded (which do not include temporary alterations in the working hours owing to changes in the state of trade) affected 26,541 workpeople, of whom 3349 had their aggregate working time increased by 5686 hours per week, and 23,192 had reductions amounting to 44,109 hours per week. The net effect of all the changes was a reduction of 38,423 hours in the weekly working time of the people affected. In every year since 1898, there has been a large net reduction in the hours per week of the persons affected by such changes.

A Large Pumping-Engine.—According to a communication from New York in the Engineering Supplement to "The Times," the City of Wheeling, West Virginia, is to instal what is probably the largest city pumping-engine in the world; its capacity being 20 million gallons a day. The engine, which is now under construction at the West Allis works of the Allis-Chalmers Company, Milwaukee, will be the builders' standard triple-expansion crank and fly-wheel type. The low-pressure cylinder will be 110 inches diameter with a 72-inch stroke. The two fly-wheels will be 20 feet diameter, and each will weigh 100,000 lbs. The total weight of the engine will be close upon 9100 tons, and it will have the above-named capacity when pumping against the regular domestic water supply pressure of 150 lbs.

SHORT STRIKE AT THE MILAN GAS-WORKS.

The City in Darkness.

ANOTHER of those short and futile disputes with which one has become familiar between the Milan gas workers and the Directors of the Union des Gaz Company broke out on Saturday, the 9th inst. At noon on that day, so we learn from the Italian newspapers, 350 stokers and labourers at the San Celso station struck work. It seems that since the beginning of the present month the men's Union, which concerns not only the Milan works of the Union des Gaz Company, but also their Genoa, Lampierdarena, Alessandria, and Modena stations, has been occupied with a question involving increases of wages to certain classes of operatives—labourers and lads. Their demands, made without the Trade Union support, were refused by the Directors, and a strike ensued. It was evidently precipitated, however, without the approval of the Gas Workers' Union; for the delegates of it discountenanced the men's refusal to work, and endeavoured to settle the dispute. They regarded the cessation from work as ill-advised and inopportune. The result was, none the less, according to "Il Secolo," that some streets and houses in Milan were in darkness on the night of Sunday, the 10th inst. In making this comment, the paper in question does not understand what a big drain on the store of gas Saturday's consumption would represent, while no gas was being made; and, though work might be resumed the very next day, the neglect of the fires that there would be at the time of a sudden strike, and the stoppage of the whole of the retort-house work, would render it impossible to have gas making again up to the normal immediately on the resumption of work. In the evening of Sunday, the men held a meeting to discuss the situation, and to consider a new general memorial which it is proposed to send to the Directors of the Company. The meeting was an exciting, noisy, and divided one. The Union leaders were against the small band of strikers, who desired an increase of 25 per cent. in the present pay of the labourers, who receive from 3·30 to 4 lire per day—not against them on the merits of their demand, but as to the advisability of the tactics pursued. After several had spoken, a resolution was passed strongly appealing to the strikers to resume work, and undertaking to support their special demands in the general memorial which will be submitted to the Directors as soon as possible.

The following account of the occurrence, which shows that there is still uneasiness and dissatisfaction among the workmen of the Union des Gaz Company, is translated from the "Corriere della Sera" for the 10th inst.

As is generally known, the employees of the "Union des Gaz," not only in Milan, but in the other Italian towns served by the Company, went on strike about two years ago; but the trouble ended after four days. The Company granted an increase of 10 per cent. on all the wages, and a Committee was appointed to consider and determine the condition of work, and settle the various questions which were the indirect cause of the strike. This Committee, of which Signor Giachi is the Chairman, have not yet completed their investigation. They settled several of the most important questions submitted to them, but were not able to come to a decision with reference to the modifications to be made in the regulations. Last month the retort-house men presented a memorial requesting an increase of wages; but the Federation of Gas Workers intervened, as they considered that the retort-house staff had no right to, and indeed could not, act alone. They submitted that the requests put forward by the men should have been considered by the Federation, and included in the general memorial which was being prepared for presentation to the Directors. The preparation of the memorial was not completed till early this month, and the men were summoned to a meeting called for the 9th inst., when they were to be informed of the improved conditions of work which the memorial would put forward on their behalf.

Under these circumstances, it is difficult to state the reasons for the recent strike, which did not spread beyond the San Celso works. Some of the men gave as the cause of their protest the fact that a truck loaded with beds and crockery was taken into the works, evidently, as they asserted, for the purpose of lodging and accommodating stokers and other workmen obtained from abroad so as to be ready in the eventuality of a strike. This was stated to have exasperated this section of the men, who, having last month presented a memorial, considered that the delay caused by the Federation was to their detriment. The "Corriere della Sera" has reason for thinking that the real cause of the strike was quite a different one. It is alleged that the retort-house men, in their memorial, made absolutely exorbitant demands for more wages and less work, and they were not accepted by the Federation, on the ground that one section of the gas workers had no right to advocate for themselves the greatest part of the increases demanded. This, it is said, was the cause of great irritation to the retort-house men, who, being the better paid, are the most exacting and violent, as was shown on the occasion of the last strike. They consider themselves indispensable, as the working of the retorts is in their hands. At all events, they gave to the Directors of the Company as the cause of their sudden strike (which was disapproved by the rest of the staff) the request for an increase of wages contained in their memorial, which was considered as withdrawn. However, as already mentioned, the strike was limited to the San Celso works.

Both the leaders of the Federation and the men's Vigilance Committee did all they could to persuade the strikers to go back to work. But it was useless; and during the whole of Saturday the settings remained idle. Unfortunately, the effects of this suspension were felt in the city; and at dinner time there was no supply of gas for cooking. The lighting of the public lamps and in the shops also showed that the pressure was inadequate. This economy was probably resorted to in order that the stock of gas in the holders might last as long as possible;

but it was severely commented upon by the inhabitants of the city, who expressed regret that a short supply of gas should be felt after only half-a-day's suspension of work. It may be easily understood that the strike, suddenly decided upon, without any consideration for the interests of the citizens, made a very bad impression.

The meeting of the Federation called for the 9th inst. to consider the further memorial to be sent to the Company in the interest of the gas workers in Milan, Genoa, Alessandria, and Modena, occupied themselves first of all with this unexpected question of the partial strike of the men at San Celso begun in the morning. There were upwards of 1000 men in attendance, including several representatives from the Genoa works and some of the strikers. The Chairman (Signor Spira) opened the proceedings by exhorting those present to be calm. The Secretary gave an account of the agitation on the part of the stokers and labourers, and pointed out that their action was most unwise; the Federation having undertaken to include in the new memorial all their requirements. The strike had, he said, come suddenly to mar the long and difficult efforts made by the Federation to obtain a general improvement in the conditions of labour. Three courses were open to them: (1) To support the strikers by insisting on the demands in their special memorial; (2) to support them by including their demands in the general memorial, provided they withdrew theirs; and (3) to leave them to themselves. One delegate from Genoa said he was prepared to vote for any proposal which the meeting considered the best; but another from the same place submitted that if the strikers did not abide by the decision of the Federation they should be left to themselves. Another speaker supported the leaders of the Federation, and condemned the strike, as the unconsidered decision of a hundred men might, he said, endanger the result of the agitation now in progress for the benefit of thousands. He strongly advised the strikers to go back to work. After some further remarks, one of the strikers, speaking in the name of his colleagues, said they were ready to resume work provided the Federation undertook to present the general memorial by the following Monday; and should a favourable reply not be received within five days, a strike to be decided upon. The Secretary of the Federation, however, refused to accept a limitation of time—the final decision depending, he said, on many questions.

In the result, the following resolution was adopted unanimously: "This meeting of the gas workers in reference to the strike of the labourers appeals to the discipline of the strikers, requests them to go back to work, and assures them that their demands will be supported in the general memorial, which will be presented as soon as possible." At the request of the Secretary, the strikers present declared themselves willing to go back to work, and stated that they hoped their colleagues would do the same.

Monazite Deposits in Brazil.

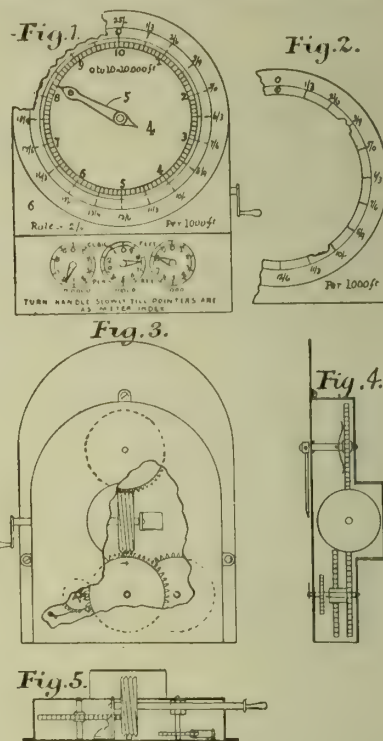
The British Consul in Brazil says in his annual report, which has just been issued by the Foreign Office, that as regards monazite, the Bahia and Espirito Santo deposits continue to be worked by concessionaires who ship their product to Hamburg, where it is bought on the basis of its thorium content. These deposits furnish practically the entire supply. Other deposits, however, are known to exist, some of which appear to be worth careful examination. Further prospecting shows that monazite is a mineral of fairly wide distribution in Brazil. It occurs over a wide area embracing the south and east of Minas and the State of Rio de Janeiro. It is usually found in the rolled gravels of the flat valleys locally known as "vargens," which are the beds of ancient lakes in which a natural concentration process, extending over vast periods of time, has resulted in the removal, by attrition and hydraulic concentration, of the lighter constituents of the granite rocks. There, as in the United States, the monazite appears always to accompany one variety of mica; and where the rocks change their character, with the disappearance of the mica the monazite disappears also. Owing to the much less energetic washing and attrition to which these hill-gravels have been subjected, the proportion of hard and heavy minerals is far lower than on the seashore. Few "vargens" show more than a proportion of 1 per 1000 (1 kilo. per cubic metre) of the mineral, and this is often mixed with garnet and ilmenite, or titaniferous iron sand; so that a process of magnetic separation is necessary to remove these accompanying minerals. However, some deposits are reported to exist in which the proportion of monazite is much higher.

Scottish Junior Gas Association (Western District).—The opening meeting of the Western District Division of the Association for the sixth session will be held in the Glasgow and West of Scotland Technical College, George Street, Glasgow, next Saturday evening. The President (Mr. D. Currie, of Stirling) will deliver an address entitled "Notes on the Valuation and Selection of Gas Coals," which will be open to discussion.

Artesian Borings for Water.—In the "JOURNAL" for the 5th inst. (p. 20), reference was made to the successful artesian boring at the works of Messrs. Horlick at Slough. An important point in connection with this borehole is that it is the first to be successful in tapping a supply of water from the lower greensand formation. At least four boreholes had previously been carried down to great depths in the London basin, in attempts to tap the water in the formation named, but without success. These attempts were made at the following places: Messrs. Meux's Brewery, Tottenham Court Road, depth 1144 feet; Crossness, Southern Outfall Works, depth 1060 feet; Richmond Water-Works, depth 1447 feet; Kentish Town Water-Works, depth 1302 feet.

COX'S PORTABLE INDEX READER.

IT may be remembered that in the "JOURNAL" for the 26th of January last some new ideas on the subject of gas consumers and their accounts advanced by Mr. G. J. Cox, of the Metropolitan Gas Company of Melbourne, were published. In putting them into practice, the necessity for adding certain mechanism to consumers' meters was evident. In order to obviate this, Mr. Cox has now provided, as a portable apparatus, substantially as shown in the accompanying diagrams, the extra mechanism necessary to carry out a concurrent system of index reading.



In the form shown, a series of imitation index pointers and a consumption indicator derive their movements from a worm-gear wheel, which is either actuated by fingers direct, or by the handle shown or else some equivalent. Owing to the small amount of gearing required to do what is necessary, the position of the index pointers would easily be altered by an accidental touch, if driven by a tandem train; but by using the worm, the wheel train and correlative pointers are locked in position so long as the worm is not purposely turned. The consumption indicator is fast on its arbor, and is driven by a spring friction-clutch acting against the 60-tooth free running wheel, as such wheel is driven by the worm. The consumption indicator can therefore be set at zero on its dial scale, as may be necessary, without in any way interfering with the position of the index pointers below. The worm also drives the 60-tooth wheel and the usual conjoined 6-tooth meter index pinion of the thousands pointer of the imitation index, and such wheel and pinion drive respectively the adjoining hundreds and ten thousands pointers. A ratchet-wheel and spring are preferably carried on the arbor of the hundreds pointer, to prevent the index being turned in the wrong direction; and a sealed stop action may be applied, if desirable, to arrest the index gearing when the index registering capacity is exhausted. Consequently, the pointers cannot start a new cycle of indications unless the seal is broken. The permanent characters on the enamel (or substitute) consumption dial face may include the cash value indicators, as the intact portion of the dial face shows in fig. 1. But, in order to allow for a change of rate, Mr. Cox prefers to confine the permanent characters on the dial face to the portion that is limited by the mutilated part of the face, and to provide a paper or thin metal portion, somewhat as shown in fig. 2, as a separate instalment of the dial carrying the sequence of cash values, which would either be clipped or pasted on the dial-plate outer edge, and appear as shown complete in fig. 1. The details of the arrangement are shown in figs. 3, 4, and 5.

To carry into practice the idea of concurrent indicating with the modified arrangements, as now devised, the consumers concerned would each be provided with the device just described, and with a supply of cards bearing the necessary office memoranda and pointerless dial diagrams, on which, at the time appointed, the consumer endorses the positions of the respective complementary pointers of his meter index. When commencing operations, each consumer, on the pre-arranged date, would set his imitation index to coincide with his actual meter index, and then set the consumption indicator to zero; or, if preferred, an inspector could start these operations for the consumer by setting the index apparatus from the last reading recorded. On the first subsequent date fixed for the account-determining period, and thereafter on such dates as he may be directed, the consumer would

turn his index forward till it again coincided with the actual meter register, and the consumption indicator would then automatically point to the quantity of gas consumed and to its cash value. The consumer concerned would duly endorse on the dial diagrams provided on the card all the data required to form and show a diagrammatic reading of his meter index for the use of the supplying body, and to show his consumption and his liability for himself, after which he would proceed to reset the consumption indicator to zero, but without interfering with the index portion of the apparatus. Other details would be more or less as suggested in the article on this subject which has already appeared.

This arrangement of portable apparatus, besides dispensing with the necessity for disturbing the meters, enables the responsible consumer to keep the apparatus from interference by irresponsible persons. There is, of course, nothing to prevent a consumer setting the index of his apparatus to coincide with his meter index daily, or as often as he may desire, and so keep the progress of his gas consumption under close observation by means of the consumption indicator. Apart from the matter of concurrent indicating, Mr. Cox considers that such a device as the one described would become a very popular article of sale among gas consumers generally, for their own purposes.

HUMPHREY'S INTERNAL-COMBUSTION PUMP.

IN the "JOURNAL" for the 20th of April, an abstract was given of a paper submitted to the Institution of Electrical Engineers by Messrs. Leonard Andrews and Reginald Porter on "The Use of Large Gas-Engines for Generating Electric Power."

In the discussion on the paper, Mr. H. A. Humphrey, whose contributions to gas-engine literature have been noticed from time to time in our columns, referred casually to a type of prime mover which he had devised, as the result of a long series of experiments. Pending a fuller description of the motor which we hope to give in an early issue, it may be mentioned that it is a complete novelty, and embodies the idea of converting the energy of gas explosions into water power, and utilizing this by suitable turbine apparatus. The new pump, which is the subject of an illustrated article in the current number of "Engineering," has recently been officially tested at Dudley Port by Professor W. Cawthorne Unwin, F.R.S., whose report has been forwarded to us by Mr. Humphrey; and we extract therefrom the following comparison of the new pump with a gas-engine driving a centrifugal pump: "Suppose a gas-engine driving a centrifugal pump required to do 16 P.H.P., on a lift of 33 feet, or the same work as the Humphrey gas-pump tested. On such a lift, the efficiency of the centrifugal pump would certainly not exceed two-thirds, and might be rather less. Hence the gas-engine would have to supply in normal working 24 B.H.P. at the pump-shaft. Gas-engines will not work with an overload, and to be safe, it would be desirable and usual to have a gas-engine of 32 H.P. (maximum), which in normal work, supposing the efficiency of the pump to be as assumed, would develop three-quarters of maximum power. So working, it would require 80 to 85 cubic feet per hour of gas of the quality used in the preceding trials for each brake horse power. Hence, it would require 80×24 to 85×24 , or 1920 to 2040 cubic feet per hour. The comparison therefore stands thus: Gas-engine and centrifugal pump 120 to 127 cubic feet of gas per P.H.P. hour; Humphrey gas-pump, 83.1 cubic feet of gas per P.H.P. hour. Working with less load, the comparison would probably be more favourable to the Humphrey pump, because as the lift decreased, the efficiency of both the gas-engine and the centrifugal pump would diminish."

Manchester District Institution of Gas Engineers.

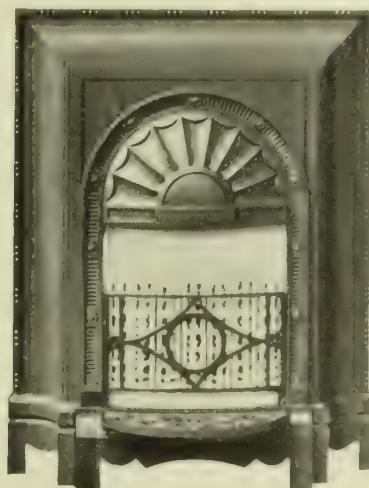
It may be remembered that at the annual meeting of the Institution held in February, the President (Mr. J. W. Morrison) gave the members a cordial invitation to visit Sheffield at the October meeting. In view, however, of the great interest now being taken in the question of carbonization, and as the President has recently visited St. Helens to inspect the installation of vertical retorts there, he is of opinion that it would be more interesting to the members for the meeting to be held in that town instead of in Sheffield. In compliance with his wishes, and with the permission of Mr. S. Glover, the Corporation Gas Engineer, the Committee have arranged for the 157th general meeting to be held at St. Helens, on Saturday, the 30th inst. The Mayor (Mr. A. J. Foote) has placed rooms in the Town Hall at the disposal of the Institution for the meeting; and the members are invited to luncheon by the Chairman and Directors of the Sheffield Gas Company, and to tea by Mr. Glover. With regard to the business, we learn from the programme issued by the Hon. Secretary (Mr. W. Whatmough, of Heywood), that the members will assemble at the St. Helens Gas-Works just before midday for the inspection of the Glover and West vertical retorts, a description of which was given in the "JOURNAL" for the 8th of June (p. 632); and after luncheon the business on the agenda will be disposed of. The principal items are a discussion on the paper on "The Slot-Meter System," read by Mr. E. A. Harman, of Huddersfield, at the May meeting, and a paper on "The Vertical Retorts at St. Helens," by Mr. S. Glover. The meeting promises to be a most interesting and instructive one.

NOVELTIES BY R. & A. MAIN.

A New Interior Fire.

It is always a pleasure to be able to draw attention to novelties in connection with apparatus for gas utilization; and, owing to the enterprise of the manufacturers, it must be admitted that opportunities for this indulgence are not lacking. Many designs of gas-heating appliances for the forthcoming season have already been described and illustrated in the "JOURNAL;" and this week we are in a position to refer to some new goods that are being marketed by Messrs. R. & A. Main, Limited.

In the first place, it may be remarked that Messrs. Main have brought out several new designs of fires, one of which, the "Gainsborough," is illustrated below. This is a neat looking fire of the Colonial Adam style which would be suitable for practically any position; and, as will be seen, it embodies the latest principles of up-to-date gas-stove construction. It is fitted with shallow brick; and the fire-bars are so constructed as to minimize obstruction to the radiation of heat. Gas and air adjusters are fitted; and both the burner and brick are removable. A feature of this, and other of Messrs. Main's fires, is the new fuel which has



The "Gainsborough" Gas-Fire.

been evolved by the firm as the outcome of long experience, and which they believe to be the best possible type for shallow fires. The advantages they put forward for it are that it looks well; it has a bright, cheerful, red appearance when the gas is lit; it is neither too light nor too heavy; it has not that monotonous look common to most gas-fires; and it gives splendid radiating results for a small gas consumption. In the centre of the fuel there is a little solid needle part, which heats up and spreads the flame to the outside of the fuel; and it is this which the firm point to as the secret of success.

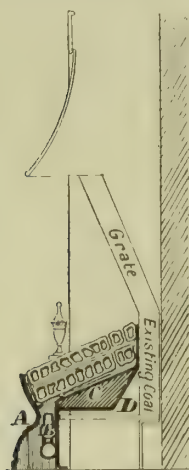
A difficulty that is frequently experienced by gas undertakings is a disinclination on the part of would-be consumers for heating purposes to have their ordinary coal-fire grates interfered with; and this, of course, is a trouble that one is particularly liable to encounter in cases where the existing fittings happen to be of a



The "St. Nicholas" Interior Fire—Front View.

particularly handsome and appropriate character for the rooms in which they are placed. Equally suitable types of gas-fires could, no doubt, be introduced; but, even so, the consumer often cannot be induced to "take the plunge." To meet such cases as these, there have for a long time past been on the market various designs of gas-fires for introduction into coal-grates; and now

Messrs. Main have added to the number one which is very simple, effective, and inexpensive. The illustrations show the means that have been adopted to secure this combination of advantages in the



Section of St. Nicholas Fire.

A. Combined Front Bar and Fender. B. Removable Burner. C. Fire Brick. D. Back Frame Plate.

18 inches. To show that appreciation at the hands of the public, it is merely necessary to remark that, in the course of a couple of days at the Dundee Gas Exhibition (an account of which appeared in last week's issue), over a hundred orders were secured.

The last innovation to which reference will be made in the present article is in connection with the "St. Magnus" gas-heated steam-radiators. Messrs. Main, feeling that there was a difficulty

in ensuring satisfactory action with the ordinary type of valve fitted in gas-steam radiators, have been experimenting for the past two years with a view to securing a more reliable type of reducing valve. In the new patent valve which is now fitted to these gas-radiators, they claim that they have succeeded in effecting a very decided improvement, inasmuch as it absolutely ensures the



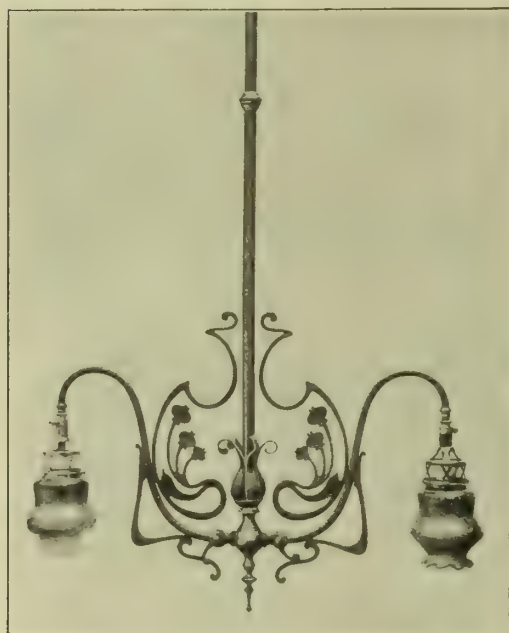
"St. Magnus" Gas-Steam Radiator, with New Patent Valve.

reduction of the gas supply as the steam pressure rises. The radiators themselves, it may be pointed out, are made in three different sizes, and are mounted on cast-iron bases.

WILLEY AND CO.'S NEW GAS-FITTINGS.

In continuation of the notices which appeared last week of new designs in gas-fittings, reference may be made to the excellent assortment of articles of this character which Messrs. Willey and Co., Limited, of London and Exeter, have brought out—most of

which can be seen at the show-rooms of their London Offices, No. 18, Adam Street, Adelphi, W.C. It is only possible to give a few illustrations of the many attractive patterns that the firm stock; but these are fairly representative ones. The first is an elegant and artistic two-light pendant, which is claimed to be quite a new departure in design—all the scrolls being cast brass, and not stamped. Another tasteful line is the cylinder inverted



Two-Light Pendant.



Cylinder Inverted Hall Lamp.



Reversible Harp Pendant.

hall-lamp, with a satin finish frosted glass, 10 in. by 5½ in. There are three ornamental wreaths supporting the glass, which greatly add to the appearance of the fitting. Reversible fittings, for use with either upright or inverted burners, are heard a good deal of now-a-days; and the harp pendant of this nature which is illustrated is worthy to take its place among the best of them.

The festoon of cast brass with which it is decorated gives it a very desirable look. Among the firm's goods which are not here shown, a word must be spared for some new tastefully designed inverted brackets, with stamped scrolls and back. These fittings look extremely well when provided with suitable glass or beaded shades.

We are reminded of the approaching close of the year by the arrival of the first of the new diaries usually received about this season. It is the "Mechanical World" Pocket Diary and Year Book, which has now reached the twenty-third year of publication. A large number of improvements have been effected in it, and a considerable amount of new matter has been introduced.

The section on "Gas-Engines" has been thoroughly revised by Mr. W. A. Tookey, who has supplied an entirely new section on "Oil-Engines," including some notes on engines worked with crude oil. The rest of the matter consists of useful engineering notes, rules, tables, and data. The book is published by Emmott and Co., of 65, King Street, Manchester, price 6d. net.

MECHANICAL CHARGING OF GAS-RETORTS.

In the "JOURNAL" for the 5th inst., we gave a translation of the principal portions of the specification of a French patent taken out by Messrs. Robert Dempster and Sons, Limited, for a system of charging vertical retorts. The English specification was published shortly afterwards, and was briefly noticed in the "Register of Patents" last week. The firm have also patented an appliance for use with the system already described; and the following particulars as to it are translated from the French specification.

According to the present invention, it is proposed to feed the

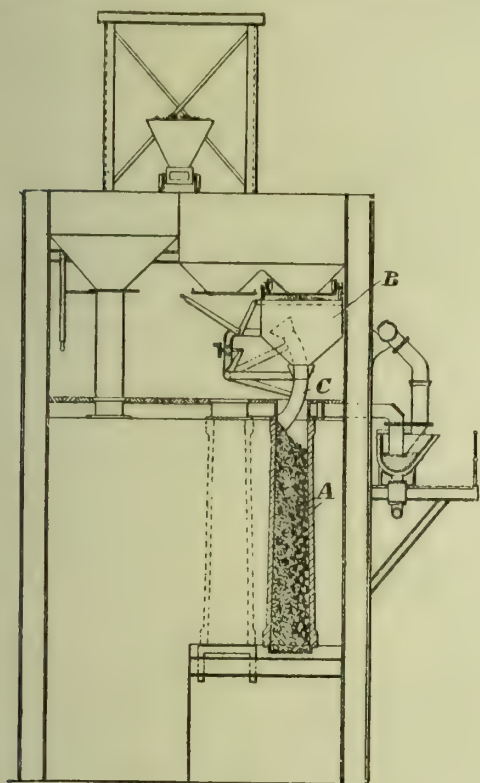


Fig. 1.

coal from a movable hopper, truck, conveyor, or other device, to the retorts, through a movable shoot running a certain distance into the mouth of the retort. When this is filled to the level where the coal reaches and closes the lower opening of the shoot, the column of falling coal is checked until the shoot is raised. This cuts off the supply of coal; and when the shoot is raised, it discharges itself into the retort to complete the charge. When the coal is introduced on one side of the retort, as described in the specification of the previous patent, the lower opening of the shoot can be inclined during charging at an angle proportionate to the axis of the retort; and the shoot in rising delivers, in the part of the retort not previously filled, the small amount of coal left in the shoot, the capacity of which is such that this quantity can be regulated according to requirements. Thus a retort cannot be under or over filled; the charge being automatically regulated according to its capacity. The importance of this will be evident, because it is perfectly well known that a retort incrusts by a deposit of carbon will hold much less coal than when it is clean—that is to say, just after it has been scurfed.

Various methods of applying the invention are shown in the accompanying diagrams. Fig. 1 is a section of a bench of retorts above which there is a hopper combined with a shoot or automatic measuring trough; fig. 2, a diagram showing the working of an inclined shoot in place of the curved one represented in fig. 1; fig. 3, a sectional elevation showing the working of a straight shoot moving vertically; and fig. 4, an elevation, perpendicular to fig. 3, the coke-hopper being removed.

In fig. 1, A is the retort being filled, and B the hopper, furnished with wheels, and running on rails. A curved shoot C is supported by an arm engaging with, or fixed to, the boss of a lever hinged on a screw worked by a hand wheel; the screw and arms being supported by a bracket on the hopper. The top of the shoot is in the form of a bell, or is provided on three sides with a bell-mouthed funnel; the remaining side being intended to receive the coal from an opening at the bottom of the hopper. By turning the wheel, the lever is pulled to the left, so as to raise the shoot, which works against the flat side of the hopper to take the position marked in dotted lines—the shoot thus forming the outlet of the hopper, and cutting off the entrance of coal; whereas during this ascending motion the small amount of coal in the shoot is distributed on the sloping coal, so as to make the heap about level at the top of the retort.

In the varied form of the appliance represented in fig. 2, an inclined shoot receives (when in the position shown by the full lines) coal through the opening D in the hopper. When the retort is filled to the mouth of the shoot, the fall of coal ceases; and when the shoot is moved back into the position shown by the dotted lines, it acts like a sliding door to close the opening D, while the coal in the hopper falls into the retort and completes the charge.

In figs. 3 and 4, the hopper for charging the retort can be fed

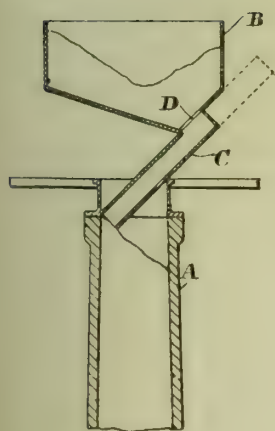


Fig. 2.

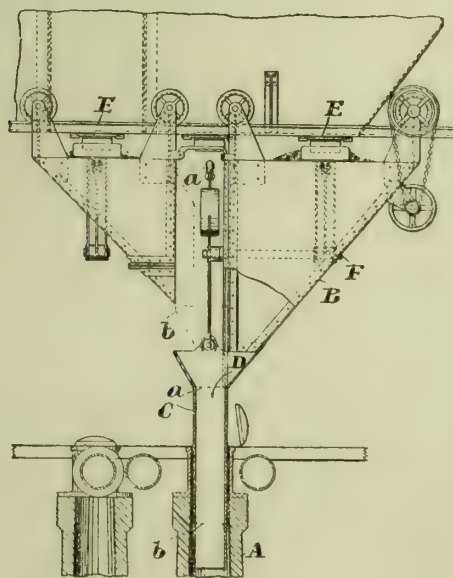


Fig. 3.

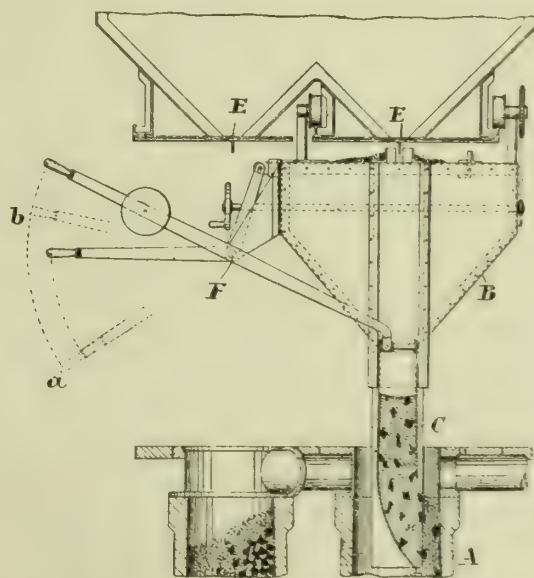


Fig. 4.

Dempster and Sons' Mechanical Retort Charger.

from continuous coal-bunkers through sliding doors E worked by catches on a sliding bar movable backwards and forwards by a bent lever fixed on the shaft or journal F. A separate coke-hopper, which can be fed with coke in a similar manner from the compartments formed in the coal-bunks, to store the coke or breeze, is coupled with the coal-hopper by a hook, or the two hoppers can be made in one piece or can work independently. They are mounted on wheels running on rails; and a chain worked by a wheel assures accurate adjustment. The straight shoot works in guides on the flat side of the hopper, and can be raised and lowered by working the weighted lever shown. The shoot is represented by full lines in its extreme lower position, while the dotted lines *aa* in fig. 3 show the height to which the top and bottom of the shoot are raised when the hopper is moved, and the lines

bb its height when it receives coke from the hopper. The same letters in fig. 4 show the corresponding positions of the lever. The hopper has an inclined prolongation which meets the top of the shoot when in its lower position; the coal being then able to fall freely on the inclined plane to run through the opening D into the shoot; but the side opposite the shoot runs outwards and upwards to a height approximately the same as that of the top of the opening D, in order to prevent the coal running out of the shoot.

At the commencement of charging the retort, the shoot C is lowered from the position *a* to *b*; the back of the shoot continuing to close the opening D. The slide is drawn out so as to allow a sufficient quantity of coke to run down the inclined plane into the shoot, and thence into the retort. The slide being then shut,

the shoot is lowered into the position indicated by the full lines, and begins to fill with coal from the opening D. When the retort is full to the mouth of the shoot, the coal ceases to fall into it. The shoot is then drawn out of the retort, and closes the opening D, the coal in the shoot falling into the retort to complete the charge. The space between the shoot in its raised position and the mouth of the retort can be made adequate to allow of the retort-lid being closed before moving the hopper. The door E is then shut. If the hopper contains sufficient coal to fill the retort immediately following, another door in the bunk need not be opened before the hopper reaches the last retort but one; and so on alternately. In fig. 4, the under part of the shoot is represented arched, so as to drive the coal to one side; but this shape, though advantageous for other reasons, is not at all essential in the present invention. By varying the length or downward course of the shoot, the retort can be filled to any previously determined level—i.e., to the top, or nearly the top, so as to permit of the regulation as required of the empty space shown.

The method of charging here described, though more especially intended for application to vertical retorts, can be utilized perfectly well for inclined or other retorts.

GAS FOR BALLOONS.

A recent number of the "Journal für Gasbeleuchtung" contains a letter from Dr. W. von Oechelhaeuser, the Managing-Director of the German Continental Gas Company, with reference to experiments which have been made by his Company on the manufacture of a special gas for balloons. Herr von Oechelhaeuser presented a preliminary paper on the subject at the Aeronautical Congress which was held at Frankfort-on-the-Maine on the 18th ult.; and he promises to make a more exhaustive communication as soon as the experiments have been completed and the details of the process can be published—which he hopes will be in the course of a few months.

Meantime, he reports that the experiments have shown that a gas of about 0.225 specific gravity may be produced on a working scale in vertical retorts by the decomposition of ordinary coal gas. This gas would have a lifting power of about 62 lbs. per 1000 cubic feet; whereas some hydrogen plants will produce gas with a lifting power of about 74 lbs., while the coal gas used at Berlin and Zürich for the Gordon-Bennett competitions had a specific gravity of 0.4, corresponding to a lifting power of about 48 lbs. per 1000 cubic feet. On the other hand, the rules of the International Aeronautical Association assume a lifting power of 43.7 lbs. for coal gas, which corresponds to a specific gravity of 0.44. So high a specific gravity will, Dr. von Oechelhaeuser observes, only be found in the gas made at works where water gas is mixed with the coal gas, or where coals of very recent formation are carbonized. It appears that the lifting power of the new balloon gas is to that of hydrogen as 1000 is to 1050, if the officially assumed value is taken for hydrogen. A balloon of 35,000 cubic feet capacity will carry 660 lbs. more weight if filled with the new gas than if filled with ordinary coal gas—that is, the volume of the balloon may be reduced by 30 per cent. for the same load. The new gas contains over 80 per cent. of hydrogen, and the proportion of methane—the most difficult to decompose of the compounds in coal gas—is reduced to 5 to 7 per cent.

The scientific facts relating to the decomposition of coal gas by great heat, on which the process of manufacture of the gas is based, have been known for a long time. They were stated about 20 years ago by Professor Bunte. But the difficulties of the practical manufacture of such an attenuated gas are greater than would be anticipated from a knowledge of the scientific facts. The object has been to produce the gas in the ordinary course of gas manufacture with the same settings as are used on the gas-works. Vertical retorts have therefore naturally been employed for the experiments at the Dessau works; and it will not be known until the experiments have been carried further whether the process can be worked with horizontal and inclined retorts.

Dr. von Oechelhaeuser propounded at the meeting of aeronauts at Frankfort a scheme to assist aerial travellers to locate their position, consisting in inscribing on the upper surface of the crowns of gasholders either the names of the towns in which they were situated, or, perhaps preferably, numbers or signs conforming to an internationally accepted code. The large area of gasholders, and their high and conspicuous position, rendered them, he said, eminently suitable for such a scheme; and the signs could readily be illuminated if necessary.

Midland Association of Gas Managers.—The autumn general meeting of the Association will be held, as already briefly announced, at the Grand Hotel, Birmingham, next Thursday, under the presidency of Mr. W. Langford, of Longton. According to the agenda issued by the Hon. Secretary (Mr. Harold E. Copp, of West Bromwich), there will be a discussion on the revision of the rules, a paper on "Gas-Works Rate and Income-Tax Assessments," by Mr. George Helps, of Nuneaton, and another on "Some Aspects of Recent Competition," by Mr. W. J. Rendell Baker, of Malvern. The office-bearers for the ensuing year have been elected; and their names will be announced at the meeting.

YORKSHIRE JUNIOR GAS ASSOCIATION.

With every sign of vigour and sustained interest, the Yorkshire Junior Gas Association entered upon its seventh session at the annual meeting held on Saturday at the Leeds University. The attendance was large, the members enthusiastic and glad once more to meet after the summer recess, and the occasion one that will long be remembered with special satisfaction.

Mr. H. BUTTERFIELD, the retiring President, took the chair at the onset. He congratulated the members on the work of the Association during the past year, and on its present position. He was perhaps not so enterprising as their President should be, and certainly not one naturally at ease in a prominent situation, or in one necessitating much speaking or the assuming of public responsibilities. So they would not be surprised to hear him say he was not unwilling—nay, even glad—to lay down the honours of the position which their votes had called upon him to fill. He had, nevertheless, enjoyed the past year's work, and was desirous of bearing testimony to the willing and ample support given to him by his colleagues. He had had to face some strong criticism during the past year, notably in connection with his presidential address, and had been kept from some of the meetings owing to an accident that befell him in the spring; but he hoped that even his imperfections would make the way none the less easy for his successor, who would, even by contrast, shine the more.

The SECRETARY (Mr. C. T. B. Roper, of Bradford), presented his report of the year's work; and it was adopted.

The retiring President then formally installed his successor, Mr. STEPHEN W. SHEPHERD, the Manager of the Bradford Corporation Chemical Works at Frizinghall, who gratefully acknowledged the cordial welcome extended by the assembled members and the graceful eulogy of his predecessor. He said he was too modest to claim any special virtues that would justify his selection, and looked upon it rather as a claim on future service than as a reward for past work. He recognized the honourable traditions of his office, and said he would endeavour to live up to them. He begged the members to be to his faults "a little blind" and to his virtues "very kind."

A vote of thanks to the retiring officials was passed after short speeches by Messrs. FELL and M'NAB, and responded to by Mr. BUTTERFIELD.

Mr. J. TAYLOR (of Mossley), the President of the Manchester and District Junior Gas Association, was then introduced to the members. He conveyed to them the cordial greetings and good wishes of his Association, and congratulated them on their sustained vigour and good work. He said he was delighted to see so large a gathering at their business meeting, from which he could realize their interest in, and devotion to, their Association. He trusted the two Associations—so nearly related, and with so many interests in common—would continue to prosper and to co-operate harmoniously. He extended, in his representative capacity, the heartiest good wishes to their newly-installed President.

A final vote of thanks expressed the Association's gratitude to the University authorities for their kindness in granting the use of their rooms for the meeting and lecture.

The ballot for officers resulted in the following elections:—

President.—Mr. S. W. Shepherd, of Bradford.

Senior Vice-President.—Mr. F. Scholefield, of Dewsbury.

Junior Vice-President.—Mr. W. N. Booth, of Huddersfield.

Ex-President.—Mr. H. Butterfield, of Silsden.

Secretaries.—Messrs. C. T. B. Roper and E. Gillett, of Bradford.

Treasurer.—Mr. E. Garsed, of Elland.

Council.—Messrs. W. Atley, of Normanton, W. Cranfield, of Halifax, J. Demain, of Garforth, G. W. Fligg, of Dewsbury, and J. H. Hill, of York.

The members then adjourned to the Chemistry Lecture Theatre, to hear the address which Mr. W. R. Herring, the Engineer to the Edinburgh Gas Commissioners, had come to deliver.

The PRESIDENT, in introducing the lecturer, referred to the notable list of eminent men who had addressed the members in that room, and who, out of the stores of their experience, had illuminated so many aspects of the work of the gas industry. They welcomed that day one of the country's foremost gas engineers—one of the few who had had the unusual opportunity of erecting a large complete gas-works on a new site. His brilliant success in this enterprise had made his name so familiar and famous, that he hardly needed an introduction to them, especially as they remembered that he had formerly been the Engineer of the Huddersfield Gas-Works.

LECTURE BY MR. W. R. HERRING.

Mr. HERRING then delivered the following lecture:—

When I was asked by Mr. William Cranfield to address you on the occasion of the inauguration of your present session, I was at the outset in a little difficulty in responding, as I had already promised to address the Scottish Junior (Eastern District) Gas Association, and feared I was not equal to the preparation of two addresses suitable to the occasion, to be delivered almost simultaneously. When, however, Mr. Cranfield was good enough to suggest that the title should be the "Granton Gas-Works," I was very much relieved, as, in the first place, the subject-matter was already to hand, and, in the second place, required only a little

preparation on my part to reduce it to reasonable proportions. I have therefore much pleasure in appearing before you to-day.

I cannot at the outset refrain from making some reference to the distinguished position which your Association occupies in relation to the foundation of a chair of "Gas Engineering and Fuel" in the Leeds University as a memorial to the late Sir George Livesey, whose memory will live in his accomplished works so long as the gas industry prevails. It is not possible to conceive a method of perpetuating his memory that would be more acceptable to that great leader than that which has been determined on by the gas industry; and Leeds has the proud distinction of being selected as the best centre for the initiation and continuation of work that will be of inestimable benefit to the industrial world. Your Association is indeed to be envied in being in such close proximity to this centre; and it behoves all those studying the profession to take the fullest advantage of the unique opportunities which they possess.

Considerable publicity has already been given to the constructional details of the Granton works; and the illustrations which are to be thrown upon the screen will more particularly illustrate the general features of the works. Before, however, proceeding with these, it may be of interest to relate briefly the circumstances which prompted the construction of works of such a magnitude to take the place of existing works of combined equal capacity. The locality which the Gas Commissioners of Edinburgh are required to supply covers an area of some 88 square miles, and of some 500,000 inhabitants. The gas supply had its origin at three different manufacturing stations. All of them had been in existence for from 70 to 80 years, and were on cramped areas of ground completely enclosed on all sides. Not one of the manufacturing stations had a gasholder upon it or within half-a-mile of its site; and every available square yard of ground was utilized. The general arrangement of such a works was necessarily of the usual patchwork design, which inevitably results in having to provide for increasing output on an already congested area. While the carbonizing plant of necessity, when every retort was working, as it was in the year 1897, was equal to the then requirements, the subsidiary plant was altogether incapable of dealing properly with the gas so produced.

In the case of two of the works (jointly equal to an output of 10 million cubic feet per day), the gas was supplied direct to the consumers without the intermission of a gasholder, or the advantage which a holder gives in mixing the gas as produced. When one bears in mind that the gas supply was of 25-candle power tested in a flat-flame burner, it will be realized what considerable changes inevitably took place in the quality supplied from hour to hour, and of which the consumers felt the full disadvantage. Prior to my taking up the position in Edinburgh, each of the works was under separate management and administration. I think it only right to place upon record my opinion that my predecessors had jointly one of the most difficult offices to fill, but filled them, notwithstanding their difficulties, with considerable skill and judgment. You will therefore fully appreciate the necessity for mature consideration being given to the ways and means of providing for the continuing supply with the increasing demands where the then manufacturing stations were in such a congested condition, and the supply could only be maintained by working every available retort in the midwinter time and only partially carbonizing the coal during days of stress and demand. I was obliged to report that the time had arrived when the most serious consideration must be given to the means of providing the present and future demands upon the undertaking. This necessitated a most careful investigation in order to determine what was best to be done, both from the practical as well as from the financial point of view. It really resolved itself into minute consideration of two entirely different schemes: (1) The reconstruction of the existing works on their existing areas; and (2), the construction of new works on a new area equal to the whole.

The difficulties of reconstructing an existing works on a cramped area is necessarily greater than when there is reasonable room that will permit of sectional reconstruction; and while a moderately satisfactory reconstruction scheme was propounded, and could have been carried out in the case of each of the respective works—and was, in fact, planned and the cost of its execution estimated—it was inevitable that any such reconstruction, while adding to the producing capacity to some extent, would only have deferred for a comparatively few years the time when further extensions would have to be carried out, and these could only have been done upon a new site. Thus reconstruction would have meant adding a fourth independent works to the gas undertaking of the area supplied; whereas the procuring of a new site and the building of one large manufacturing station thereon offered considerable prospects of economy in management and administration and labour. It would afford every facility for the introduction of the most modern plant; its selection would permit of giving the greatest consideration to traffic facilities, both for import and export to and from the works; and, what is also of some importance, the removal of the manufacturing station from the centre of habitation.

Comparative estimates, together with the advantages and disadvantages of both proposals, were prepared; and it was found that the construction of new works on a new site offered by far the greatest prospects of success, both financially and practically. In the first place, their construction would necessarily be cheaper than the reconstruction on the old sites. The facilities that could be taken advantage of in so planning the works as to manipulate

the materials used and resulting from the process of manufacture in the most direct and simple manner, afforded prospects of considerable economy—so much so in fact that the scheme was started on the promise that the saving in the cost of manufacture alone would be more than sufficient to pay interest and sinking fund charges on the cost of the land and the construction of the works, and that there would also be a margin to allow a reduction in the price of gas to consumers. I am glad to be able to say that these promises, formulated before a penny had been spent, have been more than fulfilled since the works have been established and in operation now for the past six or seven years; and when I tell you that the gross profits of the undertaking have been increased from £38,000 in 1896 to £112,000 in 1909, with the commercial conditions as to price of coal practically the same, rates of labour higher, and a lower price for gas than was ever charged in the area in question before, you will be able to realize the financial effect of the scheme that has been carried out.

Before touching in detail upon the various phases of the works, I would like to say a few words on what is sometimes looked upon as unwarrantable expenditure in the construction of such properties as gas-works. I am dealing now more particularly with the æsthetic features of the works. It must be admitted that gas-works are in many cases a hideous eyesore to the locality in which they are placed; and I have never been able to quite admit that the necessities of the operations warranted such a hideous aspect. It is quite true that the old type of works, with hand charging and coke yard practice, was responsible for this to some extent; but I could never realize why gas-works as a rule, internally and externally, presented such a hopelessly untidy and dirty appearance. While often those in charge were not responsible (the structural conditions themselves making order almost impossible), I always felt that sufficient attention was not given to the general appearance of such works in the majority of cases; and when I had the opportunity of constructing new works on a new site, where it was intended that labour-saving appliances were to be introduced wherever they showed an economical advantage, I determined to so plan the works as to mitigate these evils to the utmost extent. I therefore kept steadily in mind, in planning the Granton works, that their general appearance when finished should be at least presentable, without adding to their structural cost or sacrificing in any way the efficiency of the various operations that go to make up the whole.

For your guidance, I may say that such designs have resulted in positive economy, rather than adding anything to structural or running costs. The manipulation of traffic alone, whereby incoming coal traffic passes in one direction—the waggons being emptied and continuing in the same direction into the coke-yard and under the coke and refuse loading plant and passing out of the works the other end of the circuit-loop—in itself has resulted in considerable economy in the manipulation of the traffic, and in other ways that could be indicated. Then, again, the materials of which the works were to be constructed, its locality on the sea-board, and its general surroundings, demanded that thought should be given first to using suitable materials that would be impervious to the climatic conditions, and, secondly, to what we in Scotland call the amenity of the locality. Stone is the structural medium in most Scottish towns; but owing to a building boom that prevailed at the time of the inception of the works, and also to its greater cost, a hard vitrified brick was determined upon for the outer face-work, backed by a brick of equally good quality, but less satisfactory appearance. The Granton works were the first brick structures of any magnitude in the locality.

Instead of constructing the buildings of plain, thick walls with so many holes for air and light, the pilaster form of construction was introduced, which permitted of introducing certain architectural features into the building and reducing the substance of the brick between the pilasters or columns to a merely thin shell; thus giving not only some appearance, but resulting in considerable economy in construction, as I will show later on. Some of my friends—shall I say the unreflecting ones?—who have seen the works are under the impression that the Granton buildings have cost more than they need have done, and that an unnecessary amount of money has been spent for the sake of appearances. Perhaps the best means of ascertaining this point is to compare the cost of the Granton buildings with similar structures; and, in passing, I may say that the completest detail as to the cost of their various parts has already been published for everybody to criticize.

An architect will tell you that the cost of a building is estimated and valued on the unit basis of per cubic foot of gross structural capacity, measured outside walls, &c.; and Hurst's "Architects and Surveyors Handbook" gives the rates for various classes of buildings from mansions at 1s. 6d., down to what he defines as fourth-class buildings, and this is stated at 4½d. per cubic foot of structure; whereas Leaming's "Quantity Surveying" gives 5½d. for warehouses of plain character. As you will presently see the photographs of the Granton buildings, I will leave you to judge for yourselves; but if I take credit for having only put up fourth-class structures, which Hurst's book says cost 4½d. per cubic foot, let us see how this figure compares with the actual expenditure.

The retort-house block	cost 1'69d. per cubic foot of structure.
The coal-store block	1'59d. " " "
The pumping-station	3'4d. " " "
The meter-house	3'1d. " " "
The station buildings, offices, and stores,	4'5d. " " "
The workshops and locomotive sheds	2'5d. " " "

These figures include the building complete—foundations, roofs,

windows, floors, &c. So far as the cost of the buildings therefore at Granton is concerned, notwithstanding their presentable appearance, it does not arise from expenditure so much as a little forethought and common sense in determining their design and the disposition of the materials used in their construction, and can be accomplished by all of you when doing similar work.

Let us now deal with the works as a complete structure. It is commonly stated before Parliamentary Committees that the sum necessary for laying down a new works for manufacturing and storage purposes ranges from £50,000 to £60,000 per million cubic feet of daily output—this figure having nothing whatever to do with the distributory system, &c. My estimate for the construction of the first section of the works was £450,000, or £45,000 per million cubic feet of daily output. It was finished complete, including the preparatory work necessary on a virgin site—a deal of which was available for the construction of the future sections—for the sum of £42,000 per million cubic feet of daily output. From this you will gather that the construction of new gas-works on modern and up-to-date lines, equipped with the most modern plant and mechanical appliances for performing the various operations involved for the saving of labour, need not cost more to-day than many of what might be termed the old type of works did but comparatively speaking a few years ago. I am further in a position to state, with regard to the question of the repair and maintenance of such a works, that its equipment, with its multifarious devices for saving labour, is certainly not greater than—if as great as—in the old days with less modern plant.

Some of you may know that I have on former occasions taken exception to the inconclusive manner in which gas-works statistics are kept, and to the impossibility of ascertaining from such statistics the relative merits of the different types of plant employed to accomplish the same object in different works. To state it in a few words. In my opinion the present method of recording the working results of a gas undertaking are not in sufficient detail to enable a proper comparison to be made with other works, as there are items charged under the heading of repairs and maintenance in some works which in others are charged to manufacture, and *vice versa*; and, further, wages charges are very often mixed up with charges which are affected by the general commercial conditions or the geographical position of the works in question.

So far as Granton is concerned, we have kept our labour costs for manufacture and repairs and maintenance strictly separate, and have sectionalized the labour costs under many headings. We are therefore able to make the strictest comparison between the efficiency of various types of plant on our own works; and it would be still better if we could compare these with plant doing similar work, but perhaps of a different type, on other works. Reverting, however, to the question of repairs and maintenance of a modernly equipped works, I will deal with the figures covering a period of the past five years; and under the heading of repairs and maintenance, we sectionalize the following items. Mechanics, &c., at repairs while the plant is running; mechanics, &c., at sundry repairs on the works in general; railways and sidings; retort-settings; producers, &c.; ironwork of all descriptions; hot-coke conveyors; engines and exhausters; tools and implements; boilers, &c. This has averaged, for labour only, 11'465d. per 1000 cubic feet of gas made, to which must be added the cost of the materials purchased and used for the same purpose, and amounting to 11'13d.

Now if you will turn to the published statistics of gas undertakings, you will find that the items of repairs and maintenance are considerably more than this. This is partly on account of the fact that there is a loose method of defining the items which should be charged to the respective headings, as already mentioned, and also to the fact that it is under this heading that items fairly chargeable to capital account are often entered—a practice which is to be commended, as it resolves itself into a liquidation of the capital account by the amount so charged. The fact is that with reasonable care and proper supervision the mechanical devices are of the most reliable character, and that spare parts required for their renewal can be stocked, and the weak link in the chain, both figuratively and literally, seen to before a breakdown occurs.

Just one word as to running costs. Granton has been so well advertised in more ways than one that I feel it to be a little tedious to repeat what to me is an oft-told story. But in order to make my address complete, I think it necessary to briefly refer to these figures, which comprise the manufacturing costs and charges. Under the title of carbonizing on the three-shift principle, we have separate data, such as: Foremen and junior foremen on the three shifts; discharging coal-waggons and breaking; elevating and conveying coal to storage bunkers; charging retorts; drawing retorts; pipe jumping, cleaning and pointing retorts, and greasing machinery, &c.; producer and ash men; hot-coke conveyor attendants; engine attendants for coal and coke handling plant. For the past five years, all these items have averaged 12'6d. per 1000 cubic feet of gas made. Purification has cost 0'125d. per 1000 cubic feet over the same period. The attendants at the exhausters, the washer and plant house, boilers and works syphon men add a further 0'220d.; so that, together for the complete cost of manufacturing, wages of operatives, including foremen, is 16'05d. per 1000 cubic feet for the past five years. To this should be added such items as the labour involved in heating-up retorts, coke men, locomotive men and shunters, the gasholder and pump-house attendants, and general

purposes, including the office staff, weighbridge attendants, store-keepers, messengers, yard cleaners, and labour attending to refuse removal, water pumping, &c. (0'408d.).

When these items are included, you will see that there is nothing left to be chargeable to manufacturing costs, and that our figures are favourable to the works to which they refer. We can thus claim to have established three important points:

Firstly, that the constructional cost of a new works on a new site, or, what is exactly the same thing, a new complete section on an old site, is, under certain circumstances, a much more profitable financial transaction than the reconstruction and extension or patching-up of old works.

Secondly, that the construction of new works, or a complete new section, affords very much greater opportunity of designing and equipping it in such a way that the running costs are reduced to a minimum.

Thirdly, that the repairs and maintenance of plant on a new works or separate section constructed upon the most modern lines and equipped with every mechanical device, costs no more than, if as much as, in the old days with the old type of plant.

These are very important factors to have established, and offer considerable scope to the rising generation of gas engineers who may at any time be called upon to face problems such as these. It will require some courage on their part; but if their courage is backed by the assurance of unchallengeable data, they need not fear stating the case. Before, however, any such proposition is put to a board of business men, it is requisite that the alternative scheme should be equally well matured and its costs made out in detail, so that the administrators of the undertaking will be required to make their choice, which I venture to say, if properly put, will result in the new scheme of either new works or complete new section being adopted where congested conditions prevail; for, after all, it is not a question of how much a thing costs, but as to how much will a certain capital sum, judiciously expended, enable you to save as compared with your present system of working. This truism is nowhere put into daily practice to a greater degree than by the Yorkshire manufacturers, who know when to scrap plant and to replace it by new and more modern appliances. And it was in Yorkshire that I learned the lesson myself!

At the close of the lecture,

Mr. Herring threw upon the screen a series of views illustrating the Granton works, and for about an hour proceeded, by their help, to describe the works. As questions had been invited, they were put at intervals and answered as they arose. Keen interest and close attention were manifested; and subsequent conversations endorsed the eulogies of the speakers, who formally voiced the thanks of the meeting, and gave point to the rounds of applause that marked the close of the lecture. The Granton Gas-Works have been so fully described and illustrated in the "JOURNAL" that no further report of this part of the lecture is needed. Still, to a gathering of juniors, few of whom had ever seen the actual works, the story of the planning, erecting, and working of this notable example of modern enterprise was as fresh and arresting as a few years ago it was to their seniors.

The PRESIDENT proposed a vote of thanks to Mr. Herring. He remarked that it was the first time their annual meeting had taken the form of a visit to a gas-works, for such it had almost actually been, thanks to the admirable series of views and the lucid explanation given of them. They had realized that a master mind had been engaged on the planning and erecting of these works; and they had been struck with the proof they afforded that structural strength and convenience in working were not inconsistent with the pleasing architectural features so truly in keeping with the associations of Edinburgh. They must all have been surprised at the low cost at which such fine erections had been put up and fitted with labour-saving devices, and with the excellent financial results that had marked their working. The lecture had been as inspiring as it was instructive; and they must all feel under deep obligations to Mr. Herring for his kindness in delivering it.

Mr. CRANFIELD said that by the kind trust of the Council the work of securing the annual lecturer usually fell to his lot; and therefore he had a personal pleasure in seconding the vote of thanks to Mr. Herring, who with so kindly a promptness had acceded to his request to appear that day. Mr. Herring had been one of the earliest of the prominent engineers to welcome and encourage the newly-formed Junior Associations, whose present position and possibilities of usefulness had been largely due to the fact that they had been trusted, inspired, and put on their mettle by such men as their honoured visitor. His message that day had been largely an encouragement to them as individuals to go forward, and to trust their deliberately formed judgments. They had had their minds lifted to great ultimate issues—to use an historic phrase, they had been encouraged to study big maps—and exhorted not to let the small and immediate wholly engross their attention or narrow their outlook. In his fine address last week to the Eastern District Division of the Scottish Junior Gas Association, Mr. Herring had also given the complementary advice of thrift and alertness in watching details. These two addresses formed an harmonious whole; and in its printed form it could not fail to be of wide usefulness. In his Scotch address, Mr. Herring had referred to the great help their young men might receive at critical times in their early career from access

to good technical books in the lending libraries of the Juniors Associations. Mr. J. H. Brearley, the Examiner in "Gas Supply," had also recently called attention to the same need, and had suggested such libraries in connection with separate gas-works. From his (Mr. Cranfield's) connection with the studies of considerable numbers of young men, he strongly endorsed the advisability of rendering such greatly-needed help; and their lecturer would be pleased to know that a library had for several years been in operation in their Association. To add to such libraries was one way in which valuable and much appreciated help might be extended by the Senior Associations, who sometimes wondered in what way they could render any help to the juniors. He hoped the day was not far distant when for the authors of "gas books" to forward a copy of their works to the libraries of the six Junior Associations would be regarded as just as much a matter of course as the sending of a copy to Stationers' Hall and the British Museum. He believed some had already done so. The Council of their Association had also cast a longing eye on the valuable abstracts published with the yearly "Transactions" of the Institution of Gas Engineers, which, at present unknown and inaccessible in that form to most juniors, might have an extended usefulness if they were also bound up with their proceedings. Mr. Herring's final cautionary words must appeal very strongly to them—viz., the need of full consideration of the bearings of any new bold departure they ever felt tempted to embark upon, and the strength that followed from "the assurance of unchallengeable data." He hoped that in any such great enterprise in their own professional or private life they might eventually be able to show a balance-sheet that as well accorded with the original estimates, and as fully vindicated the wisdom of their proposals, as had been the case with Mr. Herring and the Granton Gas-Works.

Mr. TAYLOR said he deemed it a privilege to have been present at so helpful a lecture as that which had just been delivered, and to have the further opportunity of adding a tribute of gratitude on behalf of the Manchester and District Junior Association to so good a friend of the juniors as Mr. Herring had always been. Edinburgh had undoubtedly been in a difficult position as regards gas supply some years ago, and needed a master mind to devise and carry out a plan of deliverance for them. Such a master mind they had secured; and Yorkshire would always be proud to remember it was within her borders that Edinburgh found him. The beauty and admirable arrangements at Granton appealed strongly to all who had seen them; and that afternoon they had had made evident to them other aspects of its success.

Mr. J. H. HILL (York), as one of the older members of the Junior Associations, reminded them that Mr. Herring was once a young man, and even now he was not an old one. One was apt to stand in awe of a master mind, and to imagine he was born with it, had always had it, and had not had to tread the same path of laborious learning and the execution of lowly task that they had. Whereas attention to details and trifles, and the grasping one by one of the great principles of life and action, were needed in the case of all. Like all masters in practice, Mr. Herring was open to new ideas, and ready to advance, as seen in his attitude in regard to vertical retorts. He (Mr. Hill) was glad to find Mr. Herring intending to experiment in this direction, and he would have every confidence in following the lead the results would indicate.

Mr. J. FURNISS (the representative of the Manchester and District Institution of Gas Engineers), speaking as an old neighbour and friend of the lecturer, rejoiced that his presence there had given emphasis to the example his life and career afforded to young men. He was personally glad of Mr. Herring's success in fighting the old prevalent idea that a gas-works must necessarily be hideous, and that not only was art never to be mentioned in their connection, but any idea of making them attractive was an absurdity.

Mr. HERRING, who was greeted with loud and long-continued applause, on rising to respond to the vote of thanks, assured the members in all sincerity that he was overcome by their heartiness and the kindly remarks just spoken. His first post of personal responsibility was at Huddersfield; and there he had to assume a greater responsibility than he had been originally appointed to. Whether it was this chance that made him clench his teeth and grip hard, he did not quite know; but it was from his association with Yorkshire men he acquired many useful habits. As he saw the willingness with which the West Riding manufacturers would scrap plant, even if fairly new and far from being worn out, when they saw an advantage to be gained by so doing, he wondered how they could afford it; and he set to work to think out why they should apparently throw money away. He thus learned that it was not so much what a thing cost that mattered, as what could be got out of it. Money in abundance could be promptly obtained, if adequate security existed and a gain of 5 per cent. was assured. Many had gone wrong here, and been crippled in their work for want of bold courage that would scrap plant, &c., and face a temporary loss that might in a few months emerge into a success that not only recouped all past loss but amassed solid profits. He did not advocate waste—i.e., scrapping for scrapping's sake. They must be sure that their new venture would pay, not only for what was scrapped, but for what was put in its place. The conductors of many works had spent too much in the past, and that not wisely, so that they were now handicapped by a weight of dead capital. In some of these cases, the ruling powers were consequently reluctant to move forward, and fearful of incurring fresh large expenses. But the best way of

recovering themselves was to spend, in order to get profits that should clear off part of their encumbrances from the dead past. He cherished the warmest of sympathy with the juniors, and partly because he was not so far beyond their age. He realized the necessity of association, and rejoiced at the modern facilities given to juniors. He felt somewhat embarrassed at talking about his own works, and would have found it more congenial to deal with general topics and praise the work of others. He thanked them heartily for their vote.

BALTIC GAS AND WATER ASSOCIATION.

This year's meeting (the thirty-seventh) of the Baltic Association of Gas and Water Engineers took place at Stralsund. The following account of the proceedings is taken from the official report in a recent issue of the "Journal für Gasbeleuchtung."

The meeting was opened by the President, Herr Gellendien, Manager of the Elbing Gas-Works, who referred to the loss which the Association had sustained during the past year through the death of Herr Liegel, formerly Manager of the Stralsund Gas-Works, whose name was widely known through the regenerative retort-setting which he had devised. A few words of welcome to the Association were spoken by the Burgomaster of Stralsund, Herr Gronow. An account of the water supply of the town was given by Herr Rauschenbach, the Manager of the Stralsund Water-Works. Herr Sorge, of Thorn, communicated a report of the Committee which had been formed with a view to the co-operative buying of coal for gas-works in the same district. The Committee had come to the conclusion that such a scheme could not be carried out by the Association on behalf of the members; but they believed that some benefit might be gained by the gas-works of adjacent towns combining for the purchase of the whole of the coal required for their needs. Herr Menzel, of Berlin, then described a high-power lamp working on gas supplied at ordinary pressure. Herr Nathan, of the German Incandescent Gaslight Company, of Berlin, next referred to the mantle-tax which came into operation in Germany on the 1st inst. (October). Gas-works would be required to report to the Revenue authorities between the 1st and the 17th of October the number of mantles which they have in store; and only mantles already in the hands of private householders will escape the tax. Dr. Hübner, of the firm of Messrs. Julius Pintsch, of Berlin, next described some novelties introduced by his firm in connection with inverted gas lighting. He was followed by Herr Pedega, of Messrs. Ebrich and Graetz, of Berlin, who described the firm's appliances for high-pressure gas lighting and methods of suspending and supporting high-pressure gas-lamps for street lighting. A lengthy description of the gas-works of Stralsund was next given by the Manager, Herr Rauschenbach. Herr Merckens, of Lyck, then described a method he had followed for firing semi-producer and producer furnaces with tar; and Herr Sorge, of Thorn, read a paper on the use of tar in the construction of roads. The private business of the Association was next taken; and Herr Gellendien, of Elbing, was elected President for next year. It was decided that the meeting of the Association next year should be held in conjunction with the meeting of the German Association of Gas and Water Engineers, at Königsberg.

London and Southern District Junior Gas Association.

The Association will hold the first meeting of the 1909-10 session at the Cripplegate Institute, E.C., next Friday, when Mr. Corbet Woodall will address the members. Afterwards there will be an informal social gathering. The subsequent arrangements for the session are: Nov. 13, visit to the Vauxhall station of the South Metropolitan Gas Company. Nov. 26, a paper by Mr. W. Wright on "Cleaning Gas-Cookers by a New Process," followed by a series of lantern slides on the Gas Industry. Dec. 4, a visit to the Tottenham Gas-Works. Dec. 10, a lecture by Mr. Jacques Abady, on "Light—and Some Reflections." Jan. 12 and 13, a visit to Messrs. Parkinson and Cowan's meter-works. Jan. 28, short papers, one of which will be by Mr. C. E. Rosevear, entitled "Notes from Hythe." Feb. 9, a visit to the Voelker Mantle Works. Feb. 25, a paper by Mr. J. G. Clark, on "Some Notes on Gas Lighting." March 12, a visit to the Hornsey Gas-Works. March 18, a lecture by Dr. Harold G. Colman. April 9, morning visit to the Beckton Gas-Works. April 22, question night. May 14, visit to the Bromley Gas-Works. May 27, the annual general business meeting. A question-box will be put on the table at all meetings of the Association; and the queries placed therein will be dealt with on question night.

The Late Mr. Matthew Leaf.—The funeral of the late Mr. Matthew Leaf, whose somewhat sudden death was recorded last week, took place at Naburn Churchyard, and was attended by the Chairman of the York Gas Company (Mr. J. R. Hill), several of the other Directors, the Engineer, Manager, and Secretary (Mr. J. H. Hill), and a number of the workmen, who preceded the hearse. Prior to the funeral, the Directors held a meeting and passed a resolution recording their deep regret at the loss they had sustained, and their high appreciation of Mr. Leaf's services to the Company. They also offered their sincere sympathy with Mrs. Leaf and the family in their bereavement.

SWISS GAS & WATER ENGINEERS' ASSOCIATION.

Annual General Meeting.

The Thirty-Sixth Annual General Meeting of this Association was held at Neuchâtel from the 11th to the 13th of September; and a report of the proceedings has been published in a recent number of the "Schweizerischen Bauzeitung."

On Saturday, the 11th ult., the managers of gas and water works assembled for a preliminary sitting, in which the present state of the market for coke, tar, and ammonia was discussed. The explosion which took place at the gas-works at Geneva on Aug. 23, however, formed the chief topic of debate. A number of those present had visited the scene of the disaster. Herr Weiss, the Manager of the Zürich Gas-Works, who had been appointed to make the official investigation of the cause of the explosion, made some interesting observations in regard to it, and proposed that opportunity should be taken to correct in the Press the wrong notion prevalent among the public that a gasholder had exploded at Geneva. Such rumours were apt to make those living near gas-works uneasy.

The general meeting took place on Sunday, the 12th ult., in the lecture room of the University, under the presidency of Dr. Miescher, the Manager of the Bâle Gas-Works. After reference had been made to recently deceased members of the Association and to the newly-elected members, Herren Stucker and Dind presented papers describing the development of the Neuchâtel Gas and Water Works, of which they are the respective Managers. It was mentioned that the gas-works, which have hitherto been leased to a private undertaking, will pass into the hands of the Corporation on the 1st of January, at which date Herr Stucker will retire from his position as Manager. Herr Weiss, of Zürich, next presented the usual report on the coal testings which had been carried out in the preceding twelve months at the Zürich Gas-Works. Fewer samples than before had been tested in the Association's coal-testing plant; but on the other hand, 23 large-scale tests had been made in the new experimental plant of the Zürich gas undertaking. The investigations showed that while the quality of the coals had remained about the same as before in respect of the calorific value and illuminating power of the gas afforded by them, there had been a marked reduction in the proportion of ash in the coal, and, consequently, in the coke obtained from them. Therefore, the coals must be regarded as of better quality. The price had remained much about the same as in the previous year, notwithstanding that the supply had been latterly in excess of the demand. The Union of Swiss Gas-Works, which was formed during the year for the purpose of the joint purchase of coal supplies, was about to take the first step in this direction by arranging that coal should be bought and paid for by the works on the basis of its industrial or manufacturing value.

Dr. Ott, Chemist of the Zürich Gas-Works, then read a paper on the valuation of gas coals. He had arrived at the conclusion that it was only possible for gas-works to obtain thorough knowledge of the industrial value of a coal by carrying out tests on a large scale, as could be done in the experimental plant at the Zürich Gas-Works. Such tests furnished exact information on the make of gas, its calorific value and illuminating power, and the yield of bye-products. He had drawn up a scheme for the valuation of gas coal which took into account the value of both the gas and the bye-products, in conjunction with the cost of carriage of coal from the pits to any gas-works. Dr. Constam, the principal of the Swiss Fuel-Testing Laboratory, supported Dr. Ott's conclusions. He emphasized the importance of continuous control being maintained over the quality of the gas coals delivered to a works, just as coal supplies for heating purposes were now regularly controlled by a determination of the calorific power of average samples. He differed, however, from Dr. Ott in believing that the small coal-testing apparatus of the Association, though it did not afford the same yield and quality of gas and coke as would be obtained on the large scale, was nevertheless valuable in that it gave strictly comparable values for the different coals, provided they were always distilled at the same temperature.

Herr Pedega, of the firm of Ehrich and Graetz, of Berlin, next spoke on the advances which had been made in inverted gas-burners, both by the use of high-pressure gas and of air at high pressure. He concluded that, if properly constructed lamps were used and the installation was carried out with care, high-pressure gas could successfully compete with electric lighting, as the results obtained in the City of Berlin had already demonstrated. Herr Weiss, of Zürich, showed, by means of a plan, the arrangements which had been made for the supply of gas for the Gordon-Bennett Balloon Competition held at Zürich earlier in the year; and the Association next awarded medals to four workmen who had been for many years employed on Swiss gas and water works. Herr Weiss, of Zürich, was chosen as President for the ensuing year, in succession to Dr. Miescher, of Bâle.

The afternoon was devoted to an excursion to Colombier, where those attending were entertained by the local Gas Company. The official banquet was held at Neuchâtel in the evening. On the morning of Monday, the 13th ult., an inspection was made of the water reservoirs, electricity works, and a chocolate factory. In the afternoon, a steam-boat excursion was made to Estavayer. It was decided to hold next year's meeting of the Association at Aarau.

ESTIMATING THE VOLATILE MATTER IN COAL.

An abstract was given in the "JOURNAL" for June 1 (p. 584) of a paper which Professor E. J. Constam, head of the Federal Fuel-Testing Laboratory at Zurich, presented at the International Congress of Applied Chemistry held in London the last week of May. The subject of the paper was "The Determination of the Amount of Volatile Matter in Solid Fuels." The abstract only was read at the meeting; and the full text of the paper has not, so far as we are aware, yet been published in English. The last number to hand of the "Journal für Gasbeleuchtung" contains, however, a paper by Professor Constam dealing with the same subject and dated April last. It is not stated that this is the text of the communication presented to the International Congress; but it seems probable, from internal evidence, that it is a reprint of that paper. We give below some extracts from it by way of supplementing the official abstract already published in the "JOURNAL" in regard to points of particular interest to the analyst of coals for gas-works use.

The author's studies on the subject have extended over more than five years, and have been carried out in conjunction with a number of collaborateurs on portions of whose investigations communications have already been published [see the "JOURNAL," Vol. XCVI., p. 460; Vol. CIII., p. 382; Vol. CVII., p. 696]. By all methods for the laboratory determination of the volatile matter in coal a weighed portion of the coal is taken in a closed platinum or porcelain crucible and gasified over a burner or in a heated muffle, and the residual coke is weighed. The different ways of carrying out this test, however, lead to very great differences in the amount of coke obtained. Some of the differences in the results recorded are due to different methods of calculation being used. The majority of chemists take the yield of coke as the percentage which the weight of residual coke represents of the weight of the original sample of coal. In many cases the moisture present in the coal is included in the volatile matter as calculated by difference from the yield of coke. Muck, however, pointed out long ago that the results would only be comparable for different coals if they were calculated on the basis of coal and coke free from ash. Seyler has since emphasized the importance for comparative purposes of expressing the volatile matter as a percentage of the ash-free and dry coal. Strahan and Pollard, in a recent monograph on the coals of South Wales, took the volatile constituents as the loss of weight of a sample of coal by coking minus the proportion of moisture present. The author follows Muck and Seyler, and takes as the yield of coke of a coal the yield calculated on the ash-free and dry coal substance. Consequently, also, he defines the volatile matter of a coal as the yield of gas of the ash-free and dry coal substance. Comparative figures are thus obtained for the different varieties of coal which are independent of the water and the ash contained in the samples.

Besides the differences referred to, which are due to different modes of calculating the yield of coke and of volatile matter, the results are affected greatly by the method followed in the laboratory for determining the yield of coke. Muck pointed out that it was absolutely essential to follow exactly the same method of testing if the results obtained were to be uniform and comparable. The yield of coke he found was increased if the coal was heated slowly. The author investigated, in collaboration with Herr Rougeot, the comparative results obtained by Muck's method and the Bochum method of estimating the yield of coke in the laboratory on twenty-four different samples of coal which were also carbonized in a cast-iron retort at a temperature of about 830° C. It was found that the Bochum method gave results which, while they were from 1 to 3 per cent. lower than the results by Muck's method, agreed closely with the yield of coke in the iron retort. Bender's contention, that a portion of the residual coke was burnt in the Bochum method, was proved to be untenable. The low yield of coke is accounted for by the thorough carbonization which the sample undergoes in the Bochum method. These investigations, which referred to gas coals only, were extended by the author in a subsequent series of researches, made with the assistance of Herr Schläpfer [see "JOURNAL," Vol. XCVI., p. 460], to representative samples of other types of coal; and the yield of coke in the retort was compared with the results obtained in the platinum crucible by five different methods—viz., those of Muck, of the Committee of the American Chemical Society, of Mahler, of Goutal, and the Bochum method.

These investigations demonstrated that the yield of coke obtained in the crucible by the American Committee's method agreed most closely with the results of carbonization in the retort. They further showed that the chemical composition and the calorific power of the combustible substance of the coke obtained was in no way dependent on the composition of the original coal, but depended only on the manner in which the carbonization was effected. The heat of combustion of the dry and ash-free coke obtained in the crucible by the American method, agreed most closely with that of the combustible substance of the retort coke. Although it was not supposed that the yield of coke from the charge of a little over 1 lb. in weight carbonized in a cast-iron retort would agree exactly with the results of carbonization on a

large scale, it appeared reasonable to assume that there would be closer agreement between these results than between the results of coking in a crucible and of large-scale carbonization. Hence, of the crucible methods, that of the American Committee should agree most closely with large-scale working.

Later, at the author's suggestion, Herr Streit carried out some analyses and calorific power determinations on the coke obtained by Goutal's, the Bochum, and the American method from twelve different types of German coal, as well as thirteen gas cokes from Swiss and German gas-works and seventeen metallurgical cokes of German and French origin. His investigations led to the conclusion that the chemical composition and the heat of combustion of the combustible substance of the coke resulting from the gasification of coal, are dependent only on the method of carbonization (*i.e.*, on the rapidity and duration of the heating and the temperature of carbonization); also that the cokes may be ranged in order of completeness of carbonization in the following order, starting with the least well carbonized—viz.: (1) Goutal's crucible coke; (2) the Bochum crucible coke; (3) the crucible coke obtained by the American method; (4) gas coke; and (5) oven coke. Streit further found that the ash-free and dry coke obtained by any one method from the different coals had the same calorific power, whereas the cokes obtained by different methods from the same coal had different calorific powers. The calorific power of the combustible substance of the coke was highest in the least completely carbonized (Goutal's coke) and lowest in the oven coke.

Kolbe extended these investigations by comparing the yields of coke obtained in an experimental retort from twelve French coals and one Spanish lignite with the results obtained in the platinum crucible by the Bochum and the American methods [see "JOURNAL," Vol. CIII., p. 382]. His investigations showed also that the results obtained by the American method approximated more closely than those of the Bochum method to the yields of coke in the retort. Hinrichsen, on the other hand, has recently stated that the yield of coke by Muck's method is in certain cases lower than the yield on a large scale; and he recommends the general adoption of the old method of Finkener, which consists in the gradual gasification of a sample of coal in a Rose crucible in a current of hydrogen. The results of this method are about 7 per cent. higher than those of the American method. Geipert states that he has found the best agreement between the results obtained with a large-scale experimental gas plant and with a crucible if the yield of coke in the platinum crucible is determined by heating it first with a simple bunsen and later with a triple bunsen flame.

These examples suffice to show that it is out of the question to find a laboratory method which will give results agreeing in all cases with the yields of coke obtained in working on a large scale. It must, however, be recognized that different coke-oven works obtain different yields of coke from one and the same coal, and that two gas-works using the same coal will not obtain the same yield of coke. Hence it is evident that no crucible method can agree in all cases with the large-scale results, since the latter really differ among themselves. A generally applicable standard method of determining the yield of coke must therefore be selected rather on other grounds, of which the following are the most important: (1) Agreement of the results obtained in parallel testings; (2) the influence on the experimental results of the size of the crucible and the temperature and duration of the heating; (3) the convenience and rapidity with which the test may be carried out; (4) the applicability of the method to all solid fuels; (5) the extent of its use at the present time. It appears from what has already been said that the standard method should be that which gives a coke which approximates most closely in chemical composition to the coke obtained in gas-works and coke-ovens. In order to ascertain which method complied best with this condition, the author undertook a number of investigations in conjunction with Dr. Kolbe. Ten coals chosen for their low content of ash were carbonized at a temperature of 830° C. in an experimental retort, and the coke obtained was carefully analyzed.

The mean results for all these samples on comparison with similar results obtained by Streit for coke produced on gas-works and in coke-ovens [see table *infra*] showed agreement in chemical composition of the coke produced in the small experimental retort with the gas-works and oven coke. It was then only necessary to make comparative analyses of crucible cokes with the experimental retort coke in order to ascertain which of the different crucible methods gave results most nearly resembling those obtained in the coke-ovens and on gas-works. The yield of coke from the ten coals which had been distilled in the experimental retort was determined in the crucible according to Finkener's method, Muck's method, and the American method; and the cokes obtained were analyzed. The results are shown in detail in a table printed in the original paper, from which it appears that Finkener's method gives the highest yield of coke and the American method the lowest. The yields of coke according to Muck's method sometimes approximate more closely than those of the American method to the retort results; but in all cases the composition and the heat of combustion of the coke obtained in the crucible by the American method most nearly resemble those of the gas-works and oven cokes. This will be seen from the following table, in which the average figures are given. It may be mentioned that of the ten coals used for this series of researches, nine were of English and one of German origin.

Mean Proportions of Carbon and Hydrogen, and Mean Heat of Combustion of Ash-Free and Dry Cokes obtained by Different Methods.

	Percentage of		Heat of Combustion, B.Th.U. per lb.
	Carbon.	Hydrogen.	
Finkener's crucible method.	91.68	2.61	14,363
Muck's " "	93.35	1.73	14,643
American Committee's " "	95.84	0.81	14,425
Experimental cast-iron retort	96.43	0.81	14,443
Gas-works	96.16	0.95	14,499
Coke-ovens	96.47	0.64	14,310

The high proportion of hydrogen in the crucible coke obtained by Finkener's method should be noted. If the results for the ten samples are plotted on a diagram, the curves obtained indicate that the Finkener coke follows to an appreciable extent the variations in composition and character of the coals from which the coke is produced; whereas the retort coke and the crucible coke obtained by the American Committee's method give nearly identical curves, which are almost independent of fluctuations in composition and character of the original coals. The Finkener coke somewhat resembles anthracite; whereas the coke obtained by the American method is more nearly a true coke similar to that obtained on gas-works and in coke-ovens. The Goutal, Muck, and Bochum methods give yields of coke lying between those obtained by the Finkener and American methods; while the coke obtained is likewise intermediate in character between the latter. It thus appears that a cause of the different yields of coke from the same coal by different methods is to be found in the difference in the composition of the coke produced. But though the yield according to the American crucible method approximates to that obtained in retorts, it nevertheless falls somewhat short of the latter. This difference may be explained by the fact that in the carbonization of coals in a deep layer, as in retorts, coke-ovens, or even in a narrow platinum crucible, the interior portions are warmed slowly, so that tarry distillation products are produced at first and, being subsequently carbonized, assist in increasing the yield of coke.

In order to ascertain the influence of the character of the coal or material carbonized on the coke produced by the most widely divergent crucible methods—viz., the Finkener and the American methods—the author and Dr. Schl  pfer examined by these two methods ten samples of fuel, ranging in character from peat to anthracite, and with their content of volatile matter varying from 7.5 to 70 per cent. The results generally coincide with those already obtained for gas coals, though the lignites and peat yield by both methods cokes which are poorer in carbon than the coke resulting from coal. To prove further that the cokes produced from the same coal by different methods represent different stages of the carbonization of the coal, a number of samples of coke obtained by Muck's, Finkener's, and the American method, and also in the experimental retort, were further carbonized according to the American method, but in a current of nitrogen. It was found that, on the average, Finkener cokes yielded 8 to 9 per cent. of volatile matter, Muck cokes 5 per cent., and the American and experimental retort cokes 2 to 3 per cent.

Muck had already pointed out that it was necessary, in order to obtain comparable figures, that the platinum crucible used for the tests should be polished. The author had observed that a dull or matt crucible gave higher yields of coke than a polished one; and in order to determine the cause of this, he made observations of the temperature within the crucibles by means of an electrical pyrometer when the crucibles were heated under precisely the same pressure and rate of gas consumption. The temperatures observed were as follows:—

	With a Dull Crucible.	With a Polished Crucible.
At the end of the first minute . . .	800° C.	870° C.
" " second minute . . .	820° "	900° "
" " third minute . . .	820° "	900° "

The distance of the bottom of the crucible above the mouth of the bunsen burner is responsible for a difference of temperature within the crucible. When the distance is 3 centimetres, as Muck prescribed, the temperature is 860° C., when it is 6 centimetres, as prescribed in the Bochum method, it is 900° C., and when it is 7 or 9 centimetres, as prescribed in the American method and by Berthold, it is 900° to 910° C. With the porcelain crucible as used by Finkener, the maximum temperature attainable is 700° C. As the M  ker bunsen burner has recently come into use, a No. 3 pattern of it was tried with a polished platinum crucible, the bottom of which was half-a-centimetre above the mouth of the burner. In one minute, the temperature within the crucible reached 1000° C. These observations show that the lowest temperature of carbonization is obtained by Finkener's method. The temperature of carbonization by the Bochum and the American methods is the same; but the period of heating prescribed by the latter is longer; hence the coal is more completely carbonized and the yield of coke is lower with it. Hinrichs's method, which is still commonly used in England, and consists in heating over a bunsen burner for 3½ minutes and then over a blow-pipe for 3½ minutes, also gives practically the same yield of coke as the American method.

It appears from comparative tests made by the American method, firstly with the closed crucible in the ordinary way, and

secondly with a current of nitrogen passing through the crucible, that there is no combustion of the coke in the crucible when coal is being tested; but when lignite and peat are being tested, it is necessary to pass through the crucible a current of hydrogen, carbonic acid, or nitrogen, and after the heating is finished to allow the contents of the crucible to cool in a stream of dry inert gas. Otherwise the residual coke from brown coals and peat will burn through air entering under the lid of the crucible. The No. 3 Méker burner reduces the yield of coke in consequence of the more rapid and complete carbonization which the higher temperature it produces causes.

The conclusions at which the author arrives from the whole series of investigations referred to, are:

- (1) Satisfactory agreement was obtained in parallel tests by all the crucible methods mentioned; but the agreement was closest with the American method.
- (2) The yields of coke are affected to the smallest extent by the size of the platinum crucible used and the temperature of the flame with the American method.
- (3) The American method surpasses the others in its convenience.
- (4) The American method and the old Hinrichs's crucible method are the only ones adapted for determining the yield of gas from true anthracites and cokes which carbonize without luminous flames.
- (5) The American method, being general in the United States and much used in Great Britain, is the most widely adopted at the present time, which fact is in favour of its general international acceptance.
- (6) This method yields the most completely carbonized crucible coke, which resembles most closely the coke obtained on gas-works and in coke-ovens. The composition of the coke is less affected than that of the coke obtained by other methods by the composition of the coal carbonized.

Acting on these conclusions, the author would define the volatile matter of a fuel as the yield of coke, referred to the ash-free and dry coal substance, deducted from 100. The yield of coke to be determined by coking one gramme of the fuel in a polished platinum crucible of not too small a size according to the prescription of the Committee on Coal Analysis of the American Chemical Society. This prescription has already been given in the "JOURNAL"—see Vol. CVI., p. 584.

AMERICAN ILLUMINATING ENGINEERING SOCIETY.

Third Annual Meeting.

In accordance with the announcement which appeared in the "JOURNAL" a few weeks ago, the third annual meeting of the American Illuminating Engineering Society was opened in New York on the 27th ult., by Mr. E. L. Elliott, the Chairman of the Convention Committee. The following notes are taken from a communication sent to the "American Gaslight Journal."

The visitors were offered a cordial welcome by Mr. T. Cummerford Martin; and it was acknowledged by Dr. Hugh Bell. The President (Mr. W. H. Gartley) then delivered his Inaugural Address. Dealing with the position of illuminating engineering, he said that the fact that some 250 million dollars were spent for lighting each year in America would seem to be an answer to the question as to the need for work along the lines the Society were following. They needed further, however, the aid of the trained physicists in the colleges; and such interest as these had already taken spoke well for the future.

In presenting the report of the Committee on Nomenclature and Standards, the Chairman (Dr. A. C. Humphreys) spoke briefly of the work in hand; leaving to the Chairmen of the Sub-Committees the furnishing of the detailed reports. The report of the Sub-Committee on a Unit of Light was presented by Dr. E. P. Hyde at the request of the Chairman (Dr. Bell). Dr. Hyde reviewed briefly the work accomplished in the direction of the adoption of the international candle. Considerable discussion, especially in Germany, has taken place concerning the adoption of an international unit, but without an international standard with which to make a comparison; and in this connection Dr. A. H. Elliott stated that he had personally taken six carbon filament electric lamps to the Electrical Testing Laboratories in New York City, the Bureau of Standards at Washington, the Official Laboratories in London and Charlottenburg, and back to Washington, and, though the final figures were not available, the results showed a much better agreement than he had really anticipated. Another report referred to by Dr. Humphreys, on "Photometric Units," was presented by Dr. C. H. Sharp, the Chairman, but not in final form, as some of the minor details had not been decided by the Committee. He said the proposals were based upon the work of Dr. Blondel. The unit of luminous flux would undoubtedly be the unit. Drs. Kennelly, Bell, and Hyde all spoke in favour of the "C. G. S." system of measurements being adopted, as these were already international in character. Dr. Rosa said if Americans would give up the foot and adopt the metre, the Germans would be likely to give up the Hefner in favour of the candle.

The second portion of the day's proceedings was opened by the

President in the afternoon; and the first business was the reading of a paper on "The Ethics of Illuminating Engineering," by Mr. E. L. Elliott, which it is considered will serve as an excellent basis for a code which could well be adopted by the Society. In the course of the discussion, it was stated that, though a college education was desirable, it was not essential, and that an engineer could accept a retainer from manufacturers of appliances and also do consulting work. Mr. Campbell described the practice of basing the fee upon the saving on lighting bills, and expressed the hope that the practice would not be countenanced. Mr. Calvert thought the advice given by lighting companies was tending to encroach upon the work of regular practitioners. In answer to this, Mr. Owens stated that it was fortunate the lighting companies took an interest in the subject, as any increase in the number of good installations would greatly aid all concerned. Mr. Macbeth remarked that the greatest trouble so far experienced was from salesmen who were pushing their wares under the guise of illuminating engineers. In closing the discussion, Mr. Elliott said that any advice given by an engineer interested in a certain appliance should be confined to the particular system, and should not include any others, as he was manifestly unable to give impartial advice in the latter case.

The second paper was presented by Mr. Geo. S. Barrows, on "The Work of Dr. Carl Auer von Welsbach in the Field of Artificial Illuminants." Dr. Simonini, who had been associated with Dr. Auer, spoke briefly of the great work which had been accomplished; and Dr. Bell referred to Dr. Auer as one of the greatest and also one of the least recognized of research chemists.

A paper on "Progress of Illuminating Engineering in Europe" was then read by Mr. H. Thurston Owens. The author described the work which led up to the formation of the British Illuminating Engineering Society, and then covered the practical side by comparing the lighting conditions abroad with those at home. In discussing the paper, Dr. A. H. Elliott agreed most heartily with the author in regard to maintenance, and said he hoped that both gas and electric companies would give the matter greater attention. Mr. Barrows stated that he did not believe America was very much behind Europe, especially in electric lighting, and that, as far as high-pressure gas-lamps were concerned, the American manufacturers had been ready for some time to supply the demand, but that the field was covered by electric arc lamps. In closing, Mr. Owens said he hoped Mr. Barrows would be fortunate enough to visit Berlin and see the results obtained with the latest designs of electric lamps. With regard to the high-power electric lamps, which Mr. Barrows claimed were so good, they should be displaced by either newer types of electric or high-pressure gas-lamps as they had been abroad.

The next paper was entitled "Diffusing Mediums, by the Consulting and Designing Illuminating Engineer," written by Mr. A. J. Marshall; but the author did not read any part of it. Mr. Hopton and Mr. Marks discussed the conditions under which ground glass could be used to advantage, despite the interdictions of the author to the contrary. Mr. Millar said the practice of manufacturers in supplying photometric data with their lighting appliances could well be amplified by including the intrinsic brilliancy and the character and amount of absorption.

The concluding paper of the afternoon sitting, on "Illuminating Engineering from the Educational Standpoint," by Mr. F. K. Richtmyer, which was read by Mr. E. L. Elliott, in the absence of the author, covered the present course available at the Cornell University.

The President spoke of the great value of college courses in promoting the cause; and Mr. Elliott stated that it was to be hoped architects would have the benefit of them. Mr. Ashe spoke in favour of having the regular courses in physics supplemented by lectures from practical men engaged in the work. Mr. Bond suggested that recommendations as to the character and scope of the work should be made by the Society, as the author had requested.

On re-assembling on the morning of the second day, the first paper, describing "The Photometrical Laboratory of the United Gas Improvement Company," was presented by Mr. C. O. Bond; and it was immediately followed by Dr. E. P. Hyde's paper on "The Physical Laboratory of the National Electric Lamp Association." Dr. Sharp, who opened the discussion, called attention to the growing tendency among men of financial affairs to give greater consideration to matters which are far removed from any apparent direct benefits. The fact that so elaborate and complete a laboratory had been installed by a gas company marked a new era, as in former years the tendency had been towards the chemical rather than the photometrical side of the business.

A paper entitled "Notes on the Chemical Luminescence of Rare Earths," read by Dr. A. Simonini, was followed by a composite production, having the title of "The Light of the Firefly," by Messrs. H. E. Ives and W. W. Coblentz. In investigating the light of the firefly, the authors adopted a novel method of obtaining the energy distribution in the visible spectrum, and used photographic plates. The most important result was the proof that the light from the firefly is a continuous band. Dr. Sharp said it was most gratifying to have two such valuable papers presented; and in discussing them, he referred to the fact that Dr. Nicholls stated nearly twenty years ago that the efficiency of the gas-mantle was due to phosphorescence or luminescence, and not to temperature.

Notes of the remainder of the proceedings will form the subject of a further communication to our contemporary.

ECONOMIC ASPECTS OF LIQUID FUEL.

This was the subject of the introductory lecture to the courses on "Fuel" to be delivered during the present session by Mr. J. S. S. Brame at the Sir John Cass Technical Institute. It was given on Monday evening last week, under the presidency of Sir Boverton Redwood, D.Sc. In the course of his remarks, he summarized the advantages of liquid fuel over coal as superior evaporative power in the ratio of 1·6 : 1, ease of handling, and facility of stowage where coal could not possibly be stored—a ton of oil requiring only some 38 cubic feet, while coal needs 43 cubic feet. Mr. Brame pointed out that the many advantages of liquid fuel have created such enthusiasm in its favour that the important questions of supply and prices have frequently been overlooked. The total oil supplies of the world, taking the figures for 1907, amounted to 34,569,500 tons, which in terms of coal, since it has such superior calorific value, would be equivalent to 51,854,250 tons, or only one-fifth of the coal output of this country alone. Liquid fuel, therefore, cannot compete with coal, and is not a fuel for general use, but for employment in special cases. For use in internal-combustion engines, the lighter petroleum distillates are almost universally employed. Paraffin-driven motors are valuable for many purposes, notably where a portable engine is required. One important point with all engines using petroleum oils is that high compressions are out of the question, since at little more than 4·5 atmospheres there is risk of premature ignition. Hence the efficiencies obtained are low. As substitutes for petrol, Mr. Brame said the claims of benzine (or benzol) and alcohol must be considered. Benzine is produced in very large quantities from both gas and coke-oven tar; and its present price is low—about 6½d. per gallon. The calorific value per unit weight is 18,540 B.Th.U.; but per unit volume, owing to its higher specific gravity, it has a greater value than many petrols. For equal weights, the calorific value of petrol to alcohol is as 20,000 to 11,000 B.Th.U.—a ratio of 1·8 : 1; but if considered by volume, the ratio is reduced to 1·6 : 1. Since the thermal efficiency of alcohol is greater than petrol in the ratio of 3 : 2, it is evident that, volume for volume, the same power can be obtained from alcohol as from petrol. At present, however, the cost of alcohol is prohibitive, and in Mr. Brame's opinion it is unlikely that it can for many years reach the position of a commercial fuel.

HEAT CONDUCTIVITY OF FIRE-BRICK.

In the course of a paper prepared by Mr. V. F. Dewey for the recent annual meeting of the Michigan Gas Association, he expressed the following opinions on the subject of the material to be used in the construction of retort-benches.

Gas-Benches.—Furnace lining should be made of any first-class material that will stand the heat in the furnace and not flux with the ash in the fuel used. Furnace arch and setting blocks should be of a material that will stand very high temperature—considerably over 3000° Fahr.—without shrinkage under load. A slight expansion under heat would not be injurious, as provision can be made for this when erecting the bench.

Retorts.—The first requirement of a material for a retort is ability to stand fairly high heats and keep its shape. The second is heat conductivity. I am not aware that magnesia material has ever been used in bench construction. It is very high priced and expands on heating, and it would therefore be necessary to make segmental retorts out of this material. (Silica material is being used for this purpose with considerable success.)

Recuperators.—On account of the height of the furnace necessary to make a first-class producer, it would seem that the ordinary fire-clay material used in such construction would offer sufficient opportunity for the recovery of all the waste heat that the secondary air is capable of taking up.

Front Wall.—Below the combustion chamber, ordinary (first-class) fire-brick; above the combustion chamber, an inside course of silica brick, or any brick that will stand considerably above 3000° Fahr., which could be backed-up by less expensive fire-clay brick, and a layer of 1 inch of loose asbestos could be put in just inside the outside course.

The above suggestions on bench construction are applicable to a bench designed for continuous operation with the heats round the retorts of 3000° Fahr. or more.

Mr. Dewey offered the following remarks on water-gas fire-brick material.

Generator Lining.—Same as coal-gas furnace.

Carburettor and Superheater Lining.—Fire-clay brick of as low a heat conductivity as possible.

Checker-Brick.—A close-grained fire-clay brick with the highest specific heat per unit of volume possible. It should be able to stand rapid changes in temperature without cracking. The higher the heat conductivity, consistent with the above qualifications, the better.

Cardenden New Gas-Works.—We learn that the various contracts for these new works are almost finished; and it is expected that a supply of gas will be delivered to the town before the end of the month. The mains are practically all laid, and many meters have already been fixed. It is just six months since the work began.

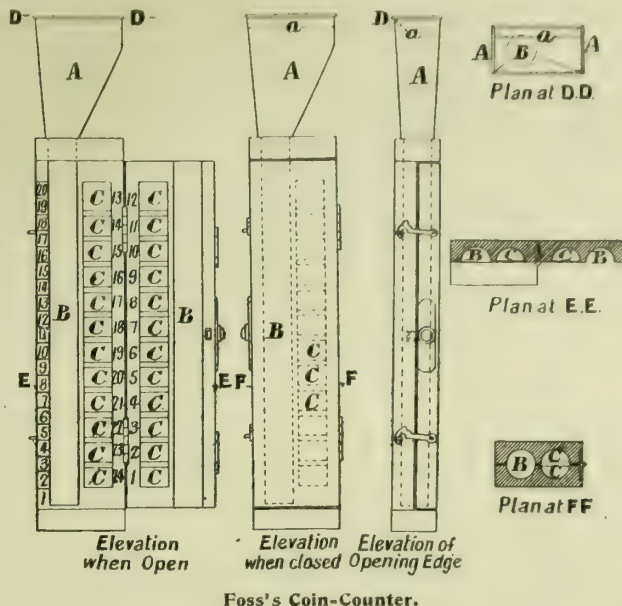
REGISTER OF PATENTS.

Counting Coins taken from Slot-Meters.

Foss, H., of Thirsk.

No. 20,518; Sept. 30, 1908.

The object of this invention is to facilitate the accurate and quick dealing with coins taken from slot-meters or other coin-in-the-slot appliances.



Foss's Coin-Counter.

The apparatus consists of two hinged portions, each with a longitudinal semi-cylindrical groove B, so placed that, when the apparatus is closed, box-like, the grooves form a cylindrical bore, which is open at one end and closed at the other. The diameter of the box is slightly larger than that of the kind of coin it is intended to receive; and the length of the bore is sufficient to accommodate a considerable number of coins—"preferably the apparatus should be able to contain the maximum number of coins ordinarily met with in a slot-meter." A funnel-shaped receiver A communicates at the top with the cylindrical bore, and has at its mouth an inwardly-inclined lip or baffle, which serves the double purpose of directing the coins when they are poured through the funnel so that they do not choke it up, and also of preventing the coins from easily falling out. By the side of one of the grooves is arranged a scale to indicate the approximate amount of money put into the apparatus, according to the reading opposite the top of the pile of coins. For example, the scale alongside the groove B in the apparatus shown indicates shillingsworths of pennies. In each half of the box, a number of cells or recesses C are provided, each capable of holding a definite number of coins—say, 12 pennies. The holding capacity of the cells corresponds with the parts B and A of the apparatus.

When the coins are taken from the meter, they are poured through the receiver A into the closed apparatus, in which they form a cylindrical pile. The box is then opened (with the groove B in which the coins rest, held horizontally); and the approximate amount of money taken from the meter is indicated by the scale. The main purpose of the invention, however, is served by the fact that the coins are now so arranged in the open box that they may be readily counted accurately. In order to facilitate this process, as each shillingsworth (say) is counted, it is taken from the main column and placed in one of the cells C. When the coins have been thus counted in this manner, they would be emptied out into a bag, so that the box is ready to be used again.

Manufacture of Water Gas.

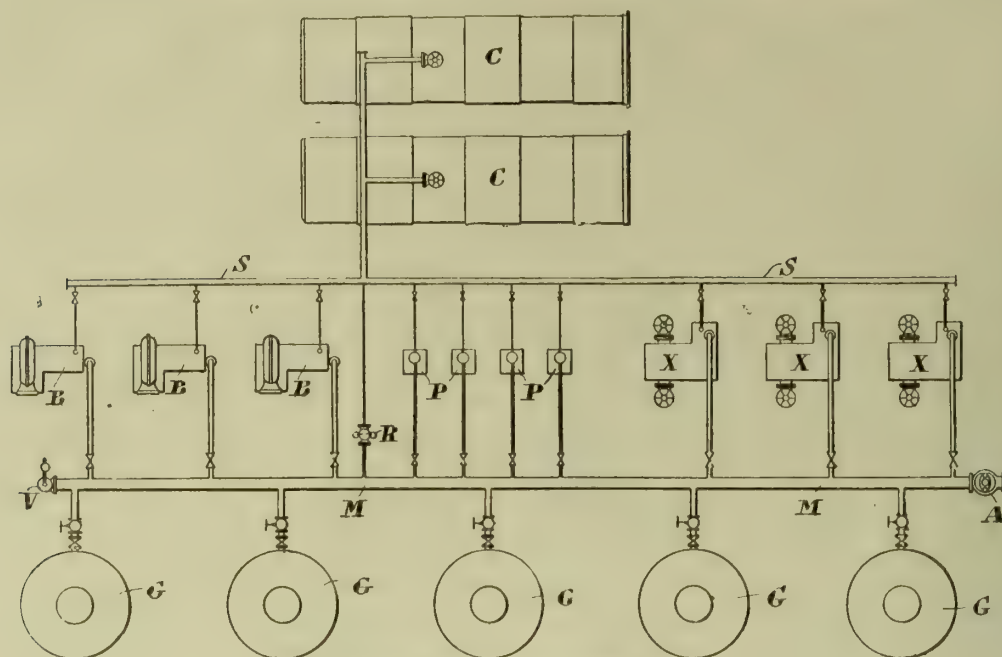
GLASGOW, A. G., of Victoria Street, S.W.

No. 17,603; Aug. 21, 1908.

This invention has for its object to increase the efficiency of plant for the production of water gas by providing that the amount of high-pressure steam necessary for a given output of water gas is reduced, with a consequent increase in heat economy and reduction in the amount of steam-generating apparatus required in plant of a given output.

While preferably supplying the blowing engines with steam at a relatively high pressure, in order to obtain an economical generation of a blast sufficient to blast the fuel-bed rapidly enough for the economical production of water gas, the patentee proposes to utilize the exhaust steam from the engines as well as from the gas-exhausters, pumps, and other steam-engines of the plant as the steam directly employed in the manufacture of the water gas. The exhaust steam is collected from the various steam-operated power-supplying devices—blowing engines, pumps, exhausters, and the like—used in the plant, and utilized as the principal or only source of steam fed into, and decomposed in, the generators during the period of water-gas production. The economy in the amount of high-pressure steam used, and in the apparatus necessary for the production of the steam used resulting from the use of the same steam twice over, first in the production of power, and, secondly, in the manufacture of gas, is obvious. Prior to its admission to the generators, the exhaust steam may or may not be superheated, as the conditions of the plant make desirable.

When the invention is applied to a single generator, it is preferred



Glasgow's Improved Water-Gas Plant.

to automatically divert the exhaust steam from the blowing and other engines directly to the atmosphere during the blowing period when no water gas is produced—thus decreasing to a minimum the steam consumption of the engines during the time when no steam is used in the generator and the blowing engines are working at full load. But it will, of course, be understood, the patentee remarks, that in the ordinary gas plant (illustrated and hereafter described more in detail) there are a plurality of gas-generators or generator sections, and that the blast takes place in some of the generator sections, while the "run" or generation of water gas takes place in other sections, and, in general, the blowing engine supplying air for a blast in one generator section at one instant, at the same instant supplies exhaust steam to another generator section in which water gas is then being formed.

In the diagrammatic representation of a water-gas plant arranged in accordance with the present invention, there is a set of gas-generators G, a set of steam operated blower-pumps B, a set of exhaust-pumps X, a set of water-pumps P, and a battery of boilers C. The boilers (heated in any suitable manner, as by independent fires or by heat derived from the gases passing out of the gas-generators) are connected to a steam-supply main S, from which pipes run to the various blowing engines, pumps, and exhaust pumps. These power supplying, steam-driven devices exhaust through pipes into a low-pressure or exhaust steam assembling main M. Pipes also run from the main M, one to each of the generators G, to supply the steam directly used therein in the manufacture of water gas.

The pressure existing in the exhaust steam assembling main M is directly controlled by an adjustable or regulating relief valve A, which can be set to open at any desired point to thereby limit the maximum pressure obtained under normal conditions in the pipe. Preferably, also, an ordinary safety relief valve V is provided, which automatically puts the main M in communication with the atmosphere when the pressure in the main exceeds the pressure at which it should be maintained by the regulating valve A. Any excess of steam required in the main M over that supplied through the exhaust pipes may be supplied from the live steam main S and the automatic pressure-reducing valve R, set to open at a pressure in the pipe M slightly below the pressure at which the valve A opens.

The pressure maintained in the main M should be sufficient—say, 3 lbs. per square inch—to cause the gas to pass at the proper rate through the generating and cleaning apparatus. Assuming that a pressure in the exhaust main of about 3 lbs. per square inch is desirable, it is preferred to set the valve A to open at about $3\frac{1}{2}$ lbs. per square inch, and to set the valve R to open at about $2\frac{1}{4}$ lbs. per square inch pressure, and to set the safety valve V to open at (say) $3\frac{1}{2}$ lbs. pressure. The regulating cocks should then be set to pass the required quantity of steam to the generator at a pressure in the main M of 3 lbs.; the steam being turned on and off from the generators by the ordinary cocks. By adjusting the various valves or cocks, the pressure in the supply main M and the rate at which steam is supplied to any particular generator may obviously be varied as desired—thus "making possible a very satisfactory and desirable regulation of the operation of the plant."

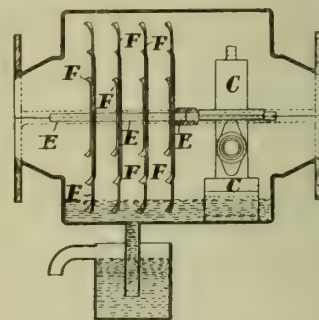
In concluding his specification, the patentee remarks: "It has been suggested, in apparatus for the generation and utilization of steam and gases, to employ in combination, a steam-generator, two gas-producers with controllable air supply, an explosion chamber in communication both with the generator and each producer, a fluid motor receiving its supply of fluid from the generator and with its exhaust controllably opening into each producer, and means (such as a thermostat) in each producer operated by the temperature of the producer, whereby the communication between the explosion chamber and each producer is opened and closed simultaneously and respectively with the closing and opening of the air supply and of the aforesaid exhaust openings to the producers. It has also been suggested that surplus gases from such a system, including water gas, may be taken off for illuminating or other purposes. As a result of my experience, I believe such a system would be unsatisfactory for the production of water gas for ordinary purposes; and I wish it to be understood that the expression 'steam' throughout this specification is not intended to include a gaseous fluid consisting of explosion products and steam."

Gas Scrubbers or Purifiers.

FARNHAM, R. V., of Wemyss Bay, N.B.

No. 28,233; Dec. 28, 1908.

This suction-gas scrubber is shown in vertical longitudinal section. It comprises an outer casing made in two parts and is interposed in the line of piping leading from the generator to the engine to be driven.



Farnham's Suction-Gas Scrubber.

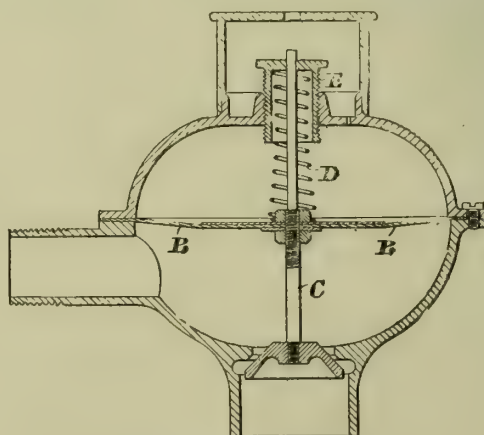
Within the casing is rotatably mounted a Pelton wheel C or turbine. Coupled to the spindle of this wheel is a spindle E carrying a series of flat radial blades F, slightly feathered at their outer ends and spaced apart. Water for actuating the wheel is admitted through an orifice in the casing coupled to the inlet G. The spent water from the wheel is allowed to accumulate in the bottom of the casing to about the depth shown (as allowed by the overflow device), so that when the wheel is rotated, the blades will throw off a fine spray, filling the scrubber casing, and through which spray the gas must pass on its way from the generator.

Gas-Regulator.

POOLE, W. W., and MANOCK, E., of Poole.

No. 6263; March 16, 1909.

This gas-regulator is of the type in which a diaphragm divides a chamber and operates a check valve through an adjustable spindle.



Poole and Manock's Gas-Regulator.

The vessel is provided at its lower side with the gas-inlet passage, and at its side with the outlet; and it is divided into an upper and a lower part by the flexible diaphragm B. At the centre of the diaphragm is the valve-spindle C, carrying a conical valve at its lower

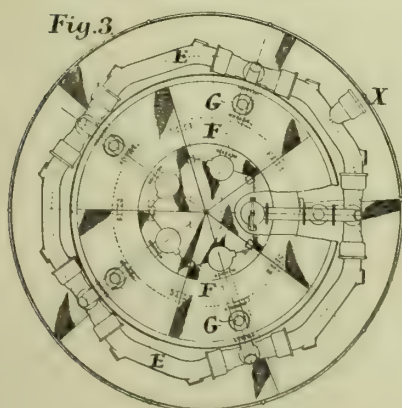
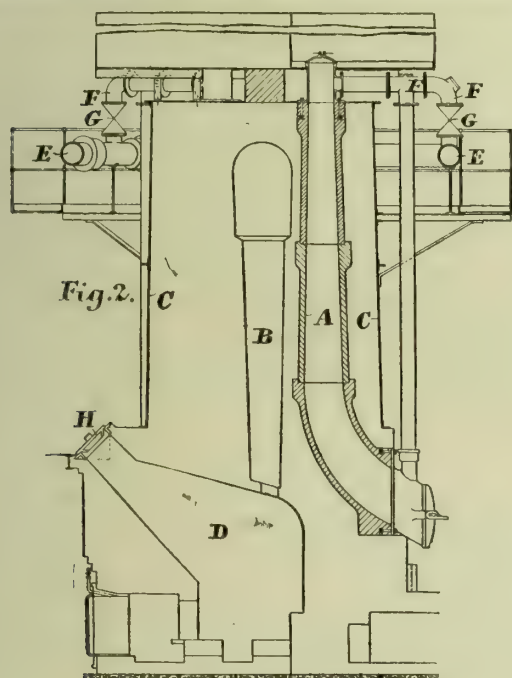
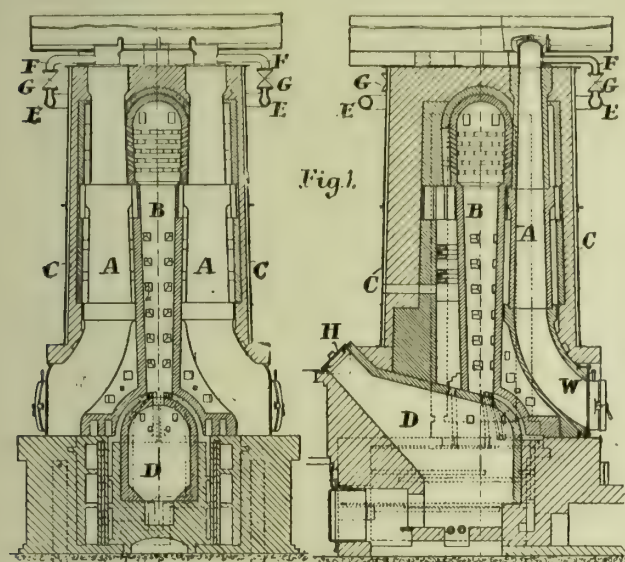
end, which meets the conical seating of the regulator chamber. On top of the diaphragm bears a spiral spring D, surrounding the upper end of the spindle; and in the top of the vessel is screwed the adjusting cap E, within which lies the upper end of the spring. The pressure exerted upon the diaphragm is adjusted by screwing the cap more or less into the chamber. The adjusting cap is protected by an outer cover.

Retort-Furnaces for the Manufacture of Gas.

THOM, T. M., of Cheshunt, and PRYOR, H., of Saffron Walden.

No. 24,332; Nov. 12, 1908.

This invention has reference to apparatus for the manufacture of gas—"for instance, carbonic acid gas by decomposing limestone, or illuminating gas by the carbonization of coal"—and for other purposes. The apparatus "comprises closed retorts of special design so arranged and constructed that atmospheric air is rigidly excluded from the interior thereof."



Thom and Pryor's Vertical Retorts.

Fig. 1 shows vertical sections of apparatus suitable for making carbonic acid from limestone. Fig. 2 is an elevation (partly in section and

partly in outline) showing the modification necessary when making illuminating gas. Fig. 3 is a plan.

The apparatus comprises a number of closed retorts A set in brick-work vertically, or approximately so, around a central combustion chamber B and within an outer steel casing C. Beneath the combustion chamber is a producer D, and near the top is a ring main E having branches F communicating with all the retorts and being provided each with its own cut-off valve G. The gas-yielding substance is fed into the retorts at the top, and the lime or coke is discharged at the bottom—both provided with gas-tight mouthpiece covers. The producer D is charged by the mouthpiece H. Inlets are arranged, one on each side of the clinking door, to admit primary air, which is raised to a high temperature before entering the producer proper.

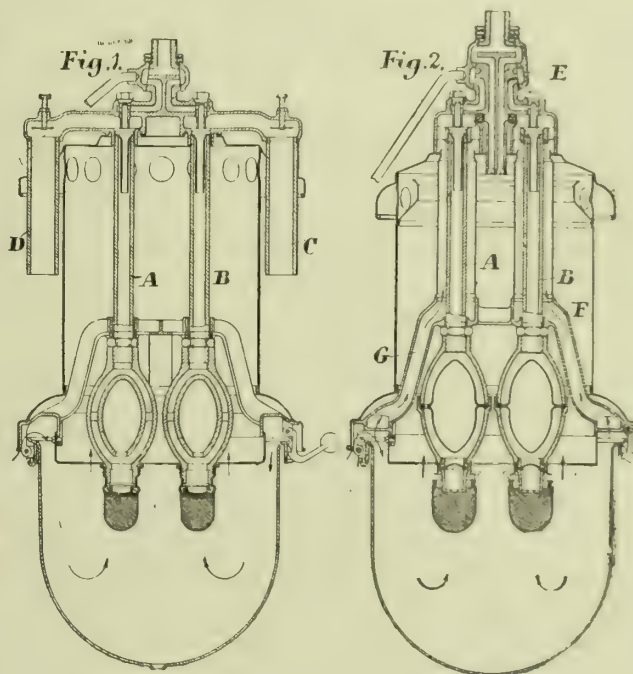
When carbonic acid gas is being made, steam-jets enter at the lower mouthpieces of the retorts as shown at W, controlled by cocks. The steam (superheated) forces its way through the limestone, partially disintegrates it, and effects the liberation of the carbonic acid more quickly and at a lower temperature than by other known means. The steam continuing to rise, carries with it the carbonic acid, and obviates the tendency of the latter, which is a sluggish gas, to become reabsorbed after liberation from the limestone, thereby forming sub-carbonate of lime. When, however, illuminating gas is being made, no steam is introduced into the retorts. Consequently, the apparatus is without the steam-pipes; but the lower ends of the retorts are connected to the branch pipes F. The ring main E for the illuminating gas plant is preferably formed as shown in the plan. Platforms near the top of the apparatus give convenient access to the ring main and to the retort upper mouthpieces. From the ring main the gas passes by the outlet X to a gasholder through the usual cleaning apparatus.

Inverted Incandescent Gas-Lamps.

EHRICH AND GRAETZ, of Berlin.

No. 10,945; May 8, 1909. Date claimed under International Convention, Jan. 8, 1909.

This invention relates to gas-lamps intended for the open air and to work with pressure gas or with pressure air. The object is to produce a lamp which shall be easily dismantled, and in which the parts requiring frequent attention and adjustment are easily accessible without dismantling the lamp in any way.



Improved Graetzin Lamps.

Fig. 1 is a section through a multiple-burner lamp to work with pressure gas. Fig. 2 shows a lamp to work with pressure air.

Above the upper part of the lamp is arranged a structure in which the air suction chambers are formed; and screwed into the upper structure and opening from the suction-chambers are two straight vertical burner-tubes A B. Leading to the suction-chambers are also air supply pipes formed in connection with two pipes C D, which are extended downwardly to a point well below the openings in the casings through which the burnt gases find their exit to the atmosphere. In order to make the lamp storm-proof, the upper structure is provided with annular ridges arranged concentrically with the bosses to which the burner-tubes are fixed. The ridges press on the cover-plate of the lamp casing, which has the edges of the holes through which the bosses for the burner-tubes pass turned up, as shown. In this way, rain is prevented from finding access to the interior of the lamp.

In addition to the advantages mentioned, the lamp is simple in structure and "enables the application of straight burner-tubes which, as is known, offer least resistance; while at the same time the objections usually associated with straight burner-tubes are avoided." In order to secure a sufficient air suction to the lamp, it is necessary that the air should be as cool as possible—that is to say, the air should not be expanded by heat. By arranging the mixing or suction chamber externally and above the lamp, considerable advantage in this respect is said to be obtained, as the mixing-chamber, being in the open air, readily gives up its heat, and thereby remains comparatively cool. Further, this action is increased by forming the mixing-chamber not

out of sheet metal, but out of comparatively thick-walled cast metal, which permits of very rapid conduction of the heat. The objections associated with the suction of air from a point above the chimney openings are said also to be avoided; while at the same time, by employing downwardly opening pipes, the action of the lamp is not disturbed by wind.

According to fig. 2, the lamp is intended to work with pressure air while the gas is under normal pressure. The pressure air is fed side-wise by connections not illustrated, and passes to an annular channel E, from which it flows to the burner-nozzles, which project into the suction-chambers opposite the burner-tubes A B. Around these burner-tubes are arranged tubes which open at their upper ends into the suction-chambers formed in the lower cast structure, and connected by the hollow radiating arms F G with the external air. Air passes through these arms in the direction shown by the arrows, and upwards through the annular space between the burner-tubes and the outer tubes. Owing to the heating action of the gases rising through the casing, this upward current is to some extent stimulated.

The conduction of the air into the suction-chamber by means of passages which are heated by the waste gases and through a tube surrounding the burner-tube is known, the patentees remark. The novelty in the present construction resides in providing a passage for additional air adapted to open into a suction-chamber arranged above the lamp casing and exposed to the air. In this way, the somewhat heated air rising through the annular space between the burner-tube A and its outer tube is cooled; and "such cooling is of great advantage in providing a proper mixture." It is not necessary, however, that the tubes surround the burner-tubes, as they may, if desired, be arranged separately, or the mixing-chambers may be supplied with their additional air by a common pipe.

APPLICATIONS FOR LETTERS PATENT.

- 22,514.—WYLD, W., and GREEN, H. E., "Utilizing sulphuretted oxide of gas-works in the manufacture of sulphuric acid." Oct. 4.
 22,659.—ROSE, A., BELLAMY, W., and DOLPHIN, J., "Inverted incandescent burners." Oct. 5.
 22,703.—BLOXAM, A. G., "Mantles." A communication from Sparlicht G. m. b. H. Oct. 5.
 22,757.—CALDWELL, R. S., OLDHAM, S. C., CLAYTON, M. G., and JONES, T. T., "Pipe-connections." Oct. 6.
 22,758.—DUCELLIER, G., "Generating acetylene." Oct. 6.
 22,781.—ROSS, F. W. F., "Valves." Oct. 6.
 22,804.—BRITISH THOMSON-HOUSTON COMPANY, LTD., "Fluid meters." A communication from General Electric Company. Oct. 6.
 22,805.—SPARKS, E., "Pressure-controllers for operating gas-lighting systems." Oct. 6.
 22,811.—WOODALL, H. W., and DUCKHAM, A. M'D., "Removing the residue from gas-retorts." Oct. 6.
 22,833.—FLEITMANN, R., "Fire-proof metallic incandescent mantle holders, protectors, and other parts of incandescent lamps exposed to the heat." Oct. 6.
 22,881.—GADD, W., "Spirally guided and spirally supported gas-holders." Oct. 7.
 22,941.—OSTERBURG, R., "Suspending lamps which are raised and lowered by means of cords." Oct. 7.
 22,965.—LAYTON, A. E., "Syphons for the collection and removal of liquid in gas mains or pipes." Oct. 8.
 22,975.—DAVIES, J., "Gas-engines." Oct. 8.
 23,082.—YATES, H. J., "Gas-fires." Oct. 9.
 23,096.—SIMON, A. L., "Carburetted air." Oct. 9.

Bradford Deputation's Visit to the Continent.

A deputation of the Bradford Gas Committee who recently visited Germany and Belgium for the purpose of inspecting the retorts in use in the gas-works of several cities, presented their report at a meeting of the Committee last week. After inspecting the new incandescent lighting in Fleet Street and across the Blackfriars Bridge extension in London, the party proceeded to Berlin, where they examined the Dessau vertical retorts of the Imperial Continental Gas Association. In the German capital also they saw the installations of high-pressure gas for street lighting purposes. At Munich, the works belonging to the Municipality were inspected; particular attention being paid to the carbonizing chambers, which supply gas for the whole city. At Cologne, only vertical retorts were in operation, all the horizontal retorts, though only ten or fifteen years old, having been abandoned. The extensive coal and coke handling plant was examined, as well as the street lighting of Cologne and also of Brussels. In summing up their report, the deputation stated that, in their opinion, some form of vertical retorts or chambers will eventually supersede the horizontal retort, and that an enormous saving of labour, and a considerable improvement in the value of residuals, would then follow. The report was accepted; and a cordial vote of thanks was given to Mr. Geldard and Alderman J. Triffit for their services during the past year as Chairman and Deputy-Chairman respectively; every member of the Gas Committee present speaking in support of the resolution.

Earl Wharnccliffe's Water Supply at Tankersley.—The Earl of Wharnccliffe has a water scheme which supplies the parish of Tankersley. This, according to Mr. C. J. E. Broughton, the Earl's Agent, and Chairman of the Wortley Rural District Council, has been the least satisfactory of his Lordship's undertakings, and has been continued mainly for the convenience of his tenants in Tankersley. But the supply touches the settlement of Pilley, which is largely owned by Earl Fitzwilliam; and Mr. Broughton told the Council that the time had arrived when the supply to this part of the area should be discontinued. Six months' notices to that effect were being issued; and the Council were warned they had better prepare a scheme of their own for the supply of water to the township of Pilley. The Council took due cognizance of the fact.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Retort Order for London Gas-Works to Go to Germany.

SIR,—At a Board meeting on Wednesday last, tenders for the whole of the retorts required for next year's renewals at two of our works were, upon the recommendations of the respective Engineers, supported by Mr. Doig Gibb, ordered from a German firm—the Stettiner Fabrik Chamotte.

The works referred to have had experience with various makes of British retorts; and the requests for the productions of our Continental friends have been made after giving the fullest consideration to the increased first cost.

It may be asked, "Why stop at two works? Why do you buy any of your retorts in Great Britain?" The answer is that we have endeavoured to follow a path between "Profit" and "Patriotism;" for it is certain that if we only studied the former consideration, we should import the whole, and not a part, of our retorts.

The saddest part of the story is that the Germans are in no better position as regards raw materials than ourselves—probably worse.

Was it not Opie who, when asked what he mixed his colours with, replied "Brains"? When will the British manufacturer use the same article in compounding his retorts?

South Metropolitan Gas Company,
Oct. 16, 1909.

CHARLES CARPENTER.

Horse-Power Rating of Gas-Engines.

SIR,—Permit me through your columns to suggest to makers of gas-engines the advisability of revising the indicated and effective horse power stated in their lists as given by various sizes (generally indicated by a letter), when running on town's gas. Some makers add the adjective "good" before town's gas, in order to indicate that the horse powers stated are the maximum powers guaranteed with gas of 700 B.Th.U. value.

As the horse power given by an internal combustion motor is dependent to a certain extent upon the calorific value of the gas supplied, and 600 B.Th.U. is very much nearer the heat value of town's gas than the figure 700 B.Th.U. upon which makers base their horse power, it is obvious that the powers now given on lists are overstated, with the result that unless an engine is selected much in excess of the rated power, the user will find it too small for his requirements. It should be remembered that the internal combustion motor, unlike a steam-engine, will if overloaded stop. Thus a moderate reserve of power which the engine may be called upon to develop should always be allowed for, so as to prevent stoppages owing to insufficient power.

In addition, probably the majority of gas-engines are upon most economical load when running at about 80 per cent. of full load.

As matters now stand, a consumer selects an engine of a certain type, and expects it, when fixed, to give the full power at which it is listed by the makers. Hence it would be much better for all gas-engines to be so listed as, with ordinary town's gas of 600 B.Th.U. gross or 540 B.Th.U. net, to give the full power for which they are rated. Similarly the effective horse power with producer gas appears to be over-stated unless the engine is running on an exceptional high calorific gas.

It is often difficult to get power users to select a size of engine with a good margin of power; and their difficulties arise owing to engines stopping in consequence of being overloaded—the result being that the engines are condemned as unreliable.

The writer has recently lost two gas-engines, each of between 30 and 40 H.P., which have been replaced by steam simply on account of continual stoppages owing to over-loading causing much annoyance and loss.

Derby, Oct. 16, 1909.

J. FERGUSON BELL.

Improperly Fitted Geysers.

SIR,—Referring to a paragraph in your issue of the 5th inst., respecting a fatality attributed to a geyser, it would seem that the flames of the burner had become extinguished owing to a back-draught, causing an escape of unburnt gas. Had a "baffle" or interceptor, such as is made for the purpose, been fitted in the vent-pipe, the back-draught (probably only temporary) would not have affected the burner. It is recognized that it is useless to discharge a geyser vent directly into the open air without some such provision; and in all probability the makers of the apparatus issued instructions to this effect—only to be ignored by the fitter.

Another consideration is that if a geyser is fitted with combined gas and water taps, or any arrangement for ensuring that the gas supply is shut off when cold water ceases to flow, the mere act of turning off the water (and consequently the gas) when the bath is prepared, removes any possibility of a continued escape of unburnt gas.

The fatality recorded is another instance of the necessity for careful selection and particularly proper fitting of geysers. That they then can be made absolutely safe is evidenced by the thousands in daily use, to the entire satisfaction of the owners.

Birmingham, Oct. 14, 1909.

T. E. BARRALET.

Kenilworth Water Company.—The annual meeting of this Company was held on Saturday, the 2nd inst.—Mr. T. S. Morris presiding. In moving the adoption of the report, which recommended the payment of a dividend of 6½ per cent. free of income-tax, the Chairman made a statement as to the extension works which the Company have in hand. Mr. Charles Hawksley had reported the sinking of a new well near the existing one, and it was down 180 feet. He said there was every prospect of an additional supply of water for the needs of the future. The report was adopted. It is stated in a local paper that the bore of the new well is 13½ inches internal diameter for the first 100 feet, and 11½ inches for the second 100 feet.

LEGAL INTELLIGENCE.

RATING OF GAS-WORKS FOR WATER SUPPLY.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.—Thursday,
October 14.

(Before Mr. Justice NEVILLE.)

South Suburban Gas Company v. Metropolitan Water Board.

This was an action brought by the South Suburban Gas Company to determine whether the Metropolitan Water Board are entitled to charge a gas company 5 per cent. on the rateable value of their property, as in the case of an ordinary domestic supply, for water used on their works, or whether such a company are entitled to a supply by meter, as for trade purposes.

Sir ALFRED CRIPPS, K.C., Mr. PETERSON, K.C., and Mr. R. J. NEVILLE (instructed by Messrs. Blyth, Dutton, Hartley, and Blyth) appeared for the plaintiffs; Mr. DANCKWERTS, K.C., and Mr. A. B. SHAW (instructed by Mr. Walter Moon, the Solicitor to the Metropolitan Water Board) represented the defendants.

Sir ALFRED CRIPPS, in opening the case, said the question raised was one of general importance, because it would affect all water and railway companies, as well as factories. He did not think there were any facts in dispute, and they appeared clearly on the statement of claim. The plaintiff Company was incorporated by Act of Parliament, and their area extended over about 15 square miles in the Penge district. They occupied premises and buildings for the manufacture and supply of gas, but no person slept or resided on any part of them, and no inhabited house duty was payable thereon. One of the obligations on the Company under the Factory Acts was to provide proper sanitary appliances for their workpeople, who numbered 380; and there were altogether eight water-closets and urinals and 42 water-taps. Up to a recent date, the water was supplied by meter, according to an agreement originally made with the Lambeth Water Company; and the annual payments had been about £49. It had been discovered that there had been some under-payments which had been adjusted; and it was now agreed that the annual payment would be from £50 to £60 per annum on the meter scale. In December, 1907, the defendants gave the Company notice terminating the agreement, and said that after April 1, 1908, they would only afford a supply of water on the terms prescribed by the Charges Act—viz., on the rateable value, as for a domestic supply. This value, including the mains and other appliances, was £17,693. On Sept. 28, 1908, the plaintiffs gave notice of their intention to discontinue taking water from the defendants; and they had now done so. The defendants sent in a demand for the quarter ending Midsummer, 1908, for £221 3s. 3d., and subsequently a similar demand next quarter; so that the payment demanded amounted to £884 per annum. The question turned on the basis upon which the defendants were entitled to charge the plaintiffs for water supplied to them during the period between March 25 and Oct. 21, 1908; the plaintiffs contending that they should be charged by meter, whereas the defendants maintained that they could charge on the rateable value of the premises, notwithstanding that the plaintiffs had not made any demand to be so supplied. Alternatively, the plaintiffs said that, if the defendants could, under the Act, charge 5 per cent. on the rateable value of the property, they were entitled to a certain rebate under one of the sections. No special point was raised by the defendants, who simply relied on the construction of the Act. Counsel then put in a plan of the premises and works, showing where the various water-fittings were placed, and remarked that, if the defendants' contention were right, every factory of this class would be charged, as a minimum, 5 per cent. on its rateable value, because, of course, every factory must have water-closets, urinals, and facilities for washing, &c.

Mr. DANCKWERTS (interposing) said that this was not at all his contention.

Sir ALFRED CRIPPS said he did not know what his learned friend's contention might be, but this would certainly be the result.

Justice NEVILLE thought the real question was whether these were "domestic purposes," under the circumstances within the meaning of the Act.

Sir ALFRED CRIPPS said this was the real question; and it would follow that in any factory where there were similar facilities afforded, the Water Board could charge on the rateable value of the premises. The plaintiff Company were rated not only in respect of their works but also of their mains, which had nothing to do with the question of water supply; the result being that with a very small use of water, which would be fairly paid for by £60 a year, they were to be charged a minimum of £880. The learned Counsel then read the material sections of the Metropolitan Water Board (Charges) Act, 1907, and said section 8 provided that the Board should, at the request of an owner or occupier of any house or building, or part of a house or building, occupied as a separate tenement, or of any person entitled to require a supply of water for domestic purposes, furnish such supply at a rate per annum not to exceed 5 per cent. on the rateable value. He should argue that this section had no application at all to a gas company's premises, which did not come within the words "house or building." Section 9 provided that where a supply of water for domestic purposes was afforded to any building occupied solely for any trade or business which was assessed at a sum exceeding £300 per annum, a certain rebate or discount should be allowed, not being less than 20 or more than 30 per cent. on the water-rate; and there was a provision that the rebate should not have the effect of producing a charge of a less amount than 5 per cent. on £300.

Justice NEVILLE remarked that the effect of this appeared to be that £15 a year was the least rate at which one could get a glass of water to drink in any business premises.

Sir ALFRED CRIPPS said this was so. Section 13 might, he thought, be important. It provided that the rateable value of any house or part of a house should be determined by the valuation list in force; and

there was a proviso that if no rateable value were shown in the list, it should be determined in the manner provided by section 68 of the Water-Works Clauses Act, 1847. His suggestion was that this was meant to apply to a case where a railway station master or a gas-works manager resided on the premises and used water for domestic purposes, and where the particular premises were not separately rated. Section 16 provided that the Board should, at the request of any owner or occupier of premises in or adjoining any street in which their service was laid, who required a supply of water for use on such premises by measure for purposes other than domestic, afford such supply by means of a meter. Up till recently, the water was supplied to the plaintiffs on this system; but notice had been given that this could no longer be done, as the water was required for domestic purposes. He should argue that the section applied, and that it was not using water for domestic purposes to merely provide such sanitary arrangements as were necessary in the case of any factory. Subsection 2 of the section gave the basis of charge which varied according to the quarterly consumption of water, which in the plaintiffs' case came to 9d. per 1000 gallons. There was a minimum charge, and also a provision that in the case of a railway, where the premises were connected, though the water was delivered from two or more meter pipes, the whole supply should be treated as one. This was, of course, to enable large consumers to get the benefit of the lower charges. He submitted that section 16 was a new departure, inasmuch as it put an obligation on the Board to supply water for trade and manufacturing purposes by meter, whereas previously this could only be done under agreement. Section 20 provided that the Board were not to be bound to afford a supply of water otherwise than by measure to any house or building whereof any part was used for trade or manufacturing purposes for which the water was employed, or to any common lodging house, barracks, workhouse, or other public institution; and there was a proviso that, where the Board declined to afford a supply otherwise than by meter, they should be bound to supply by meter. Except in certain cases, the amount to be charged by meter was not to be less than it would have been if a domestic supply had been given. This again was in favour of the Board, to ensure a minimum payment. By section 24, there was power to supply by agreement in certain cases, with a proviso that the terms on which such supply should be furnished should be the same under like circumstances to all consumers. Section 25 was important in this respect—that there had been various decisions as to what was included in the words "domestic purposes." It appeared to him that the section removed the difficulties which had arisen on these decisions, because it said in effect: Supposing the water was being supplied for domestic purposes, certain matters were included and certain others excluded; and it said that, for the purpose of the Act, the expression "domestic purposes" should be deemed to include closets and baths not containing more than 80 gallons, but should exclude a supply for any of the purposes specified, which included railways, ventilating, consumption by, or washing of, horses, washing carriages or other vehicles, watering gardens, fountains, cleansing sewers, flushing drains, fire extinction, and any trade, manufacture, or business. He submitted that a gas undertaking was all three—a factory, a trade, and a business. He did not, however, think that the words "trade, manufacture, or business," would carry him the entire length he wished to go regarding the interpretation of the Act. It simply said that, if a person took a supply of water for only domestic use, he must not employ it for any of the excluded purposes; and that if he did, some extra charge would be made. The importance of this was that it put an end to certain complications which had arisen, and defined once for all what the water might be used for if it was supplied at the domestic rate. The first question was: Did section 8, which enabled an occupier to require a supply of water for domestic purposes, apply at all?

Justice NEVILLE suggested that plaintiffs came under section 13.

Sir ALFRED CRIPPS said possibly this would be so, if the rateable value of the property had to be ascertained at all. He submitted, however, that the section only applied if any person lived on the premises.

Justice NEVILLE said that if the words "domestic purposes" meant what he had always understood them to mean—drinking, washing, and sanitary arrangements—then the purposes for which the plaintiffs wanted the water were "domestic." It did not follow, however, that the Water Board would be entitled to charge on the annual value of £17,500, because one must have the buildings in which these conveniences were placed; and it might be that what the plaintiffs had to pay would depend on the rateable value of these buildings. As they were not found in any valuation list, the value would have to be ascertained under section 68 of the Water-Works Clauses Act.

Sir ALFRED CRIPPS said this might perhaps be a solution of the difficulty; and, if that view were adopted, he did not think it would make much difference to the plaintiff Company. He submitted, however, that the section was really intended to come into operation in such cases as he had already mentioned, where someone resided on part of the premises, and so made the supply a domestic one. His contention was that sections 8 and 9 really did not apply; and, if this were so, section 13 would not apply. If sections 8 and 9 applied in a modified form, then section 6 provided the machinery by which one could ascertain the rateable value of the particular portion of the premises to which this principle ought to be applied.

Justice NEVILLE suggested that a solicitor's office or a barrister's chambers would come under section 9 as a "house or building occupied solely for the purpose of any trade or business;" and this showed that one might have a supply of water for domestic purposes to premises on which nobody slept.

Sir ALFRED CRIPPS acknowledged that this might be so; and then, he said, section 13 would come in. He submitted, however, that one could not apply the expression "house or building" to the premises of a gas-works, which in the present case were, as he was informed, a factory covering 40 acres.

Justice NEVILLE said the Act dealt with a house or building, and in respect of this the occupier had a right to a supply of water. The test seemed to him to be not whether the house or building was a domestic one, but whether the water supplied was used for domestic purposes.

Sir ALFRED CRIPPS submitted that one could not call a gas-works

extending over 40 acres a house or building at all, and that the Gas Company would thus not be entitled to ask for a domestic supply. Section 16 set forth that the Board should, at the request of an owner or occupier of any premises, or any person who might be on such premises, supply water by meter for purposes other than domestic. This section would never become operative, as he understood it, if purposes other than domestic excluded what were necessarily incidents to every factory—proper sanitary conveniences. If this were so, the Board were quite logical in saying that this water was supplied for domestic purposes; and they were entitled to charge 5 per cent. on the total rateable value. Surely the Act could never have intended that, because there was a public convenience at a railway station, the railway company should be charged on the rateable value of an enormous station for the trifling quantity of water used there. It seemed to him a *reductio ad absurdum*, and that "domestic purposes" really meant domestic as connected with residential purposes.

Justice NEVILLE said he could not see the absurdity. There might be two co-existent rights. Supposing a man had a business in large premises which were not built on at all, that he required a large quantity of water, and that he obtained a supply, under section 16, for purposes other than domestic. Then supposing he put up a building in which a manager resided. In respect of this he would be entitled to apply for a supply of water for domestic purposes; but he would still be going on with the supply for business purposes under the meter charge, though entitled to a domestic supply, under the other system, as the occupier of a building or part of a building.

Mr. DANCKWERTS said the difficulty had been solved by the Court of Appeal, pointing out that in those cases there should be two supplies—one for domestic and the other for business purposes.

Sir ALFRED CRIPPS said that if the plaintiffs came under section 13 he did not think much objection would remain; but he considered they would be carrying the construction of the Act too far as against a gas company. He submitted that in a factory where, as an incident to the user of the premises, the occupiers were bound to have certain sanitary appliances for which water was required, these were not in the nature of domestic purposes as defined by the various Water Acts or by the present Act. The appliances were there by statutory obligation as a necessary incident to the carrying on of the factory.

Justice NEVILLE remarked that one of the uses was for water-closets; and, for the purposes of the Act, the words "domestic purposes" included water-closets.

Sir ALFRED CRIPPS said he did not think this was conclusive. It simply said that if one had a domestic supply the water might be used for closets. If an occupier was not having a domestic supply at all, but was supplied under section 16, the closets did not come within the ordinary domestic purposes, but were incident to the manufactory.

Justice NEVILLE thought this amounted to saying that, where a consumer had a supply of water for manufacturing purposes, he might use the water for domestic purposes if these were merely ancillary to the manufacture.

Sir ALFRED CRIPPS said he should not put it in that way. He thought it meant this: If the conditions were such that, in respect of manufacturing premises, one had a domestic supply, this would be so; but unless those conditions arose, there was no question of a domestic purpose at all. He did not think the expression "domestic purposes" included a water-closet—not provided in the ordinary way, but necessitated under the Factory Acts.

Justice NEVILLE said there had been a case before a learned County Court Judge with reference to a railway station; and the question there was whether a sanitary convenience brought the supply within the words "domestic purposes." The Judge held that it did not, but that it was, in truth, a railway purpose.

Mr. DANCKWERTS said it was not usual to quote there the opinions of County Court Judges. The case referred to was under appeal.

Sir ALFRED CRIPPS said he quoted it as his own opinion—namely, that "domestic purposes" did not apply at all, except to buildings which were of a domestic character.

Justice NEVILLE remarked that there might be a case where only a very small quantity of water was used for trade or manufacturing purposes, and yet there might be a large number of workpeople employed, necessitating the use of water for closets, &c.

Sir ALFRED CRIPPS said that in such a case the payment would be by meter, which was the proper system; so that the Water Board would get full payment under section 16. The learned Counsel then cited and commented upon several preceding cases, including *Pidgeon v. Great Yarmouth Water-Works Company** (the boarding-house case), *Barnard Castle Urban District Council v. Wilson and Others*† (the swimming-bath case), and the *South-West Suburban Water-Works Company v. Marylebone Guardians*‡ (the workhouse case).

Friday, Oct. 15.

On the resumption of the hearing this morning,

Sir ALFRED CRIPPS continued his argument on behalf of the plaintiffs, and referred to the case of the *Chester Water-Works Company v. Guardians of the Chester Union*,§ where the water supply was held to be partly domestic and partly trade, as in the Marylebone case. With regard to Cook's case, where the question was whether the occupier of a large warehouse in St. Paul's Churchyard, where no one resided, was held liable to pay on the rateable value, he pointed out the wide difference between the building there in question, and the premises of a gas company. Under the present Act, he should think there could be no doubt that the occupiers of such a building would be liable to pay on the annual value, but subject to the 20 or 30 per cent. rebate, under section 9. The cases of *Frederick v. Bognor Water Company*|| and *Busby v. Chesterfield Gas and Water Company*¶ were also briefly mentioned. In a case at Airdrie, it was held that a publican was entitled to a supply of water by meter (which was more favourable to him), and that the Commissioners could not insist on charging on the domestic rate. In

another Scotch case, it was held that a golf club house, in which no one slept, was not a dwelling-house within the meaning of the Burgh Police (Scotland) Act, and was not entitled to a supply of water at the domestic rate. All these old cases were, however, in his view, only useful to a limited extent; the recent Act having, in reality, introduced a new and complete code which covered many of the points discussed. He therefore reverted to a consideration of the Act, and again went through the sections and elaborated the points he had already made in opening the case; the main contention being that it did not follow that because one had a water-closet the supply was a domestic one. What the Act said was that where there was a domestic supply the water might be used for closets, but not for the other purposes mentioned in the section, which were specifically excluded. In considering the question of whether the supply was really a domestic one, the principle of the Scotch cases was applicable. The learned Counsel concluded by putting in the correspondence, which included a form of agreement submitted by the defendants, which specified a minimum quarterly payment of £221 3s. 3d., which would entitle the plaintiffs to take 4,423,000 gallons of water per annum. Subsequently a second form of agreement was submitted; but it came practically to the same thing.

Mr. DANCKWERTS said at that time the Water Board were under the impression that the plaintiffs were using the water for all manufacturing purposes.

Sir ALFRED CRIPPS said that might be so. There was no reference in the correspondence to the rebate under section 9; but there was a suggestion of it in the statement of defence. It also referred to section 13, which he had already submitted did not apply to the case.

Mr. S. Y. Shoubridge, the Engineer to the plaintiff Company, was then called to prove the plan of the works, showing where the various water appliances are situated. He stated that the works' area was about 40 acres, and that a great portion of it was not occupied by buildings. There was no resident caretaker, and the premises were used solely for business purposes. The water was employed for flushing the closets and urinals, for washing, and for drinking, both by the men and the horses. The whole of the water required for manufacturing purposes was drawn from a river which ran through the works, which were under the Factory Acts.

Cross-examined: He remembered a letter coming from the defendants in March, 1908, asking the Company to state what they considered to be the rateable value of the portion of their premises supplied with water. Such statement was not, however, sent. Several other letters were read, the effect of which was that the principle on which the charge should be made should be decided by the Courts; and a notice was sent to disconnect the supply. The places where lavatories, &c., were situated were buildings or parts of buildings. Two of the taps were in stables, and the water was used for washing the horses and carts as well as for drinking. The men were at work throughout the 24 hours; there being three shifts of eight hours.

Mr. PETERSON said he had not much to add to what Sir Alfred Cripps had said, but he pointed out that section 16 gave an owner or occupier the right to require a supply by meter of water for non-domestic purposes, which included any trade, manufacturing, or business purposes. What would be a domestic purpose in one case might not be so in another; it must depend on surrounding circumstances, which must be considered reasonably. This was well illustrated in the judgment of Mr. Justice Eve in the Bognor case.

The Defendants' Case.

Mr. DANCKWERTS, in opening the case for the defendants, pointed out that there was no claim by them for any money. They were not suing for anything; it was the plaintiffs who were asking for a declaration as to the basis of charge. Sir Alfred Cripps had said several times that until the Act of 1907 was passed there was no compulsory supply by meter for non-domestic purposes; but this was a mistake. In many of the Acts of the Water Companies, such as the East London and the New River, the Company were bound to furnish such a supply on demand, provided it did not imperil the sufficiency of the supply for domestic purposes. In the Act of 1907, the Water Board were in the same position, because section 32 provided that they should not be required to supply water for other than domestic purposes if it interfered with the sufficiency of the supply for domestic purposes. The main purview of all water legislation was to secure that there should be no incentive to stint the use of water for sanitary purposes; and therefore the overall charge was imposed for the domestic supply. The same principle was intensified in the case of the Water Board, who were a public body, not trading for profit, but supplying water for the use of the public; and any deficiency in the revenue being made up out of the rates on the whole area. Council went on to cite the section of the Water-Works Clauses Act, 1863, which set forth that domestic purposes should not include the supply of water for cattle, horses, washing carriages kept for hire, or any trade, manufacture, or business. He pointed out that this was the law on which most of the cases had been decided, and was still the law, except so far as it had been superseded by the Act of 1907. Here, with the exception of horses and carts, the water was all employed for domestic purposes; and this being so, it was quite immaterial, as he contended, to consider the nature of the premises on which use was made of the water. If the Gas Company wanted a supply for domestic purposes, they must take it under section 8, subject to section 20; and the amount of the rate must be fixed according to the proportional rateable value of the buildings on which the water was used to the rateable value of the whole premises. A person who wanted water for domestic purposes must pay for it on the 5 per cent. basis; and if, in addition, he wanted it for non-domestic purposes, he was entitled to it under section 16. But he must have a separate supply; he could not commingle the two. This was clearly laid down in the Marylebone Union case; and until he put himself in a position to have distinct supplies for domestic and non-domestic purposes, he was not entitled to any water at all. In order to meet what was considered in London the grievance of having to pay 5 per cent. on the annual value of large business premises, in which very little water was used, section 9 was introduced, giving in such cases a rebate of from 20 to 30 per cent. If Sir Alfred Cripps's argument were right, it would be impossible to have water used for domestic purposes on premises occupied solely for trade or business, and not assessed to

* See "JOURNAL," Vol. LXXVIII., p. 1390.

† *Ibid.*, Vol. LXXVIII., p. 397; and Vol. LXXX., p. 284.

‡ *Ibid.*, Vol. LXXXV., p. 636; and Vol. LXXXVII., p. 120.

§ *Ibid.*, Vol. XCVII., pp. 42, 229; and Vol. CI., p. 423.

|| *Ibid.*, Vol. CIV., pp. 287, 356. ¶ *Ibid.*, Vol. VII., p. 329.

house duty; but the only purposes for which it would be required on such premises were drinking, washing, closets, &c., all of which were defined to be domestic. So that his friend's construction made nonsense of section 9. Again, section 24 (which had not been referred to) got rid of all difficulty by providing that agreements might be entered into if there were any doubt about the applicability of the other sections. Counsel then proceeded to quote and comment upon the previous cases, especially the Marylebone Union one, which he submitted was conclusive. The position was simply this: There were the houses or buildings enumerated by Mr. Shoubridge in which there were certain conveniences; and the Company were entitled to a supply of water to them under sections 8 and 9; the amount being fixed according to the rateable value of the buildings in which the things were actually placed, the value of which would have to be apportioned in accordance with section 13.

At the conclusion of the learned Counsel's argument, a short discussion took place as to the form the order should take.

His LORDSHIP then delivered the following

Judgment.

I think the principal question I have to decide in this case is whether the plaintiffs, occupying large works extending over about 40 acres, are entitled, under section 16 of the Act of 1907, in respect of their premises, the gas-works, to a supply of water by measure for purposes other than domestic. The question, to my mind, is whether the purposes for which they want the water are other than domestic. Those purposes are not in dispute. The water is required for drinking, washing, lavatory, and sanitary purposes; and it is said that, though these purposes are *prima facie* domestic, yet if they are ancillary to the business carried on upon the premises—which are used for business purposes alone, are not charged with inhabited house duty, and upon which there is no one residing in any sense—they cease to be domestic. Section 25, which is a definition to a certain extent of what domestic purposes should include, is relied upon, because these are declared not to include "any trade, manufacture, or business." It is said that these purposes are for a business because they are necessary for the carrying on of the plaintiffs' business, inasmuch as they are bound to provide for their workpeople the sanitary arrangements they have provided. I notice that the words used in section 25—"any trade, manufacture, or business"—are identical with those used in section 12 of the Act of 1863; and therefore I think that the later decisions to which my attention has been called throw a light upon the construction I ought to give to this Statute. It seems to me they show that the inquiry is not whether the premises are used for business purposes, but whether the water is used for business or domestic purposes—that the uses in the present case are domestic. That this is the true construction to be placed on section 16, in connection with section 25, is, I think, very much assisted by the terms of section 9, which provides for a rebate upon the water-rate in cases where "a house or building is occupied solely for the purpose of a trade or business, or of any trade or calling by which the occupier seeks a livelihood." It seems to me that this is the exact position of the purpose for which the houses and buildings of the plaintiffs are used. I come, therefore, to the conclusion that the plaintiffs are entitled to a supply of water, under sections 8, 9, and 13 of the Act, but are not entitled to a supply for the purposes in question under section 16. The plaintiffs have come here seeking for a declaration; and I think this is the extent of the relief I can give them. I consider that, in the main, their contention has failed; and so they must pay the costs of the action.

FALL OVER A GAS-GRID.

In the Liverpool Court of Passage last Thursday, before the Presiding Judge (Mr. W. F. K. Taylor, K.C.) and a Jury, a case was heard in which a widow, named Minnie Johnson, 75 years of age, claimed damages for personal injuries from the Liverpool Gas Company.

Mr. Lias, for the plaintiff, explained that the claim was the sequel to an accident which befel Mrs. Johnson on the night of May 14 last. She was walking to her home in a court off Boundary Street when, passing along Heriot Street, she fell over a gas-grid, the lid of which, it was alleged, was raised about half-an-inch from the pavement. She fell heavily, and sustained injuries which had incapacitated her from following her employment as a seamstress for 22 weeks. She was still unable to work, and had already lost £8 16s. in wages. The plaintiff gave evidence in support of this, and said she was afraid she would not be able to do any more work, as she still suffered from pains in the head and an injury to her wrist. A woman living in Heriot Street said she had tripped over the same grid some days before plaintiff did. Mr. Maxwell, for the defence, submitted that there was no evidence of negligence on the part of the Gas Company. They were obliged, under statutory powers, to have these grids in the pavement; and it was not suggested that they were wrongly laid. Mr. Lias contended that the grid must have been out of repair, or it would not have projected. It was the duty of the Gas Company to see that these grids did not form an obstruction; and he remarked that there must have been some laxity of supervision. The Judge intervened with the remark that a boy might have mischievously opened the grid, or some grit have got into it. Mr. Maxwell said no complaint was received by the defendants until June 3. All the gas-grids in Heriot Street were at once examined, and were found to be in perfect order. Mr. Telfer, Street Superintendent of the Gas Company, spoke to the constant examination of the grids by himself and his subordinates. The foreman of the district in question had charge of an area 4 miles square; and there was a grid to every house.

The Jury returned a verdict for the plaintiff, assessing damages at £20. Judgment was, however, reserved pending legal argument.

Liability for Prepayment Meter Robberies.

At the Bristol County Court on Monday of last week, Judge Austin heard a claim by the Bristol Gas Company against Mr. J. W. Dite. Defendant had a prepayment meter; and one day last June the Com-

pany received a post-card from him saying that it had been broken open and the money stolen. A collector visited defendant's house; and on examining the meter, found that the box had been broken open, and that the money was missing. The amount which should have been in the box was 7s. 9d., to correspond with the gas consumed; but there was only 1rd., showing a shortage of 6s. 8d. For this amount, the defendant was sued. Defendant contended that he was not liable, because he said the box had been broken open by some thief; but his Honour, in giving judgment for the plaintiffs for the amount claimed and costs, said the defendant had entered into an agreement with the Gas Company to pay for the gas registered by the meter and to keep their fittings free from damage, and therefore he must pay. Another case against Mr. J. Mortimer was heard, with a like result. There a sum of 9s. 10d., the whole of the money which should have been in the box, was missing.

A Summons under the Building Act.

At the Greenwich Police Court last Friday, before Mr. Gill, the South Suburban Gas Company were summoned by Mr. J. Tolley, the District Surveyor, for contravening the London Building Act by erecting a building without giving him notice. Mr. Blyth (Messrs. Blyth, Dutton, Hartley, and Blyth) appeared for the Company. Mr. Tolley said he understood that the Company would plead guilty. On the 8th of May he discovered that the Company were erecting a motor garage, of the building of which he had had no notice. He suggested that a nominal penalty would cover the case. Mr. Blyth asked the Magistrate to take into consideration the fact that it was only during the past summer that a decision had been given which covered this case. There were many exceptions; but the Company now recognized that the law required them to give notice to the District Surveyor. Mr. Tolley said he did not know until Thursday that the case would be undefended, and he asked for costs. Mr. Gill fined the Company 20s., with two guineas costs.

Daring Meter Robbery by a Schoolboy.

At the Marylebone Police Court, last Friday, before Mr. Plowden, a schoolboy named Albert Kerr, aged 13, living at No. 26, East Street, Marylebone, was charged with stealing 3s. 3d. from the prepayment gas-meter in the adjoining house. Mr. Humphreys, who prosecuted on behalf of the Gaslight and Coke Company, stated that on the previous Tuesday Mrs. Presland, residing at No. 28, who had recently sustained a loss in her family, received what purported to be a letter from her sister at Tooting, written on black-edged paper, asking her to meet her without fail at Baker Street on Wednesday morning at 9.30, with her son, as "there has been more trouble down here," and she wanted them to go with her to Oxford Street on very important business. Having no reason to suspect the genuineness of the letter, Mrs. Presland kept the appointment; but her sister was not at the place named. On returning home, she found the house had been broken into, and 3s. 3d. stolen from the gas-meter. The front door was barricaded with planks; but a back window was open, and an entry had evidently been effected that way. The police were informed, and on Thursday afternoon, as the result of inquiries, Detective Hadlow interviewed the prisoner at school. He at first denied all knowledge of the theft or the letter; but when pressed by his schoolmaster, he confessed that he wrote the letter to decoy Mrs. Presland and her son away from home while he broke open the window. He said it was all through his mother. He had not had much food lately, and wanted a new suit in which to appear before Lord Roberts on Saturday, as he was to be presented with a gold medal for shooting. In addition to winning this gold medal, said Mr. Humphreys, the boy also appeared to be the champion athlete of his school. Mr. Plowden warned him that the suit he would soon wear would be a prison suit if he went on like this; and on learning that the lad had been previously charged with theft, he ordered him to receive six strokes with the birch rod.

Filtration of Paignton Water.

An inquiry was held at Paignton on Thursday by Mr. A. W. Brightmore, an Inspector of the Local Government Board, with reference to an application by the District Council for power to borrow £1986 for the provision of additional filters at the new water-works at Holne Moor. Mr. J. R. Mill, the Clerk to the Council, explained that, in consequence of the urgency of the matter, the work had been carried out. Teignmouth received its supply of water from the Paignton storage reservoir; and the District Council of that place sent samples of the water to Dr. Thresh for analysis. As the result, the Council required that additional filters should be provided. Mr. F. W. Vanstone, the Water Engineer, said the water had a slight plumbo-solvent action; and though the original filters and hardening beds were efficient up to their capacity, they were inadequate to deal with the maximum quantity of water required. Samples of the filtered water taken when the maximum quantity was being discharged had been submitted to Dr. Thresh, who reported that the water was satisfactory as far as its action upon lead was concerned. Dr. Vickers, the Medical Officer of Health, said the result of his examinations since the filters had been put down was to show that the water had an alkaline reaction. Lieut.-Colonel M'Kenzie, as a ratepayer, complained of the quantity of suspended matter in the water, but was told that this was of purely vegetable origin, and did not contain peatic acid. The Inspector visited the works at the close of the inquiry to see the arrangements made for filtering the water.

The Oswaldtwistle Urban District Council Gas Committee have approved the recommendations of a Sub-Committee appointed to consider estimates for proposed extensions of the gas-works, amounting to £10,500. The Committee recommend the Council to make application to the Local Government Board for sanction to borrow this amount, and an additional £2000 for the purpose of supplying and fixing gas-fittings, slot-meters, and cookers to houses in the district at present without them.

MISCELLANEOUS NEWS.

EDINBURGH PUBLIC LIGHTING.

Annual Report of the Inspector.

We have received the report of the Inspector of Cleaning and Lighting to the Corporation of Edinburgh (Mr. Geo. A. D. Mackay) for the year ended the 15th of May, and reproduce the following particulars.

In his introductory statement, Mr. Mackay says the reduction in the lighting hours authorized by the Municipal Council in the interest of economy, and referred to in his report for 1907-8, was continued throughout the year under review. Instead of all-night lighting of all the public-lamps and stair lights, which was in operation up to 1907, one-half only of the lamps were lighted from May 1 to Aug. 31, with full lighting of all the lamps from Sept. 1 till April 30 up to midnight, when one-half were darkened. The stair lights burn till midnight only from April 1 to Sept. 30, with all-night lighting from Oct. 1 to March 31. The Inspector thinks it right to call attention to the fact that the change has caused considerable dissatisfaction among the citizens, many of whom have addressed remonstrances to the department on the subject. His own opinion is that the partial darkness of the streets and stairs causes inconvenience, and is anything but conducive to the safety of life and property.

On the 15th of May last, the streets of the City were lighted by 10,242 incandescent gas-lamps and 1203 electric arc lamps; and the common stairs by 12,663 gas-jets and 198 electric lights. In the previous year, the number of gas-lamps was 10,081; and the increase of 161 is accounted for by additional lighting in areas on the outskirts of the city, &c. The number of electric arc lamps has been increased by 10; the additional lamps having been required to light up the south side of Princes Street, &c. The number of gas stair lights has gone up by 268; the previous year's total being 12,395. This increase is due to the demand for improved lighting, and also to new tenements. The 10,242 incandescent gas-lamps have a varied consumption, particulars of which are as follows: 755 have 2 feet, 8450 have 2½-feet, and 1037 have 3-feet burners. The Inspector says the 2½-feet burners give every satisfaction; and as those at present consuming 3 cubic feet become worn out, they are being replaced by the 2½-feet size.

It was stated in last year's report that a few experiments had been made in connection with the lighting of common stairs on the incandescent gas system. At the date of the report under notice, there were 13 stairs lighted; and the Inspector had nothing further to say on the matter.* Some progress is being made in the electric lighting of common stairs. In the previous report, it was shown that 69 stairs had been electrically lighted; the number of jets being 152. On the 15th of May, the number of stairs lighted in this way was 90; the lights employed being 198. Mr. Mackay says the demand for this system of lighting in the stairs of better-class tenements is on the increase, where electric mains are available. In compliance with a request by the Gas Commissioners, the Lighting and Cleaning Committee sanctioned a trial of incandescent burners in several quarters of the city.

The following is a summary of the expenditure on public lighting for the year under review:—

Street gas lighting, including cost of gas, with lamplighters' wages and incidental expenses	£24,385 13 4½
Electric lighting, including incidental expenses	11,339 13 8½
Stair lighting, including gas, wages, and other expenses	11,240 8 8½
Total	£46,965 15 9

The expenditure for 1908-9, compared with that of the previous year, shows an increase of £1550 19s. 11d., due to an advance in the cost of gas.

Mr. Mackay gives tables showing the progress of electric and gas lighting—in the case of the former from 1895-6 onwards, and in that of the latter from 1891—and the variations in the gas-rates during the latter period. The value of the lighting plant, as returned to the City Chamberlain, on the 15th of May last, was £20,545 7s. 11d. The Inspector says the waste of plant is very considerable, arising not so much from ordinary wear and tear as through carts and other vehicles coming into collision with the lamps, and not infrequently as the result of malicious mischief on the part of idle boys and night marauders. Breakages are very frequent from these causes; and the replacement of the damaged or broken lanterns and pillars represents a considerable annual expenditure.

GAS EXHIBITION IN BELFAST.

A first-class exhibition of gas appliances, promoted by the Belfast Gas Committee, was opened last Tuesday in the Ulster Hall of that city. No charges are being made for admission; and, in addition to the various exhibits, there are cookery lectures by Miss Miles, of Bristol, including special demonstrations for school children and illustrations of sick-room cookery for nurses.

The exhibitors include seven gas-stove manufacturers: Messrs. John Wright and Co. have a big display of special gas appliances, particularly of radiators, gas-fires, cookers, and boilers. Messrs. Fletcher, Russell, and Co. show cooking-ranges, hot-plates, special toasters and grillers, water-boilers, wash-boilers, smoothing irons, and other goods. Articles of a like character are exhibited also by Messrs. Wilsons and Mathiesons, Richmond Gas Stove and Meter Company, Messrs. R. & A. Main, Messrs. Arden Hill and Co., and the Cannon Foundries.

In the lighting department, Messrs. J. & W. B. Smith have an attractive range of their goods; and Messrs. George Hands and Co. show in the same line. As to the lighting of the hall itself, the "Belfast News

Letter" makes the following remarks: The exhibition was seen at its best in the evening, when full effect could be given to the magnificent display of high-power incandescent gas lighting installed by the James Keith and Blackman Company. Each of the large overhead lamps, of which there are eighteen, consumes 25 cubic feet of gas per hour, and develops a light of 1500 candles, or 60 candles per cubic foot. The beautiful, soft, penetrating light, which filled the hall and its approaches with its bright effulgence, was very greatly admired by visitors. It may be mentioned that the hall had to be specially piped for the exhibition; and the Gas Committee spared no expense to make perfect arrangements for lighting, heating, or other purposes. This part of the work was carried out by Mr. A. M'I. Cleland, the Superintendent of Mains, assisted by a staff of experienced gas-fitters.

There are demonstrations of laundry work and of baking on gas-stoves; while excellently furnished rooms lighted and heated by gas constitute an attractive feature of the show.

The Chairman of the Gas Committee (Mr. J. A. Doran, J.P.) presided at the opening ceremony, and said it was with extreme pleasure that he took the chair on the occasion of the opening of the first gas exhibition in Belfast. The first gas-works started operations in the city in the year 1823; and at that time the output was only 55,000 cubic feet, whereas to-day it was 2140 million cubic feet. They had now 46,340 consumers using ordinary, and 23,611 using automatic meters. A great amount of capital had been expended on the works up till the present time; and out of revenue £240,000 had been applied to the reduction of rates. At the end of the financial year they gave the handsome amount of £2400 for this purpose. There was another question which was a very burning one to the ratepayers at the present time—namely, the extension of the gas-works; but he did not intend to say very much on the subject. However, he desired to let them know that some three or four months ago he made a statement in the Corporation, that, with an extension of the works, those who used gas would be able to get it for 1s. per 1000 cubic feet. It might be interesting for them to know the price in other cities compared with Belfast, and in a moment he would quote the figures; but incidentally he might state that, if they did not get the proposed extension, it was nothing whatever to him, or to the Gas Committee. They were only doing what anyone would do for the benefit of the ratepayers. Some people might say that an extension was not required. This, however, was a matter which he did not think they had anything to do with in the meantime, as the Committee had given the subject their best attention, and had come to the conclusion that, without an extension, it would be utterly impossible for them to carry on their business. Reverting to the different range of prices for gas, he might inform them that the figures were: Manchester, 2s. 3d. per 1000 cubic feet net; Liverpool, 2s. 6d.; Leeds, 2s. 1d., less 2½ and 5 per cent.; Birmingham, 1s. 9d. to 2s. 4d., less 5 per cent.; Bradford, 2s. 1d., less 5 to 12½ per cent.; Glasgow, 2s. 4d.; Edinburgh, 3s.; and Belfast, 1s. 9½d. When returned for St. Anne's Ward, he gave a great deal of time to the gas undertaking, for the purpose of doing his duty towards the ratepayers. The price was then 2s. 3d. per 1000 cubic feet; and as he had said, it was now 1s. 9½d. With all this, they gave large sums to reduce the rates, though last year they had to pay £1000 more on account of the price of coal.

The Lord Mayor (Alderman Sir Robert Anderson, J.P.), in declaring the exhibition open, said it was really wonderful what progress the question of gas production had made. As the Chairman had told them, the works were started in the year 1822, and opened the succeeding year. The foundation-stone was laid by George Augustus, Marquis of Donegal; while the works were taken over by the Corporation in 1874, at a cost of £432,000. He read just the other day a magnificent description of the splendid effect that light had on Belfast at the time of its introduction. Thousands of people came to see the streets illuminated; and gas-lighting had a wonderfully good influence upon the city. In those days, the price of gas was 10s. per 1000 cubic feet; whereas now it was 1s. 9½d. This was an enormous reduction, and something they ought to be thankful for. Formerly no one thought of anything in connection with gas but the lighting of the houses and streets; but now matters were quite different. They would be glad to know that the penny-in-the-slot idea had been a most successful enterprise. At first there were only about 170 consumers; but now the number was, as stated by the Chairman, almost 24,000.

DEVONPORT GAS UNDERTAKING.

Another Inquiry Suggested.

The renewal of the controversy with reference to the management of the gas undertaking of the Devonport Corporation, to which attention was drawn in the "JOURNAL" last week, led to another long and acrimonious discussion at the meeting of the Town Council on Thursday.

On the motion to adopt the minutes of the Gas Committee, Mr. BISHOP moved an amendment describing as "grossly inaccurate" a statement made by Alderman Tozer, the Chairman of the Committee, on the 9th of July, to the effect that the wages paid at the gas-works in the quarter ended June 30 had been £129 less than in the corresponding quarter of the previous year, and that in the workshop there had been a dozen or twenty men with nothing to do. Inasmuch as these statements were damaging to the reputation of the late Gas Engineer, and reflected great discredit on the workmen concerned, Mr. Bishop proposed that a Special Committee should be appointed to investigate the matter and report upon it. He contended that the allegation that a number of idle men were kept at the works was a serious reflection upon a professional man; and if it was not true, it ought never to have been made. Personally he did not believe it. Mr. Buckley, the late Engineer, was not the man to allow any workman to have a penny that he had not earned. Mr. Tervet, the present Engineer, had informed him that the statement did not apply to the late Gas Committee, and that the slackness of work arose at the time when it was decided that no more slot-meter installations should be made. A new foreman was appointed; and he called the attention of the Engineer to it. Mr. Bishop read a letter from Mr. Buckley giving

* In this connection, reference may be made to the report of Mr. W. R. Herring on the subject, which was recently approved by the Gas Commissioners (*ante*, p. 63).—E.D. J.G.L.

details of the work done, and said that, in the interests of fair play, a Committee should be appointed in order that the truth of the matter should go forth to the public.

Alderman RISON expressed the opinion that an inquiry into the gas undertaking was necessary, but the holding of it by a Committee would be altogether useless. They wanted an inquiry by the Local Government Board, at which evidence could be given on oath, and the whole conduct of the undertaking investigated from the time when it was acquired by the Corporation.

Alderman TOZER thought there had been a great misunderstanding of the remarks he made at the July meeting of the Council. At the end of the first quarter of the financial year, the Engineer informed him that things were going on satisfactorily, and that in wages they would save £129 in comparison with the first quarter of the previous year. He also told him that certain expenditure, amounting to £152, in connection with the gasholders, the public lamps, and the removal of a chimney-stack, which might have been placed to the capital account, had been charged to revenue, because the Corporation's borrowing powers were practically exhausted. In this way there was a saving of £281 in wages; and in the past three months the saving would go up to a total of £419. As he knew they could not reduce the wages without employing a less number of men, he asked the Engineer how this was; and the Engineer told him he went into the workshop and found a dozen or more men with nothing to do and discharged twelve. Mr. Bishop was entirely beside the mark. There had been no mention of the late Gas Engineer's name; and, as a matter of fact, this was four or five months after Mr. Buckley left. No reflection was cast on either the officials or the men.

Mr. MONK said he was a member of the last Committee of Inquiry, and, as one who was quite independent, he could say that the gas undertaking had been conducted quite fairly and honestly. If they appointed another Committee, they would get no farther than the facts presented by Alderman Tozer. There was nothing in the statement to disbelieve. If Mr. Bishop could show that the works were not properly conducted, he (Mr. Monk) would vote for an inquiry; but as matters stood, it would be useless. He believed they were doing more damage to the gas undertaking by this kind of discussion than they could ever repair.

Alderman HORN BROOK, the late Chairman of the Gas Committee, thought Alderman Tozer would have welcomed inquiry, as he himself had welcomed it on a former occasion; and he believed he would come out of it clean and respectable, as he (the speaker) had done. To go back to the beginning, they had lost £50,000 which might as well have been thrown into the sea; and if they had had the Local Government Board inquiry which some people talked about, he could himself have put the Inspector on the scent of something in less than half-an-hour. The Committee found nothing. As to Mr. Bishop's motion, there was not much in it; and if they beat about for eight months, as they did over the last inquiry, it would result, as that one did, in the discovery of a mare's nest.

Mr. BISHOP remarked that in the letter which Mr. Buckley sent to

him, there were two different legal opinions which set out that such statements as were made with regard to the late Gas Engineer were mean and contemptible, because they were made under the plea of privilege. Mr. Buckley had spent three-and-a-half strenuous years at Devonport, and brought the gas undertaking from a condition of wreck to that of a good going concern. He left with the eulogy of the whole Council; and they ought now to refrain from damaging his reputation.

On being put to the vote, the motion was lost by a large majority.

Mr. Buckley's Reply to Alderman Tozer.

Mr. J. W. Buckley, the former Gas Engineer to the Devonport Corporation (now of Hornsey), in the letter read by Mr. Bishop at the meeting of the Council above referred to, said :

In the "Western Morning News" of the 9th of July Mr. Tozer is reported as having stated : (1) In the first quarter of the financial year, the wages paid at the works were £129 less than the corresponding quarter last year, and that increased expenditure took place though no particular work was done outside the ordinary production of gas, while this year special work was in hand. (2) In the workshop there were a dozen or twenty men with nothing to do. The facts are as follows :

With regard to the first statement, neither Mr. Tozer nor the Engineer was on the works during the corresponding period named, and knew nothing of the great amount of work done by direct labour. The extensions and alterations caused more work in one season than was ever done before or since—viz. : (1) Many of the retort-benches and retorts were dismantled; (2) retort-fittings were cleaned and refixed; (3) foul mains were re-arranged and erected; and (4) coal-breaker pits and steel framework prepared.

With regard to the second statement, the amount of wages paid for the maintenance of stoves, which included the men cutting off and re-fixing in consumers' houses, was—

	1907-8.	1908-9.
Total wages	£225 9 6	£252 18 3
Average per week	4 6 8	4 17 3

The late Engineer's official connection with the Corporation terminated on Nov. 30, 1908. The discovery of the twelve to twenty men in the workshop was made on April 14, 1909.

Cost of Maintenance of Cookers.

	1907-8.	1908-9.
Wages	£225 9 6	£252 18 3
Stove parts, materials, &c.	166 5 3	142 1 9
Total	£391 14 9	£395 0 0
Number of cookers	802	935
Average cost per cooker	£0 9 9	£0 8 5
Average wages per week	4 6 8	4 17 3

The wages do not exceed the pay of four men all told, including

What is True

of all valuable inventions in the past is true
of the
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affected have cried out in vain against them,
and set Prejudice against Progress.

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those engaged in cutting off and refixing the cookers, which is work outside the workshop. This shows the extreme absurdity of the statement that twenty men were employed in the workshop during the late Engineer's time with little or nothing to do.

The cost per cooker is due to the following facts: (1) Determination on the part of the late Engineer to keep the cookers as up-to-date as possible out of revenue. (2) Immediately it came to the late Engineer's knowledge that cookers were on the district and not being used, they were brought to the works and thoroughly overhauled. (3) From time to time many cookers were found broken, many of the parts worn out, and in such a condition that they might easily have been "scrapped" and the capital expenditure burdened with the cost of replacements. As a matter of fact, the late Engineer did find a number "scrapped" ready to be broken up; but rather than do this he had them put into thorough working order at the expense of revenue, often at considerable cost, but always with benefit to the undertaking.

SERIOUS COMPLAINT AT TONBRIDGE.

Time of Extinguishing Metered and Unmetered Lamps.

At a Special Meeting of the Tonbridge Urban District Council last Thursday, the members had before them a serious complaint which had been made by the Gas Company with reference to the extinguishing of the public lamps. Mr. James Donaldson, a member of the Council and Manager of the Gas Company, retired during the consideration of the matter.

The Clerk (Mr. H. W. Peach) read a letter, written by Mr. Donaldson from the gas-works, and dated Oct. 4, in which he said he had recently discovered, in connection with the public lighting of the town, a series of irregularities which called for the instant attention of the Council. By the instructions of his Directors, he gave full information and particulars to Mr. Bradley, the Council's Surveyor, on Sept. 16, and not having received a reply, and believing that no dismissal of any employee in the Lighting Department of the Council had taken place, his Directors desired him to ask Mr. Peach to read the letter to the Council. The letter proceeded to allege, by means of a tabulated statement, that certain of the street-lamps were left alight by the Council's employees after the meter-lamps, which registered the amount of gas consumed, had been turned off. His Directors, Mr. Donaldson said, were convinced that a system of deliberate fraud had been adopted by some one in the employ of the Council. The Directors did not, of course, suggest that these dishonest tactics had been resorted to on the instructions of the Council, or of Mr. Bradley; but they felt annoyed that their confidence had been abused, and shareholders victimized, by a dishonest employee in a manner of which it was impossible to speak too strongly. The Company asked the Council to adopt some

different system, and reserved the right to take such proceedings as they might be advised.

The Clerk also read a report by the Surveyor, which stated that a lamplighter had been suspended from his lighting duties. The meter-controller of some of the lamps was set to go out before some of the other lamps. The lamplighter's explanation was that the clockwork controller lost time that he corrected; but with regard to certain lamps he had no reason to give. On moonlight nights, the lamplighters had to exercise discretion; and thus some lamps were left alight.

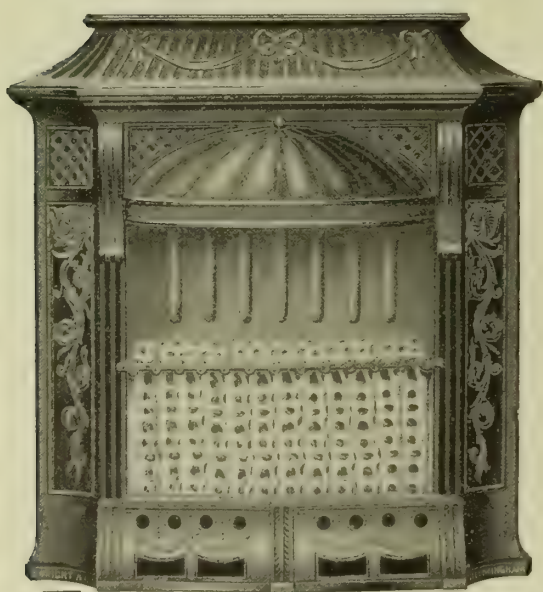
A discussion followed, in the course of which it was pointed out that, during the period of the irregularities, the consumption of gas was higher than for the corresponding period of last year. Eventually, the following resolution was carried: "That the Clerk be instructed to draw up a letter, to be approved by the Chairman of the Council, enclosing a copy of the Surveyor's report, and asking the Gas Company to withdraw the suggestion that the Council was a party to the abuse of confidence contained in the ultimate paragraph of their communication; and that the Company be also asked to render an account if they are of the opinion that more gas has been used than has been registered, and that they be informed that the Council will defend any process that may be brought against them as suggested in the latter part of their communication."

Liversedge and Heckmondwike Gas Question.—Last week, public meetings were held in both Liversedge and Heckmondwike to consider the promotion of a Bill by the two District Councils for the purchase of the undertaking of the Heckmondwike Gas Company. In each case strenuous opposition was encountered, and the proposal was defeated by a large majority. It seemed to be feared that compulsory purchase would prove too costly to be remunerative.

Sale of Coke by Tender at Devonport.—At the meeting of the Devonport Town Council last Thursday, the Town Clerk (Mr. R. J. Fittall) stated, in answer to a question, that a Sub-Committee had considered tenders for 1000 tons of coke, and recommended the acceptance of that of Messrs. W. E. Harvey and Co., at 10s. per ton. The special conditions of the tender were that none of the coke was to be sold to customers of the Corporation, and that they were not to undersell the Plymouth Gas Company in Plymouth. Mr. Bishop moved a resolution condemning the Committee for accepting this tender at a price 5s. or 7s. less than the amount charged to other merchants. Alderman Tozer said the coke was sold by public tender at the highest price obtainable, and was not an unusual transaction. He agreed, however, that it was very unwise to sell coke in this way; and he had discussed the matter with the Engineer, who would make suggestions with a view to avoiding a condition of things under which the poor paid the highest price and the large buyers the lowest. Several members expressed the opinion that better terms might have been obtained or the matter ordered differently, to the benefit of the ratepayers. On being put to the vote, the resolution was lost by a large majority.

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COAL SHORTAGE AT BRIGHOUSE.**Report of an Investigation Committee.**

A fortnight ago, at a special meeting, the Brighouse Corporation Gas Committee discussed some alleged discrepancies (which had already been the subject of an investigation by a Sub-Committee) existing in the works books of the Gas Department, and examined the late Engineer (Mr. J. Parkinson), the late Manager (Mr. W. L. Sutcliffe), and a clerk in the gas office. Afterwards a Sub-Committee were appointed to draw up a report on the findings of the Committee. This report has now been presented to the Council, convened as the General Purposes Committee, and has been adopted by a majority of votes of members present. It is in the following terms.

The Gas Committee desire to lay before the General Purposes Committee matters which they consider of importance to the whole Council. At the Gas Committee meeting, held on Aug. 9, 1909, it was reported by Mr. Harold Davies (the Manager) that there was a serious shortage in the stock of coal as represented in the yearly balance-sheet on March 31, 1909, amounting, at the time of reporting on Aug. 27, to approximately 803 tons. The Manager also reported that the stock of coal on March 31, 1909, according to the balance-sheet, was 2000 tons; whereas according to his estimate, the storage capacity at the gas-works was not more than 1000 tons. The Committee considered that these reports should be fully investigated, and appointed the Chairman (Alderman Healey), along with Councillor Rogerson and Mr. Davies (the Gas Manager), to be a Sub-Committee, with instructions to investigate and report—first, how much coal had been paid for by the Committee; second, to check the weigh-books during the same period, and discover what weight of coal had actually been received into the works; third, what weight of coal could actually be stored in the works.

On Sept. 20, the Sub-Committee reported that they had examined the invoices of coal paid for since April 1, 1904, to March 31, 1909, and had also examined the weigh-books of coal received during the same period, and had found that during the five years the Corporation had received coal in excess of the invoice weights to the extent of 226 tons out of a total weight invoiced of 88,079 tons, which proves that the Corporation had received the full weight of coal invoiced. These investigations were made separately and concurrently by different members of the Sub-Committee, who did not meet each other until they met to compare the final results of each individual inspection. The Sub-Committee also reported, from actual measurements taken by them, that the "maximum capacity of the store is 1000 tons." The Sub-Committee further reported that, according to the stock-book, more coal had been actually carbonized during the five years ending March 31, 1909, than was shown in the monthly working statements submitted to the Gas Committee. This made it impossible to balance the coal stock-book; and in order to adjust this difference, an average of 516 tons of coal was annually written

off the stock without the knowledge of the Committee, and described as "error."

The Gas Committee considered the Sub-Committee's report on Sept. 29, and decided to interview Mr. W. L. Sutcliffe (the late Gas Manager) and Mr. J. Parkinson (the late Gas Engineer). This interview took place at the public offices; but the Committee were unable to obtain any satisfactory explanation from the two gentlemen, as their evidence was directly contradictory on nearly every vital point. In answer to a question by the Chairman, Mr. Sutcliffe gave the basis of his measurements. But the investigations of the Sub-Committee proved that it was impossible for the store to hold more than 1000 tons; and the Sub-Committee's measurements were confirmed by a technical authority on the subject, a copy of whose work was to be found in the Gas Manager's office.

As a result of these investigations, the Gas Committee are of opinion: (1) That the whole amount of over-estimated stock of coal, which on Sept. 1 was 766 tons, should be written off at once. (2) That the system of presenting the figures in the monthly working statements has been unreliable and misleading. (3) That Mr. Parkinson has failed to give the attention to the Gas Department which his position as Gas Engineer called for, and which the Committee believed that he was giving; and they are specially disappointed in his confession before the Committee of his ignorance of the state of the stock-book and how the annual returns and statements of the stock were arrived at. (4) That the official management of the gas undertaking has been lax and inefficient, as instanced by the fact that the retort-house and plant, valued at £9000, was not insured against fire.

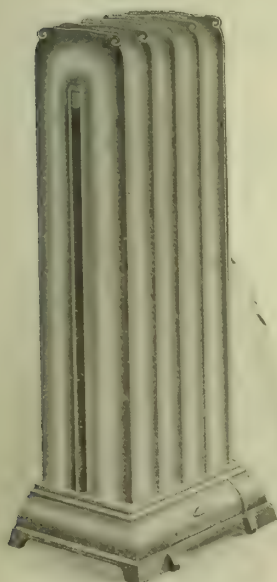
When this report was published, a petition was in course of signature, and was being numerously signed by ratepayers in the district, for presentation to the Mayor (Alderman Stocks), asking him to call a public meeting to consider the present position of affairs.

Gas Suffocation Case at Cambridge.—An insurance official named Harrison, who had for some time been living alone at Cambridge, was found dead in a house last Tuesday, having been suffocated by gas. The tap in the room was turned on; and it was thought that deceased, who had been missed for some days, had been dead about a week.

Improvement of the Exeter Water-Works.—On the invitation of Mr. Stocker, the Chairman of the Water Committee, the members of the Exeter City Council visited the Danes Castle reservoir last Wednesday, to see the works in progress for covering the reservoir. The City Engineer (Mr. T. Moulding) explained that the work was undertaken in consequence of complaints as to the condition of the water, which it was considered was brought about by the action of the sun. The work had been accomplished, both at that reservoir and the one at Marypole Head, by building brick pillars which had been joined up with girders, and covering the whole area with reinforced concrete. The covering of Marypole Head reservoir had stood the test of a load of 174 lbs. to the square foot, with the very minutest deflection.

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PRICE OF GAS AT SOWERBY BRIDGE.

A Satisfactory Position.

The Sowerby Bridge Gas Committee, in the minutes which were submitted at the last monthly meeting of the Council, recommended that, as from the 1st inst., the price of gas in the Sowerby Bridge district be reduced from 2s. 1d. to 1s. 11d. per 1000 cubic feet, and in the out-districts (including Luddenden Foot) from 2s. 9d. to 2s. 7d. per 1000 cubic feet.

The Chairman of the Committee (Mr. J. W. Whiteley), referring to the proposal, said he could not resist paying a compliment to the way in which their predecessors had handled the gas-works. Had it not been for the good management, they would not have been able to make these reductions. He thought they were quite justified, in the interests of all parties concerned, in reducing the gas to this price. The Committee had just paid the last instalment of the £61,906 borrowed for the purchase of the works, which would mean a saving in interest and sinking-fund charges of £1390. They had likewise saved £285 on contracts for coal this year, making altogether a total saving of £1675. There had been an extraordinary expenditure of £237 at Luddenden Foot, and a new boiler at the Sowerby Bridge works cost £140, making a total of £647, which left them with a net gain for next year of £1028. The consumption of gas totalled 141,657,500 cubic feet; and if all consumers took advantage of the 10 per cent. discount, the net reduction would amount to £1662, or a deficit on the saving he had shown of £34. In future, however, they did not anticipate having to spend any extraordinary money at the Luddenden Foot Works. The works had been brought up to a state of efficiency which he had desired ever since he joined the Committee. With regard to their own works, they had been gradually concentrating all their energies on the retort-house; and in the near future the principal expenditure would be in this quarter. The estimated cost would be something like £12,000. The £647 extraordinary expenditure this year would more than pay for the interest and sinking fund on the amount. In his opinion, the reduced price of gas would be an inducement for enterprise in their district from outside; and he thought they would be doing enough for posterity if they could keep the gas at this price. With regard to their income from residuals, it had not been very satisfactory in the past; but he believed that in the future there would be a greater demand. So far as he had been able to find out, there were not thirty works in the British Isles which were selling gas under 2s. per 1000 cubic feet; and the only other works of a similar size to their own selling gas under 2s. were those at Bingley.

In passing the minutes, the Chairman said he thought they ought to appreciate the thrift and management of those who had held the reins before. They themselves had continued the same policy during the past few years, with such satisfactory results.

The minutes were adopted.

AMMAN VALLEY GAS COMPANY'S AFFAIRS.

The following circular has been addressed to the shareholders in the Amman Valley Gaslight and Coke Company, Limited.

Gas-Works, Ammanford, Oct. 12, 1909.

Dear Sir (or Madam),—Your Directors propose to place before you the facts concerning the promotion of the Company which show how the interests of the shareholders have been neglected by the promoter and his associates.

The promoter of the Company was Edmund Eaton, of No. 99, Cannon Street, London. In 1904, the registered the Gas and Water Works Supplies and Construction Company, Limited; and in March, 1905, another Company, the Water and Gas Debenture and Share Investment Trust, Limited.

On Oct. 24, 1905, an agreement was arranged by Eaton with the Ammanford Council, under which the Construction Company undertook to supply gas for the lighting of the urban district, which agreement was acquired by your Company. Under clause 20, either party could terminate the agreement by three months' notice in writing. The Council exercised their power, and terminated the agreement—apparently not being satisfied with the way the works were being carried out, and the financial position of the Company.

The works were not completed within the specified time—viz., the 8th of July, 1907, but were opened several months later, on Nov. 23; but no supply of gas was then or has since been given.

Notwithstanding this, misleading circulars have been from time to time sent out to shareholders asking for further subscriptions; and the amounts received have been used to pay further sums to the promoting Companies, the interest on the debentures, and the most pressing creditors. The Company has had no revenue; and consequently all liabilities have been paid out of capital. On many occasions, the Company has had no cash balance; and it has been solely owing to the response to the misleading circulars referred to that the Company has been kept afloat. This accounts for the refusal of your late Directors to furnish the shareholders with an account and balance-sheet, although they have been repeatedly asked to do so.

For the benefit of those shareholders who were not able to be present at the meetings held in the months of January to April last, the following summary of what took place is given:—

- (1) It was pointed out that the promoters had received over £10,000 in cash, in addition to debentures and shares, for which they had erected works valued at considerably less than the amount paid in cash.
- (2) A Committee of three shareholders was appointed to meet Mr. Eaton and to propose (a) that the works be handed over to the shareholders at the capital subscribed by the public—about £14,000; (b) that all the shares and debentures held by Mr. Eaton and his nominees be surrendered; (c) that he



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Works: CARRON, STIRLINGSHIRE.



pay certain liabilities, and thereby release the Company from debt.

- (3) At the urgent request of the shareholders, Mr. E. J. Field consented to join the Board.

An appointment was made by Mr. Eaton at No. 99, Cannon Street, which he failed to keep. After protracted negotiations, the Committee learned Mr. Eaton would not agree to the shareholders' proposals.

The effect of the Amman Valley Gas Bill—nominally promoted, in the interests of this Company, by Mr. Eaton—would have been to keep the control in his own hands, and to legalize the contracts with his other Companies. There was absolutely no prospect of the Bill passing; and, moreover, the Company had no funds to carry on the Bill, was being pressed by its creditors at the time, six months' debenture interest was due for payment, and a Receiver was in possession on behalf of the debenture holders. For these reasons, the Bill was abandoned; and the Directors decided not to oppose the Ammanford Gas Bill, which proposed to purchase the works at a price to be agreed upon by an arbitrator appointed by the Board of Trade.

Under the terms of the Amman Valley Gas Company's prospectus, the Construction Company guaranteed a dividend of 5 per cent. per annum on all shares issued. This has not been paid since the 24th of June, 1908; and your Directors propose taking steps to recover the arrears—about £500.

Cash payments and allotments of shares and debentures to the following amounts were made to the Construction Company and the Water and Gas Trust, at meetings at which Mr. Eaton presided, or was present: Cash, £10,320; debentures, £6940; shares, 9637. Notwithstanding these payments, the Construction Company allege that further sums are due to them.

It is impossible to state the actual liabilities at the present time, as no proper accounts have been kept; but they are estimated at about £1500. The total debenture debt is £12,330, of which only £3962 10s. was paid in cash. In some instances, debentures have been issued as security.

The Directors recommend that an application be made to the Court for the setting aside of the shares and debentures allotted otherwise than for cash, and for the recovery of the arrears of the guaranteed interest. Otherwise the whole of the £14,000 subscribed, and a large part of the debentures, will be absolutely lost. The Directors have no funds at their disposal with which to make the application; but they suggest that shareholders should subscribe at the rate of 1s. for each share held by them (i.e., 5 per cent.) to a fund to be used solely for this purpose and liquidation expenses. The matter would then be taken into Court without any further liability to the shareholders.

The present Board wish it to be distinctly understood that they are in no way responsible for the past mismanagement and squandering of the shareholders' money.

(Signed) H. RUSSELL }
E. J. FIELD } Directors.

THE ELECTRIC LIGHTING QUESTION AT FINCHLEY.

A Local Paper Speaks Out.

The position at which the Local Government Board and the Finchley Urban District Council have arrived in regard to the application of the latter for a loan of £2200 for electric lighting purposes has been referred to in previous issues of the "JOURNAL." Notwithstanding the refusal of the Board to grant the loan, the Council are going, as mentioned last week, to spend £240 out of the current rates in lighting a portion of the district. The following are the comments of the "Barnet Press" on the subject: "It is a pity that there is friction between the Local Government Board and the Finchley Council with respect to the proposed loan for street lighting. Rightly or wrongly—it is not for us to determine which—the Local Government Board feels that the Council has not been quite candid in the matter, and that the Council is influenced not wholly by a desire to improve the public lighting on the best possible terms, but has in view the bolstering up of the electrical undertaking. If the Council had no electricity works, it is inconceivable, in view of the experience of other towns, that it would adopt flame arc lighting, for the authorities agree that high-pressure incandescent lighting is the cheapest and most effective form of street illumination. But, having electricity works, the Council favours flame arc lighting as helping the electricity revenue, regardless of the fact that, leaving out of count the question of efficient lighting, the general body of ratepayers who do not use electricity would be made to contribute compulsorily to the electrical revenue. Naturally, councillors as a body desire to make the electricity revenue balance the expenditure; but we do not think any individual councillor would justify taxing the general body of ratepayers by employing the more expensive of two forms of lighting, especially when the cheaper form is the more effective. The fact is that a Council which runs an electrical undertaking has tied its hands. What is the remedy? Get rid of the incubus. We believe that the Council could sell the undertaking without suffering any great loss. But, says a critic, if it would pay anyone to buy the electricity undertaking, it would pay the Council to keep it. Not so. Experience—the great teacher—has shown again and again that a municipality cannot carry on such an undertaking as economically as a trading company. Here and there one finds municipal electricity works paying a profit; but for every one such, there are two which are a burden on the rates. Nobody greatly blames a Council for trying an experiment; but when the experiment either fails of success or places an unnecessary burden upon the general body of ratepayers, why should a public body not do what a prudent individual would do under like circumstances—sell out?"

The Mitcham and Wimbledon Gas Company have reduced their charges for lighting the street-lamps as follows: No. 2 burners, £2 15s.; No. 3 burners, £3 3s. 10d.; No. 4 burners, £3 16s. 9d.; lamps on Common, £3 15s. A contract has been entered into by the Mitcham Council with the Company for twelve months on the foregoing terms.

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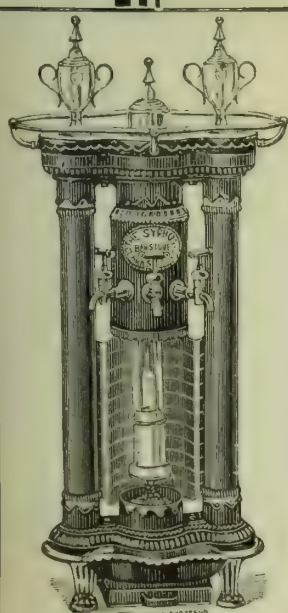
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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

On Oct. 5 I wrote that it was gratifying to learn that the Gas Committee of the Arbroath Corporation had unanimously resolved to recommend that Mr. A. C. Young, the Gas Manager, should be voted an honorarium of 100 guineas, in recognition of his services to the Corporation. The statement was true so far as the Gas Committee were concerned; and I thought that, being a unanimous recommendation, it was certain of adoption by the Town Council. This, however, has not been the case; the Council having on Monday rejected the recommendation. Bailie Smith, the Convener of the Committee, moved approval of the recommendation, which he supported with the arguments that, in the reduction of the price of gas from 4s. 4½d. to 2s. 8½d., Mr. Young had, in seven years, saved £8000 to the community; and that, in connection with the erection of the gasholder recently inaugurated, he had saved £300 of commission to an engineer, and £250 in having part of the work done under his own supervision—£550 in all. Mr. Black thought they should wait till after the municipal election before voting the proposed honorarium, in order to give the ratepayers an opportunity of expressing their opinion in the matter. He had written to a number of towns, of similar size to Arbroath, and he found that the salaries paid to the Gas Managers there were £200, £250, £400, and £350. The price of gas in these towns was 2s. 9d., 2s. 11d., 2s. 10d., and 3s. 2d. In each of these towns, the price of gas had been reduced during the past seven years by from 6d. to 9d. per 1000 cubic feet; showing that it might not be management alone that had brought about a reduction, but rather the evolution of the manufacture of gas. Bailie Thomson agreed that Mr. Young had been a very good manager. He went to Arbroath in 1901 at a salary of £200. They had twice raised his salary by £50 at a time, making it £300 now. Mr. Young had done a great deal of extra work; and he agreed that he was entitled to payment for it. He thought, however, that an honorarium of 100 guineas was more than enough for the work done. He moved that they give Mr. Young £50. Mr. Littlejohn moved direct disapproval of the proposal. There was a long discussion, replying to which Bailie Smith pointed out that in Arbroath the price of gas had been reduced, in seven years, not by 6d. or 9d., but by 1s. 8d., per 1000 cubic feet, and that if they were to add the amount paid out of revenue, it would have given a further reduction of 5d. He twitted some of his colleagues with being intimidated by the coming election. On a first division, 13 voted for delay, and five for a vote of £50. A second division resulted in disapproval being carried as against delay; and in a third division, eleven voted for disapproval against six for approval. The time for bringing forward the proposal was most inopportune. Of the six members who retire at the ensuing election, one declined to vote, four voted disapproval, and only one had the courage to vote approval. There is little doubt that, had the election been past, the recommendation of the Gas Committee would have been carried. The Committee reported that

since authority was given a year ago to procure gas-heated radiators as an experiment, to be hired out to private consumers, there had been 35 fixed.

At a meeting of the shareholders of the Cambuslang Gas Company, Limited, on Wednesday, the Chairman—Mr. D. Rankine—said that the meeting had been called so that the shareholders might give their approval to a proposal by the Directors which would involve the Company in an expenditure of £9000. A scheme had been put before the Caledonian Railway Company; but they had not yet given their decision upon it. The scheme was for the construction of a siding into the gas-works. It was also proposed to erect public offices and show-rooms. The report of the Directors on the extensions was approved; and it was unanimously agreed to authorize the borrowing of the necessary amount to meet the cost.

Mr. G. A. D. Mackay, Inspector of Cleaning and Lighting for Edinburgh, in his annual report to the Town Council, which is dealt with in another column, refers to the arrangement for lighting only half of the street-lamps between May 1 and Aug. 31, and the extinguishing of lights on common stairs at midnight between April 1 and Sept. 30. He thinks it right to call attention to the fact that the change has caused considerable dissatisfaction among the citizens, many of whom have addressed remonstrances to the department on the subject. His own opinion is that the partial darkness of the streets and stairs causes inconvenience, and is anything but conducive to the safety of life and property.

In the Markinch Town Council on Monday, a letter was read from the Secretary to the Gas Company, to the effect that the Directors were willing to recommend the shareholders to sell their undertaking to the town at a price to be fixed by arbitration. The Council agreed to lay the matter before the ratepayers at the forthcoming election.

The Portsoy Town Council have resolved to retain a gas contingent guarantee rate of 2d. in the pound on occupiers. The gas supplied is acetylene, for which the Corporation charge 5s. per 100 cubic feet, both for private and street lighting. Out of a population of 1878 persons, there are only 60 gas consumers. The number of public lamps is 67; so that the Corporation are themselves the largest consumers. The situation in Portsoy is not one which should encourage any community to give up coal gas and adopt acetylene as the general illuminant.

On Oct. 14, 1859, the water of Loch Katrine was turned on by the late Queen Victoria for the supply of Glasgow. The fiftieth anniversary of the event was celebrated on Thursday by several appropriate functions. Among others, a brass tablet in commemoration of the presence at the opening ceremony of a guard of honour of the then newly-formed corps of volunteers, was unveiled in Glasgow Cathedral by Lord Provost M'Innes Shaw. The guard numbered 400 in 1859. The survivors now total 35; and of this number there were 26 present on Thursday. In the evening, a banquet was given by the Corporation in the Municipal Buildings, in the course of which a portrait of Lord Provost Stewart, who was the leading spirit in the movement for procuring the water of Loch Katrine for the city, was unveiled, and handed over to the Committee on Galleries and Art to be hung in the City Galleries.

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Fireworks displays were given in three of the city parks. The Stewart Memorial Fountain, in Kelvingrove Park, was illuminated in the evening. Last night a reception was held in the Municipal Buildings. Fifty years ago the population of the water supply district was 439,901, and the average daily supply from Loch Katrine was 14,675,000 gallons; whereas last year the population was 1,117,229, and the supply drawn was 60,817,000 gallons. Loch Katrine and the service reservoirs contain altogether about five months' supply. At present a scheme is being carried out to include the waters of Loch Arklet. When this is completed, Glasgow will have a supply of 75 million gallons of water per day. The undertaking has been a great financial success from the outset; the water-rate for the Municipality being now 4d. in the pound.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, Oct. 16.

Although mainly for covering purposes, there has been rather better demand during the week; and makers maintaining a firm attitude, the decline has been arrested. In some instances, a small advance from the lowest point reached has even been obtained. The closing quotations are £11 3s. 9d. to £11 5s. per ton f.o.b. Hull, £11 5s. to £11 6s. 3d. per ton f.o.b. Liverpool, and £11 6s. 3d. to £11 7s. 6d. per ton f.o.b. Leith. In the forward position, little new business is reported; but we hear of second-hand sellers still being willing to accept a very small premium on spot prices for delivery this year and over the first half of 1910.

Nitrate of Soda.

This article is unchanged at 9s. 3d. per cwt. for ordinary, and 9s. 6d. for refined quality, on spot.

Tar Products.

LONDON, Oct. 18.

The markets for tar products have been unchanged throughout the past week. Pitch has been steady; and as makers are well sold to the end of the year, they are content to wait a little before placing any further quantity. On the Continent, they have still some quantity to buy; but it is uncertain how much. Creosote is dull all round. In London, the makers are firm in their ideas, but cannot do business. In the Midlands, makers are well sold, and are waiting to see how the railway orders go. In the North, the market is dull, and there is a fair quantity still unsold. Benzol is steady, and prices remain unchanged; but in France business is still difficult to negotiate. Fifty-ninety per cent. benzol is firm. Toluol is also firm; and in the North there are still buyers for delivery to March or June next. Carbolite is very dull indeed. Cresylic acid is quiet; and crystals are almost unsaleable. Naphthalene is quiet; but salts are steady and in fair demand. Tar is fetching very good prices compared with the value of products.

The average values during the week were: Tar, 13s. 3d. to 17s. 3d., *ex* works. Pitch, London, 26s. 6d. to 27s.; east coast, 26s. to 26s. 6d.; west coast, 25s. to 26s. f.a.s. Mersey ports, 26s. f.o.b. others. Benzol, 90 per cent., casks included, London, 6½d. to 6¾d.; North, 5¾d. to 6d.; 50-90 per cent., casks included, London, 7¾d.; North, 6¾d. Toluol, casks included, London, 9d. to 9½d.; North, 8¾d. to 9d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 1s.; North, 11d. to 11½d.; heavy naphtha, casks included, London, 10½d. to 11d.; North, 9½d. to 10½d. Creosote, in bulk, London, 2½d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. Carbolite acid, 60 per cent., casks included, east coast, 10½d.; west coast, 10½d. Refined naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

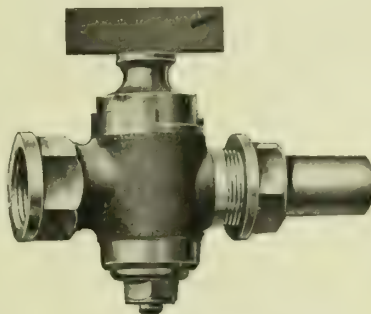
This article has been quiet throughout the past week, and prices are lower all round. The principal London Gas Companies still maintain their quotations, but would probably consider offers at somewhat under the prices asked. Beckton terms are £11 10s. In London, the price quoted is £11 2s. 6d.; in Liverpool, £11 3s. 9d. to £11 5s. In Hull, £11 3s. 9d. is asked; and in Leith, makers ask £11 8s. 9d.

Tar-Painting of Roads.—The Highways Committee reported at the last meeting of the Totnes Town Council that the Surveyor had experimented in the tar-painting of the roads, and was of opinion that it would be successful if done early in the summer on newly-made roads; a second coat being added two months later. In these circumstances, the Committee recommended that further experiments should be deferred till next spring. Alderman Hayman remarked that what they had done was not altogether a success; but he thought they would benefit by experience. The tar-painting certainly tended to lay the dust; but for some time after it was done, it was an affliction. More favourable conditions would present themselves in the spring.

Improvement of Rural Water Supplies.—In the course of a discussion in the House of Commons last Thursday week on the Development and Road Improvement Funds Bill, Mr. Leif Jones moved an amendment to insert among the purposes for which advances could be made "the provision and improvement of water supplies in rural districts." He said there was widespread need for this provision, for many districts were without a proper water supply, and it was very essential that the Development Commissioners should be able to provide or improve it. He therefore earnestly hoped the opportunity would be taken to remove what was often a scandalous state of things in rural districts. The Solicitor-General said he could not agree to insert the words. The provision of water was, of course, of the utmost importance to both rural and urban districts, and it was so recognized, with compulsory powers given to the Local Government Board. The objection to the proposal was that the question of water supply had to be dealt with as a matter of public health and by the local authority; and to insert the words proposed would be to charge upon Imperial funds what should be a matter for local rates. The Chancellor of the Exchequer had emphasized the fact that they did not want these moneys to be expended in the relief of the rates. The amendment was negatived.

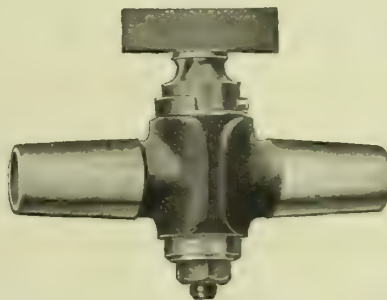
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COAL TRADE REPORTS.

Northern Coal Trade.

There has been some ease in the demand for coal for prompt shipment; but for next year's contracts, there is a much better demand, and higher prices are asked for some classes of fuel. In the steam coal trade, the price is easier for prompt shipment—best Northumbrian steams being about 10s. 9d. per ton f.o.b. Second-class steams are from 9s. 6d. to 10s., and steam smalls 5s. to 6s. The collieries are working fairly, but with the loss of an occasional day. In the gas coal trade, the demand shows the growth which is usual at this time of the year for home use; and there is a steady export trade. Durham gas coal varies from 10s. 3d. to 11s. 3d. per ton f.o.b. for the usual qualities, according to class; while for "Wear" specials, the quotation is up to about 11s. 9d. There is still much negotiation for gas coals for delivery over next year to some of the ports of the Mediterranean; and as some collieries have sold freely forward, there is a tendency to firm prices. As it is, the prices which have been agreed upon in some sales are based on from 10s. 3d. to 10s. 9d. per ton f.o.b., according to quality. Other contracts for next year are in course of negotiation. Coke is firm, and heavy shipments have been made from the Tyne. Gas coke is stiffened by these sales; and for good quality, the price is from 13s. to 13s. 6d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

The demand for coal does not improve, and prices are inclined to recede. Ell, for prompt shipment, is most in request. Splint has a regular outlet. Steam is quiet. The prices now quoted are: Ell 8s. 6d. to 9s. per ton f.o.b. Glasgow, splint 9s. 6d. to 10s., and steam 8s. 6d. to 8s. 9d. The shipments for the week amounted to 335,355 tons—an increase of 4432 tons upon the previous week, and of 18,601 tons upon the corresponding week of last year. For the year to date, the total shipments have been 11,816,626 tons—an increase of 581,115 tons upon the corresponding period.

Cost of Private Bill Legislation.—Mr. J. Francis, Labour Elective Auditor of St. Helens, in his annual report makes the following comments on the cost of promoting Parliamentary Bills: "When it is remembered that every year a number of municipalities are engaged either in promoting or opposing Parliamentary Bills, it will be seen that a large amount of public money is spent in this direction. I am of opinion that an extension of the powers of the Local Government Board, in the direction of appointing arbitrators to adjudicate in cases where the interests of two or more municipalities are found to clash, would be a very considerable step in the right direction."

Gas-Mains and Motor Traffic.—A short time ago, Mr. Arthur Thomas, the Secretary of the Slough Gas Company, wrote to the Urban District Council, at the request of his Directors, pointing out that very serious damage was being done to the Company's mains by the heavy traction engine traffic, and asking whether they would have the sympathy, and as far as possible the assistance, of the Council in any steps they might think fit to take in the matter. The Council referred the letter to the Highways Committee, who now report that, having considered it, they are unable to make any recommendations on the subject until they are informed what action the Gas Company propose to take.

Oil-Lamps at Cobham.—A correspondent writes to "The Times" as follows: "In February, 1908, the ratepayers of Cobham, Surrey, decided that it would be wise to have lamps in the streets. After just on 20 months' handling of the matter, the Parish Council have decided to invest in oil-lamps, because, it is stated, no satisfactory arrangement could be made with the Cobham Gas Company. Needless to say that the inhabitants are not altogether satisfied with this out-of-date handling of such an important matter. Cobham is a village 17 miles from London on the main Portsmouth road, and through it the motor and cycle traffic is enormous. The suggestion to use oil-lamps in such a place is ludicrous; and it is hoped better counsels will prevail."

Fire at the Commercial Gas-Works.—A fire, of which exaggerated accounts appeared in some of the daily papers, occurred at the works of the Commercial Gas Company at Stepney last Tuesday evening, shortly after five o'clock. It broke out in the vicinity of an overhead coal-store, and involved a gas-engine room. It was quickly got under, however, with the aid of the Fire Brigade; and by six o'clock was quite extinguished. It was stated in the "Daily News" that "Hundreds of tons of coal burned with great fierceness, and for a long time the efforts of the firemen had no effect whatever upon the flames." As a matter of fact, no coal was lost; and the damage, which was not serious, was confined to the structure of the engine-room and the coal-lifting machinery. The manufacturing process of the works was not affected. The origin of the fire is at present unknown.

Sales of Shares.—At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards sold, by order of Directors, three new issues of shares and stock. The first lots consisted of new ordinary 5 per cent. £10 shares in the Southend Water Company, carrying $4\frac{1}{2}$ per cent. dividend; and they were all sold at from £10 2s. 6d. to £10 5s. each. Some $4\frac{1}{2}$ per cent. perpetual debenture stock of the Ascot District Gas and Electricity Company was placed at from £100 10s. to £103 10s. per £100; and £10 new ordinary 7 per cent. shares of the Company, carrying 5 per cent., realized £10 2s. 6d. to £10 5s. apiece. A parcel of additional ordinary £10 shares in the Lowestoft Water and Gas Company, ranking for a maximum dividend of 7 per cent., but carrying $5\frac{1}{2}$ per cent., fetched £11 5s. to £11 10s. per share, and some perpetual debenture stock, £103 10s. to £103 15s. per £100. At the Duke of York Hotel, Camberley, last Thursday, Mr. F. W. Baker (Messrs. Sadler and Baker) sold some 7 per cent. cumulative shares in the Frimley and Farnborough District Water Company at from £15 10s. to £15 17s. 6d. each. The total amount realized was £4935, or an average of £15 13s. 4d. per share. At a similar sale held this time last year, the average price realized was £15 2s. 3d. per share. At a local auction sale, Mr. T. Bamber offered 500 new 6 per cent. £5 preference shares in the Langley Mill and Heanor Gas Company, Limited. There was a large demand for the shares, which realized prices ranging from £7 to £7 10s. each.

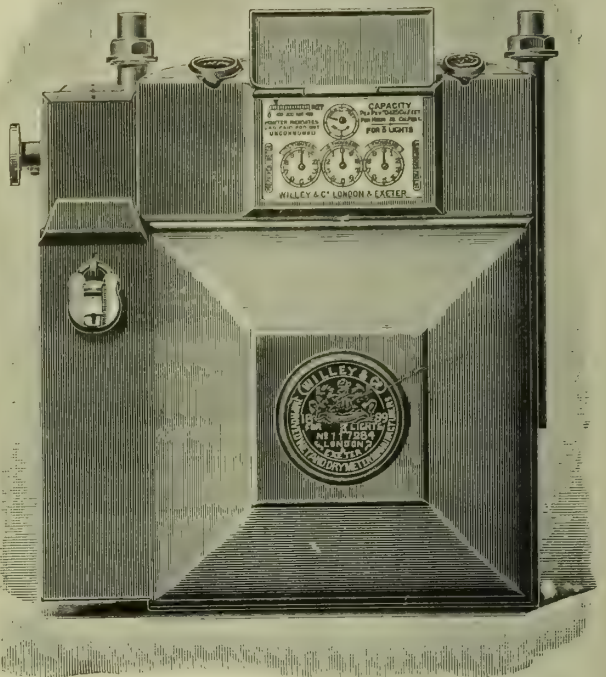
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AGENTS FOR SCOTLAND:

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Suicide by Gas at Torquay.—A suicide by gas poisoning was the subject of a Coroner's inquest at Torquay last Tuesday. The deceased, Charles King, was the Manager of the printing works at a local newspaper office, and was 40 years of age. He went to work early that day, explaining to his wife that he had something to do before the men arrived. During the morning, complaint was made that there was an escape of gas; and on the stereotyping-room being entered, King was found lying dead on the floor. Rubber tubes had been attached to the gas-jets used for heating the casting-box; and the ends were near deceased's face. He left no letter or anything to show why he had taken his life; but one of his friends had heard him talk of monetary difficulties. A verdict of "Suicide while of unsound mind" was returned.

Winding-Up of the Callington Gas Company.—The final meeting of the shareholders in this Company, convened by the Liquidator (Mr. James Venning), was held at Callington on Friday. The Liquidator presented his report and statement of accounts, showing that there had been received for the sale of the Company's property £1550, and for gas and coke to Sept. 30, 1908, £163 11s. 1d.; other receipts making a total of £1700 18s. 4d. The liabilities, including a £300 loan, amounted to £430 13s. 1d. The shareholders would receive £6 5s. per share on 200 shares (£5 paid), amounting to £1250, and there was a balance sufficient to pay 2s. per share more. The recoverable debts due to the Company were 13s. 3d. The shareholders present voted the Liquidator an extra fee of £10 for the satisfactory manner in which the winding-up of the Company had been conducted. A hope was expressed that the purchasers (Messrs. S. While and Son, of London), would find the gas-works remunerative in future, for the enterprise and improvements they had recently made in extending them and giving a great deal of employment to the town. The Liquidator was Secretary of the Company for upwards of 35 years; and the Company had been in existence 57 years.

Fatality at the East Greenwich Gas-Works.—On Monday last week, an inquiry was held at Greenwich in regard to the death of Cecil Gordon Evans, an engineering student of the South Metropolitan Gas Company, whose body was found in a gasholder tank at the East Greenwich station on the previous Thursday afternoon. It appeared that deceased and a fellow-student were taking levels in one of the gas-holders. The depth of water in the tank was 22 feet, and upon it was a raft, which had been in use. The two students had been working inside the holder since August, and were quite familiar with the place. The job was finished on the day of the accident. A labourer said he saw Evans on the raft, which he was propelling with a piece of wood. A few minutes later he saw the raft adrift, and the wood floating in the water. He did not hear any cry or splash. On the body being recovered, artificial respiration was resorted to until the arrival of a doctor, but without success. The Jury returned a verdict of "Accidental drowning." On behalf of the Company, Mr. Washington said they deeply regretted the accident, as the deceased was a most promising young man. The funeral, which took place at Brompton Cemetery last Tuesday, was attended by the Chairman of the Company (Mr. Charles Carpenter), the Secretary (Mr. F. McLeod), and the Works Superintendent (Mr. Gibson), and the respect in which the deceased was held by his comrades was shown by the large number of floral tributes sent.

Scarcity of Water in Cornwall.—In spite of the dull weather which has prevailed during the past summer and the heavy rainfall experienced in many parts of the country, some of the towns in Cornwall are threatened with something like a water famine. Reference has been made in the "JOURNAL" to the great inconvenience experienced in the district supplied by the Camborne Water Company, portions of which have been without water for days at a time. The situation in that district has been abnormally bad, and is likely to continue so until the works which the Company are carrying out for the augmentation of the supply are completed. But Camborne is not the only sufferer from the drought. The Redruth District Council issued notices last week cautioning people against wasting water, and prohibiting its use for gardens, washing windows, and like purposes. The Truro Water Company have also cut off some trade and other supplies in order to minimize the risk of having to curtail the domestic service. The Company state that the rainfall of the present year has been only about half the usual quantity. From 1904 to 1908, it averaged about 40 inches; but this year it has not so far reached 20 inches. Recently the Company have been supplying water to the extent of about 14 gallons per head per day. But the demand exceeds this; and, in order that the supply may be maintained, economy will have to be exercised by people who use water in their business. Penzance and other towns in West Cornwall are also feeling the pinch of the long-continued drought; but as the season has arrived when rain may be expected, it is hoped by those responsible for the supply of water that the trouble will soon be at an end in all the districts affected.

As a proof of the great popularity of the Davis steamless radiator, we are informed that the sales last month showed an increase of 400 per cent. on the corresponding period of the past year. The business in these goods being so much larger than was anticipated, the Davis Gas-Stove Company, Limited, who have quite recently added a wing to their new works at Luton, have just put in hand the building of two more wings; and they are also making very large extensions in their laboratory and special testing-shops.

Statements which have been published in regard to the liquidation of Meldrum Bros., Limited, have given rise to the impression among certain of their customers that their establishment at Timperley, near Manchester, is closed. We learn that this is not so, and that during the reconstruction of the Company the works have been constantly running, under the personal supervision of Mr. John W. Meldrum. Though operations have had to be restricted to some extent, business has by no means been suspended, as testified by the fact that breeze furnaces have lately been supplied to the following gas companies: Aldershot, Bath, Colchester, Christchurch (N.Z.), Dartford, Exeter, Haywards Heath, Lowestoft, Merthyr Tydfil, Para, St. Andrews, South Metropolitan, Sutton, Tokyo, and Yokohama.



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13-inch Fire Opening.

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Intense Pillar Fuel, and
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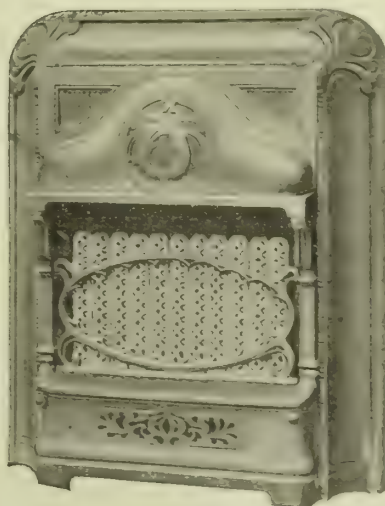
as introduced by us last Season.

RESULTS OBTAINED ARE
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ALL SINGLE ROW FUEL FIRES
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LONDON:

Office and Show-Rooms:

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The second "Model Engineer" Exhibition was opened last Friday, at the Royal Horticultural Hall, Vincent Square, S.W., by Sir Hiram Maxim, who was the recipient of a model in silver of the steam aeroplane invented and built by him getting on for twenty years ago—before the advent of the petrol engine brought such machines within the range of practical working. As Sir Hiram explained that, with his original aeroplane—the first heavier-than-air flying machine to lift itself from the ground—it was impossible for him to carry sufficient water to keep the engine going for more than a very short time; but many of the features of the aeroplane itself are embodied in types which are now proving successful. The presentation, it should be mentioned, was made by Mr. Percival Marshall, Editor of the "Model

Engineer," a founder of the Society of Model Engineers, by whom the exhibition was organized. There is to be seen a really interesting display of models of all kinds; and in a workshop, the construction of them is demonstrated. A feature of the show is a series of model making competitions, for which there have been over 200 entries. Many of the competing engines, boats, &c., are excellently made; and an inspection of them will repay anyone who is connected with engineering. The importance of model making in connection with engineering work was emphasized by Sir Hiram, who pointed out that useful investigation could often be carried out by means of models at comparatively small cost. The organizers are to be congratulated upon the character of the exhibition.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations, &c., Vacant.

AGENTS (MANTLES). No. 5144.

JUNIOR DRAUGHTSMAN. No. 5147.

TRAVELLER (COCKS, TUBES, &c.). "Manufacturers," 91, Southwark Street, S.E.

Situations, &c., Wanted.

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Patent Licence.

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Stocks and Shares.

ALDERSHOT GAS, WATER AND DISTRICT LIGHTING COMPANY. Oct. 26.

BARKING GAS COMPANY. Nov. 2.

HERTS AND ESSEX WATER COMPANY. Nov. 2.

PINNER GAS COMPANY. Oct. 26.

REDHILL GAS COMPANY. Nov. 1.

SOUTH AFRICAN LIGHTING ASSOCIATION. Oct. 26.

THE GAS METER COMPANY. Oct. 26.

WEST KENT GAS COMPANY. Nov. 2.

Meeting.

CEARA GAS COMPANY. London Office. Oct. 29. One o'clock.

TENDERS FOR

Benzol.

BRIDGEWATER COAL OFFICE. Tenders by Oct. 25.

Filter-Beds.

PONTYPOOL GAS AND WATER COMPANY. Tenders by Nov. 1.

Fire-Clay Goods.

SHEFFIELD GAS COMPANY. Tenders by Nov. 1.

Sulphuric Acid.

INVERNESS GAS DEPARTMENT. Tenders by Oct. 23.

Tar, &c.

DARENTH ASYLUM. Tenders by Oct. 25.

INVERNESS GAS DEPARTMENT. Tenders by Oct. 23.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 166.

Issue	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Oct. 14	7	Alliance & Dublin 10 p.c.	173-181½	..	5 9 7	195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
298,955	10	"	7	Do. 7 p.c.	124-13*	..	5 7 8	561,000	"	"	10	Liverpool United A.	223-225	..	4 8 11
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	94-100	..	4 0 0	718,100	"	"	7	Do. B.	166-168	+1	4 3 4
200,000	5	May 27	6½	Bombay, Ltd.	54-64	..	5 6 1	306,083	"	June 25	4	Do. Deb. Stk.	104-106	..	3 15 6
40,000	5	"	6½	Do. New, £4 paid.	48-48½	..	5 6 8	75,000	5	June 11	6	Malta & Mediterranean.	48-51	..	5 17 1
50,000	13	Aug. 26	15	Bourne 10 p.c.	28-28½	..	5 5 3	560,000	100	Oct. 1	5	Met. of 15 p.c. Deb.	59-102	..	4 18 0
311,810	13	"	7	mouth Gas B 7 p.c.	164-165	..	4 3 7	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
75,000	10	"	6	and Water Pref. 6 p.c.	158-158½	..	3 16 8	541,920	20	May 27	3½	Monte Vid. o. Ltd.	123-132	..	5 5 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	253-256	..	4 17 8	1,775,892	Stk.	July 29	4½	Newc'tie & G'tesh'd Con	100-108	-½	4 3 4
300,000	"	"	9½	Do. New	190-192	..	4 19 0	518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	93-94	..	3 14 6
50,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13-13½	..	5 3 8
206,250	"	June 11	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	300,000	Stk.	Apl. 29	8	Oriental, Ltd.	139-141	..	5 13 6
220,000	Stk.	Sep. 10	11	Brighton & Hove Orig.	208-213	..	5 3 3	60,000	5	Sep. 10	8	Ottoman, Ltd.	68-68½	..	6 5 6
246,320	"	"	8	Do. A Ord. Stk.	150-152	..	5 5 3	31,800	53	Aug. 26	13	Portsea Island A.	137-139	..	4 19 0
460,000	21	Oct. 14	10	British	42-43*	..	4 13 0	60,000	50	"	13	Do. B.	129-131	..	4 19 3
100,000	Stk.	Aug. 26	6	Bromley, A 5 p.c.	118-120	..	5 0 0	100,000	50	"	12	Do. C.	120-123	..	4 17 7
165,700	"	"	4½	Do. B 3½ p.c.	88-90	..	5 0 0	114,800	50	"	10	Do. D and E.	101-103	..	4 17 1
82,278	"	"	5½	Do. C 5 p.c.	106-108	..	5 1 0	398,490	5	May 13	7	Primitiva Ord.	7-7½	-½	4 16 7
50,000	"	June 25	3½	Do. 3½ p.c. Deb.	88-90	..	3 17 9	796,980	5	July 29	5	Do. 5 p.c. Pref.	54-54½	..	4 10 11
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	133-14*	..	5 0 0	488,903	100	June 1	4	Do. 4 p.c. Deb.	94-96	..	4 3 4
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	96-98	+1	4 1 8	1,000,000	10	Oct. 14	8	River Plate Ord.	164-164½	..	4 15 7
100,000	13	"	—	Cape Town & Dis., Ltd.	41-5	..	—	312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	96-98	..	4 1 8
100,000	50	May 3	6	Do. 4½ p.c. Pref.	54-6	..	—	250,000	10	Sep. 29	8	San Paulo, Ltd.	144-144½	..	5 8 6
50,000	Stk.	Aug. 12	4½	Do. 6 p.c. 1st Mort.	484-494	..	6 1 3	62,500	10	"	6	Do. 6 p.c. Pref.	114-124	..	4 18 0
100,000	Stk.	Aug. 12	5	Do. 4½ p.c. Deb. Stk.	82-84	..	5 7 2	125,000	50	July 1	5	Do. 5 p.c. Deb.	51-52	+1	4 16 2
157,150	Stk.	Aug. 26	5½	Chester 5 p.c. Ord.	1064-1084	..	4 12 2	135,000	Stk.	Sep. 10	10	Sheffield A.	230-232	..	4 6 2
1,493,280	Stk.	"	5½	Commercial 4 p.c. Stk.	109-111	..	4 13 8	209,984	"	"	10	Do. B.	229-231	..	4 6 7
560,000	"	"	5	Do. 3½ p.c. do.	104-106	..	4 14 4	523,500	"	"	10	Do. C.	229-231	..	4 6 7
475,000	Stk.	June 11	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	70,000	10	Oct. 14	10	South African.	124-124½	..	7 16 11
800,000	"	"	5	Continental Union, Ltd.	95-98	+1	5 2 0	6,429,895	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	120-122	..	4 7 4
200,000	Stk.	"	7	Do. 7 p.c. Pref.	138-140	..	5 0 0	1,895,445	"	July 14	3	Do. 3 p.c. Deb.	85-87	..	3 8 11
492,270	Stk.	"	5	Derby Con. Stk.	121-123	..	4 1 4	209,823	Stk.	Aug. 26	5	South Shields Con. Stk.	154-156	+1	5 2 7
55,000	"	Oct. 2	4	Do. Deb. Stk.	103-105	..	3 16 2	605,000	Stk.	Aug. 12	8	S'th Suburb'n Ord. 5 p.c.	119-121	..	4 10 11
148,995	"	July 14	12	East Hull 5 p.c. Ord.	97-99	..	5 1 0	60,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
486,097	10	"	12	European, Ltd.	243-25	..	4 16 0	117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	122-124	..	4 0 8
354,060	10	"	12	Do. £7 10s. paid.	184-19	..	4 14 9	502,310	Stk.	May 13	5	Southernhampton Ord.	111-113	..	4 8 0
15,141,545	Stk.	Aug. 12	4½	Gas 4 p.c. Ord.	106-107	..	4 7 2	120,000	Stk.	Aug. 12	6½	Tottenham A 5 p.c.	131-135	..	5 1 9
2,600,000	"	"	3½	light 3½ p.c. max.	88-90	..	3 17 9	453,940	"	"	5½	and B 3½ p.c.	111-113	..	4 15 3
3,799,735	"	"	4	and 4 p.c. Con. Pref.	103-105	..	3 16 2	149,470	"	June 25	4	Edmonton 4 p.c. Deb.	100-102	..	3 18 5
4,193,975	"	June 11	3	Coke 3 p.c. Con. Deb.	85-87	..	3 8 11	182,380	10	June 11	8	Tuscan, Ltd.	9-9½	..	8 8 6
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	92-94	..	5 6 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
82,500	"	"	6½	Do. do. 5 p.c.	117-119	..	5 9 3	236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	109-111	..	4 10 1
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	174-174½	..	6 4 0	255,636	Stk.	Aug. 26	6½	Wands- B 3½ p.c.	139-141	..	4 14 0
131,070	Stk.	Sep. 10	6½	Ilford A and C	138-140	..	4 12 10	79,416	"	June 25	3	worth 3 p.c. Deb. Stk.	73-75	..	4 0 0
65,781	"	"	5	Do. B	105-107	..	4 13 6	895,872	"	Aug. 12	5½	West Ham 5 p.c. Ord.	124-126	..	4 5 4
65,500	"	June 25	4	Do. 4 p.c. Deb.	102-104	..	3 16 11	210,000	"	"	5	Do. 5 p.c. Pref.	127-129	..	3 17 6
4,940,000	Stk.	May 13	8	Imperial Continental	180-182	..	4 7 11	253,300	"	June 25	4	Do. 4 p.c. Deb. Stk.	112-114	..	3 10 2
1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	95-97	..	3 12 2								

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Contractors for Complete CARBONIZING
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S.E.

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JUNIOR DRAUGHTSMAN, accustomed to
Constructional Steel and Gas Plant work, for a Gas-
Works in the County of Durham. Salary 30s. per Week
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300-LIGHT Dry Meter for Sale.
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Offers to No. 5146, care of Mr. King, 11, Bolt Court,
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meter, and New STEEL TANK fixed complete,
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and 50 feet Double-Lift. Cheap, with STEEL TANKS.
Can be seen temporarily erected.
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SMALL GAS-WORKS PLANT FOR SALE.
THE Chelmsford Gaslight and Coke
Company have FOR SALE the Whole of the
IRONWORK (which includes Two GASHOLDERS) of
the Writtle Gas-Works, which is shortly to be dismantled
and removed.
Particulars from the undersigned.
Er. W. SMITH,
Chelmsford. Gas Engineer.

PORTSEA ISLAND GASLIGHT COMPANY.

RUDMORE WORKS.

THE Directors of the above Company
have FOR SALE a Second-Hand Two-Bladed
Gwynne and Beale's 40,000 Cubic Feet per Hour (at
70 Revolutions per Minute) GAS EXHAUSTER, with-
out Engine, but with Belt Pulley 3 feet diameter,
6 inches wide, also 12-inch diameter Screw Down Inlet
and Outlet Disc Valves.
Further Particulars may be obtained from the under-
signed to whom Offers should be made.
J. D. ASHWORTH, M.Inst.M.E.,
Engineer and General Manager.
Plathouse Gas-Works,
Portsmouth, Oct. 11, 1909.

GAS TAR.

FOR SALE, at Darenth Asylum, Dart-
ford, Kent (under the Metropolitan Asylums
Board), during the ensuing Twelve Months, a quantity
of GAS TAR, estimated at about 400 Barrels.
The Asylum is three miles from Dartford, where the
Tar can be conveyed by Barge or Rail in consignments
of about 150 Barrels at a time. Barrels not provided.
Tenders to state price per Barrel of 40 gallons at the
Asylum, to be endorsed "Tenders for Gas Tar, Darenth
Asylum," and to be delivered at the Office of the Board,
Embankment, London, E.C., not later than Four p.m.,
on Monday, the 25th of October.
Oct. 14, 1909.

ROYAL BURGH OF INVERNESS.

TENDERS FOR TAR AND SULPHURIC ACID.

THE Inverness Gas Commissioners are
prepared to receive TENDERS for the Surplus
TAR produced at their Works to May 15, 1910; and also
for the Supply of SULPHURIC ACID during the next
Twelve Months.
Further Particulars may be had by Applying to the
Manager at the Gas-Works.
Tenders, endorsed "Tender for Tar" or "Tender for
Acid," and addressed to Kenneth MacDonald, Esq.,
Town Clerk, Town House, Inverness, will be received
up to Saturday, the 23rd inst.
The Commissioners do not bind themselves to accept
the highest Tender for Tar, the lowest for Acid, or any
Tender.
Gas-Works, Inverness,
Oct. 12, 1909.

PONTYPOOL WATER-WORKS.

CONTRACT No. 4.

THE Directors of the Pontypool Gas
and Water Company are desirous of receiving
TENDERS for the CONSTRUCTION of an AD-
DITIONAL FILTER-BED at their Nantymailor
Water-Works.
Drawings and Specification may be inspected, and
Forms of Tender and Schedules of Quantities may be
obtained (on payment of Two Guineas, returnable if a
bona-fide Tender be made), at the office of the Company
at Pontypool, and at the office of Messrs. T. and C.
Hawksley, Civil Engineers, Caxton House (West Block),
Westminster, S.W., on and after Monday, the 18th
inst., and Tenders must be delivered at the office of
the Company at or before Twelve o'clock noon on
Monday, the 1st of November, 1909.
The Company do not pledge themselves to accept the
lowest or other Tender.
T. B. PEARSON,
Secretary.
Pontypool, October, 1909.

FIRE-CLAY GOODS.

THE Directors of the Sheffield United
Gaslight Company invite TENDERS for the
Supply of SILICA and FIRE-CLAY GOODS required
at their Works during the next Twelve Months.
Specifications and Forms of Tender may be obtained
upon Application to the Company's Engineer, Mr.
J. W. Morrison.
The Directors do not bind themselves to accept the
lowest or any Tender.
Sealed Tenders, marked "Tender for Fire-Clay
Goods," must be delivered by post to Mr. Hanbury
Thomas, Managing-Director, not later than the first
post on Monday, Nov. 1.

WM. HAMBY,
Secretary.

Commercial Street,
Sheffield, Oct. 6, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to
notify that their SALES BY AUCTION OF NEW
CAPITAL ISSUED UNDER PARLIAMENTARY
POWERS, and of STOCKS and SHARES belonging to
EXECUTORS and other PRIVATE OWNERS in LON-
DON, SUBURBAN, and PROVINCIAL GAS and
WATER COMPANIES, take place PERIODICALLY
at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing New Capital, and also for including
other Gas and Water Stocks and Shares in these Periodi-
cal Sales, will be forwarded on Application to Messrs.
A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
**ALDRSHOT GAS, WATER, AND DISTRICT
LIGHTING COMPANY.**

NEW ISSUE OF £5000 FIVE PER CENT. "C"
CONSOLIDATED ORDINARY STOCK,
AND
£5000 FOUR PER CENT. CONSOLIDATED
PREFERENCE STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Oct. 26, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
PINNER GAS COMPANY, LIMITED.

NEW ISSUE OF 400 £5 "B" SHARES
AND
£700 FIVE PER CENT. PERPETUAL
DEBENTURES.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
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LIMITED.**
30 £10 ORDINARY SHARES.

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74 £10 ORDINARY SHARES.

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Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
**HERTS AND ESSEX WATER-WORKS
COMPANY.**

NEW ISSUE OF 500 £10 ORDINARY SHARES
AND
£1000 FOUR PER CENT. MORTGAGE
DEBENTURES.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Nov. 2, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
BARKING GAS COMPANY.

NEW ISSUE OF 600 £10 SIX PER CENT.
PREFERENCE SHARES.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Nov. 2, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

WEST KENT GAS COMPANY.

25 £10 FULLY-PAID ORIGINAL SHARES.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Nov. 2, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

REDHILL GAS COMPANY.

SALE OF ORDINARY "B" STOCK.

NOTICE is Hereby Given, that it is the
intention of the said Company to SELL BY
TENDER £3500 of ORDINARY "B" STOCK of and in
the Redhill Gas Company. The last day for the
reception of Tenders will be Monday, the 1st of
November, 1909, at Twelve o'clock at noon.
Forms of Tender, with Particulars of Sale and Con-
ditions of Tender attached, can be had upon Application
at the Company's Office, Brighton Road, Redhill.
By order of the Directors,
HORACE LONG,
Secretary.

Redhill, Surrey,
Sept. 30, 1909.

BRIDGEWATER COLLIERIES COKE WORKS. (THE EARL OF ELLESMERE.)

TENDERS are invited for the Crude
BENZOL produced at the above Works (estimated
at 8000 to 10,000 Gallons per Month) testing 80 per cent.
at 120° C., during the next Three, Six, Nine, or Twelve
Months, delivered into Contractor's Tanks at the
Bridgewater Colliery Siding, Wharton Hall, on the
Pendleton and Hindley Branch of the Lancashire and
Yorkshire Railway, or at the Brackley Siding on the
Little Hulton Mineral Branch of the London and North
Western Railway.
Tenders, endorsed "Tender for Crude Benzol," to
be addressed to Mr. Thomas M. Brown, Bridgewater
Coal Offices, 4, Chapel Walks, Manchester, not later
than the 25th inst.
Manchester, Oct. 5, 1909.

CEARA GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the
ORDINARY ANNUAL GENERAL MEETING
of the Shareholders will be held at the Offices of the
Company, 9, Queen Street Place, Cannon Street, in the
City of London, on Friday, the 29th day of October,
1909, at One o'clock in the Afternoon, to receive the
Report of the Directors; to declare a Dividend; to elect
Directors and an Auditor; and for General Purposes.
The TRANSFER BOOKS WILL BE CLOSED
from the 15th of October to the 29th of October, both
days inclusive.
By order of the Board,
GEORGE R. GUYATT,
Secretary.
Oct. 15, 1909.

THE Proprietors of the Patent No.
6921 of 1900, for "IMPROVEMENTS IN
CONTINUOUS GAS MUFFLE KILNS OR OVENS,"
are desirous of entering into Arrangements, by way of
LICENSE and Otherwise, on Reasonable Terms,
for the purpose of EXPLOITING the same and en-
suring its Full Development and Practical Working in
this Country.
All Communications should be addressed in the first
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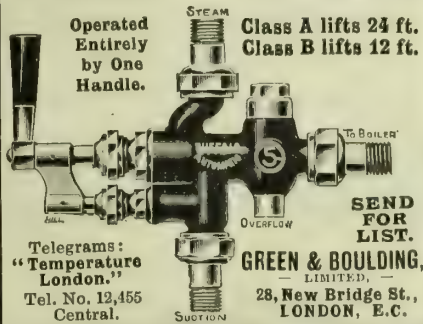
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Above the Average in Weight and Quality
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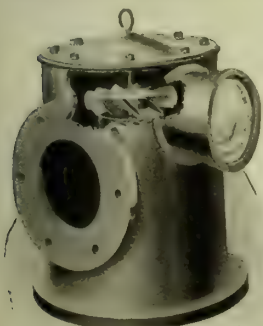
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p. 111., Oct. 5.

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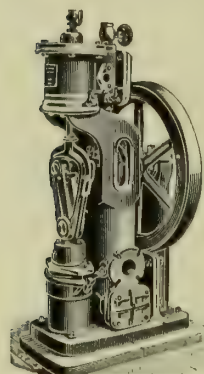


Fig. 705. "SINGLE RAM" STEAM-PUMP.

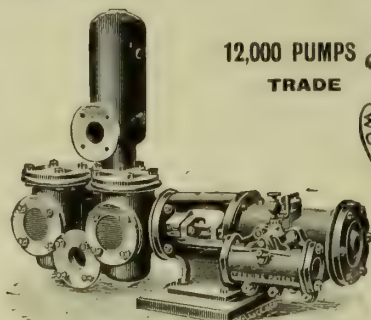


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

12,000 PUMPS
TRADE



Please apply for Catalogue No. 8.
IN STOCK AND PROGRESS.
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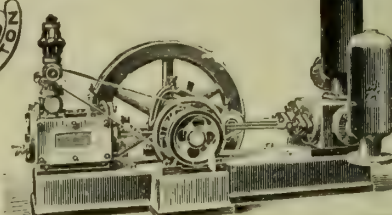


Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

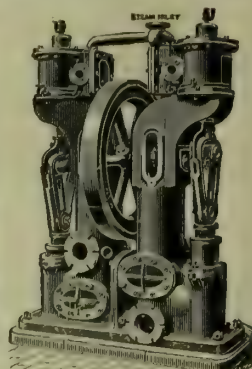


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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SILCO BRICKS prevent all settling of setting.

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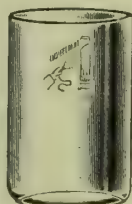
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4. **Accurate Regulation of the Air Supply.**
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
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From Lamps with more than one burner, the bunsens can be removed from the outside, without taking the lamps to pieces.



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G 5009.



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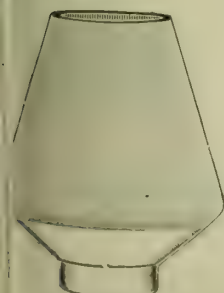
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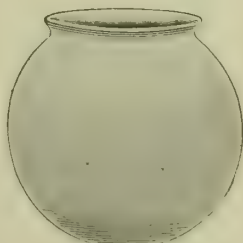
G 5100.
5 in. & 6½ in.



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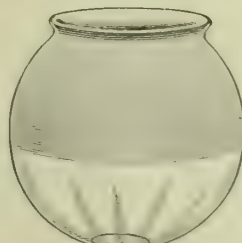
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A. The Authors used *Flanged Pipes* for the Rising Main up the Steep side of the Barff, and their experience proved that this was not an advantage, as the rigidity of the Joints involved considerable difficulty in regard to the depth of the Trench, and a good deal of Cutting to make the final Connections at each end of the Pipe-Line.

B. In the case of the Delivery Main, the Joints were *Ordinary Socket Joints*, but made with Lead only. The only difficulty met with here was the necessity for pouring the Lead in at a suitable temperature to prevent it melting the Solid Lead Filling, and running through into the Pipe.

C. In some of the Smaller Branch Connections, Lead Wool was used, and proved highly successful.

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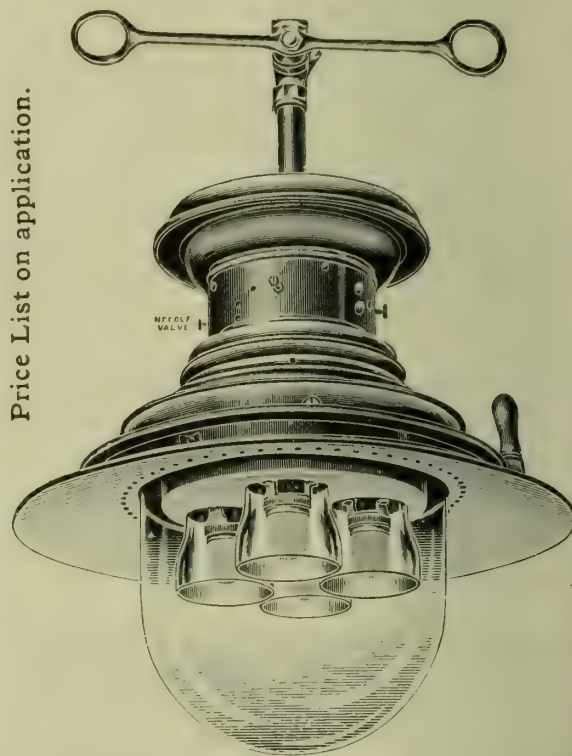
OUTSIDE

LAMPS**Fig. I.586.**

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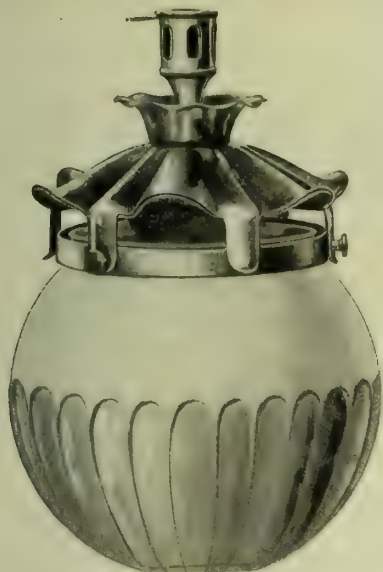
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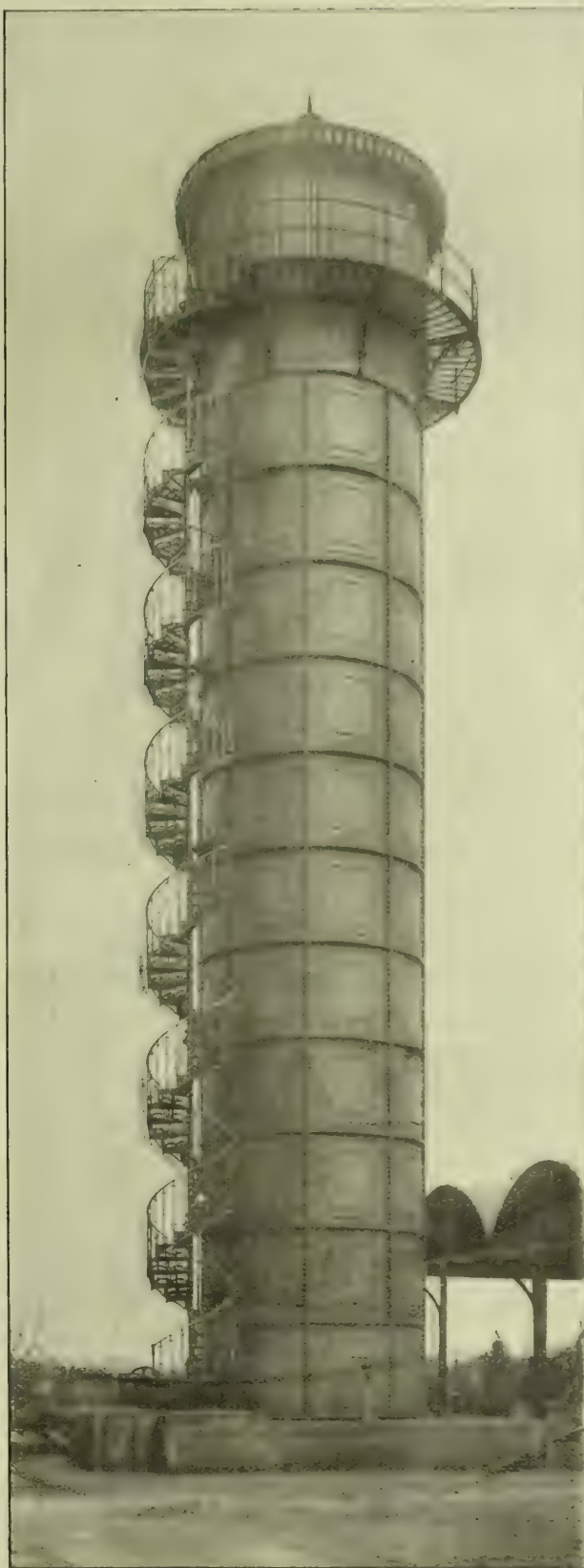
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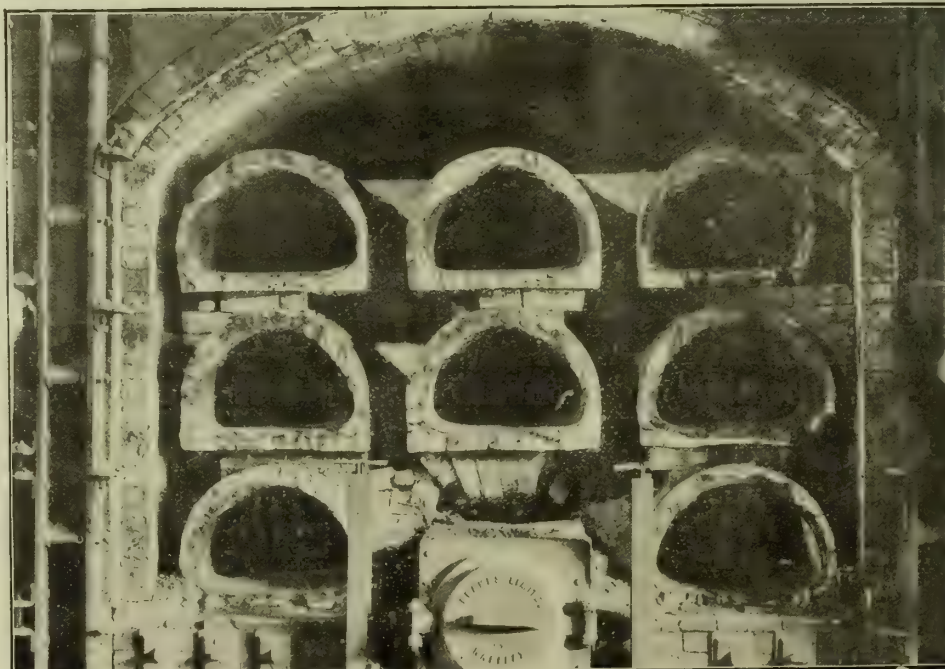
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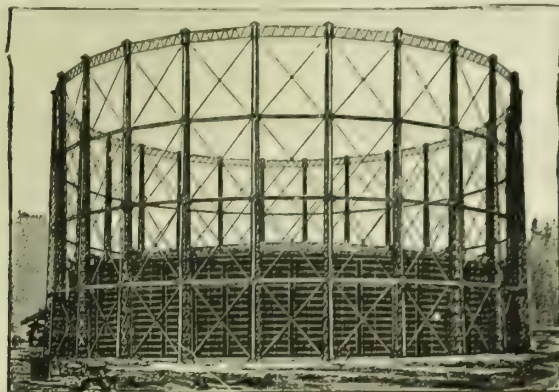
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A Few Recommendations for this System:—

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No Machinery to get out of order.

Carbonizing charges 40 per cent. less than with Horizontals.
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Yield of Gas per ton guaranteed about 1000 cubic feet more than under present conditions, of guaranteed candle power.

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Stopped Pipes unknown.

Naphthalene always in solution.
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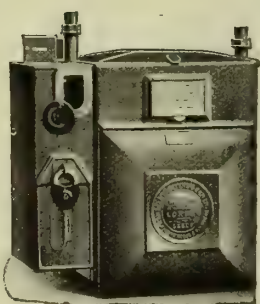
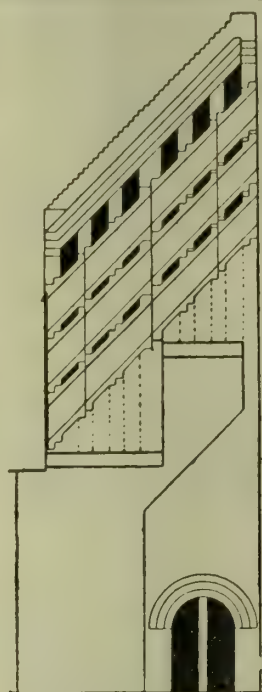
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Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

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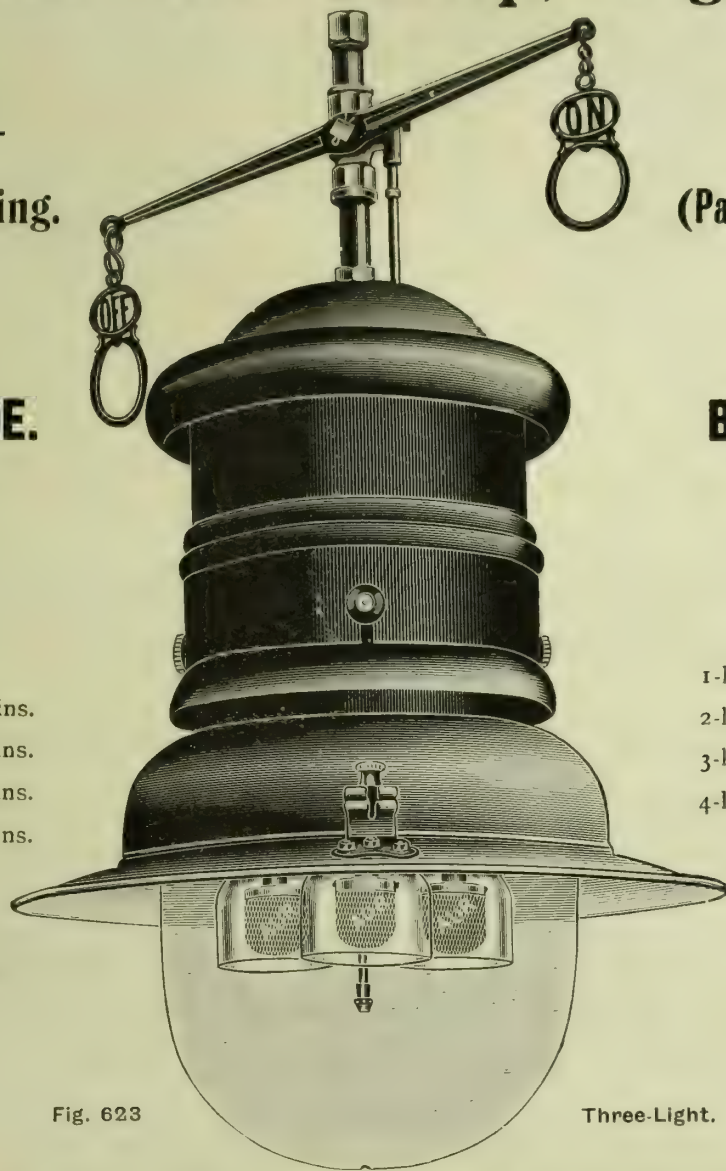


Fig. 623

Three-Light.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52 6	6/- extra.
2-light	8 feet	260	47 6	6/- extra.	4-light	16 feet	550	72 6	9/- extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3 6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3 4 1/2** per dozen, or in case lots of 5 gross, **33/-** per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2 3	5 9	5 9	9/-	Wired Globes, extra	each	2/-	2/-	2 9 3 6
" " "In Case lots per dozen.	19 6	57 9	57 9	93/-	Parabolic Reflector, extra	"	3 6	6/-	7 6 Not made
Case contains	80	18	18	12	Welsbach Mantles, each		6d.	subject as usual.	

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price **4 1/2d.** each.

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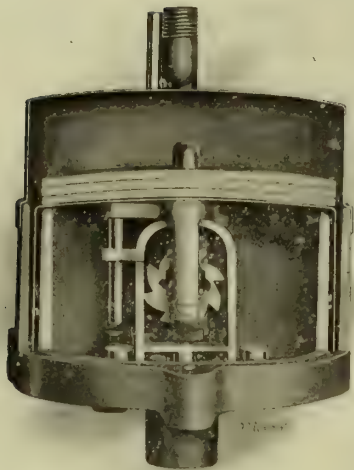
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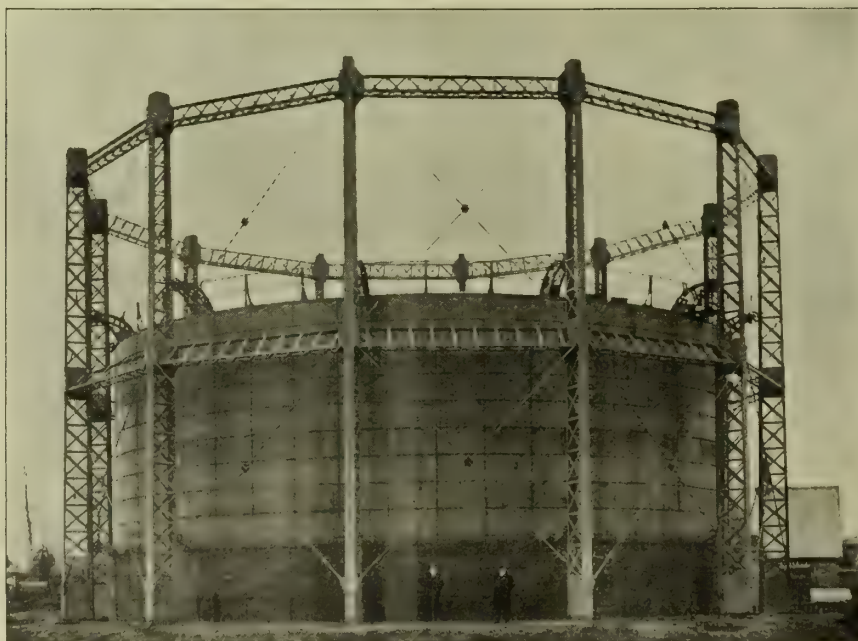
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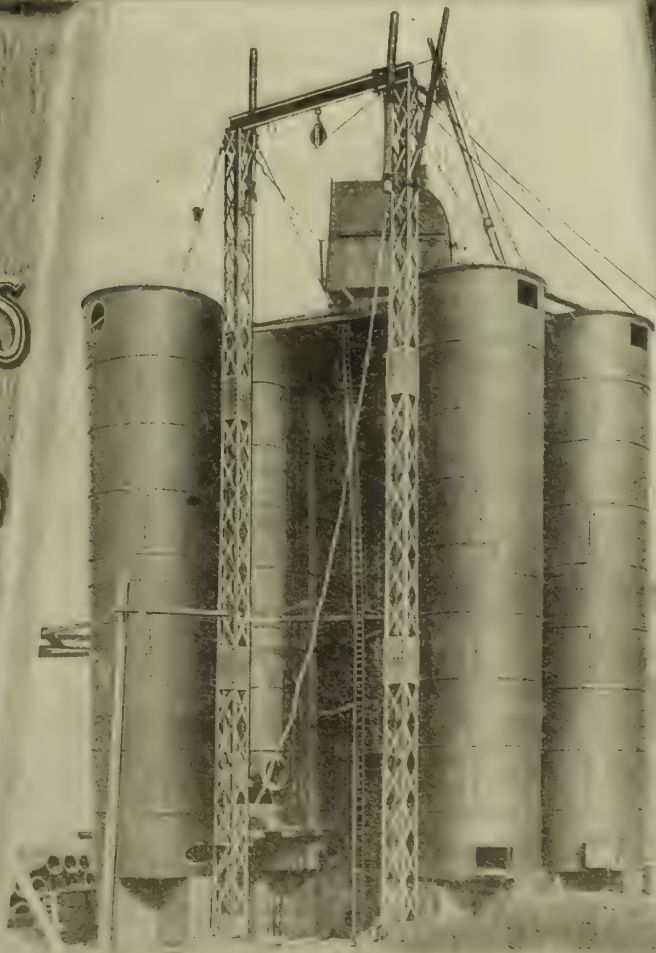
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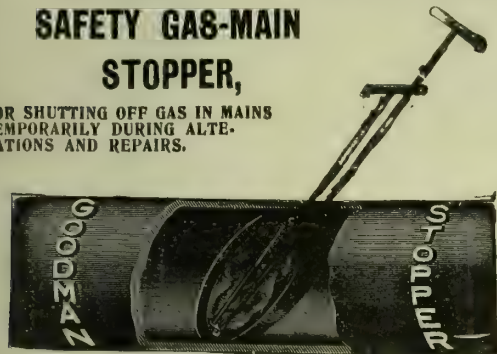
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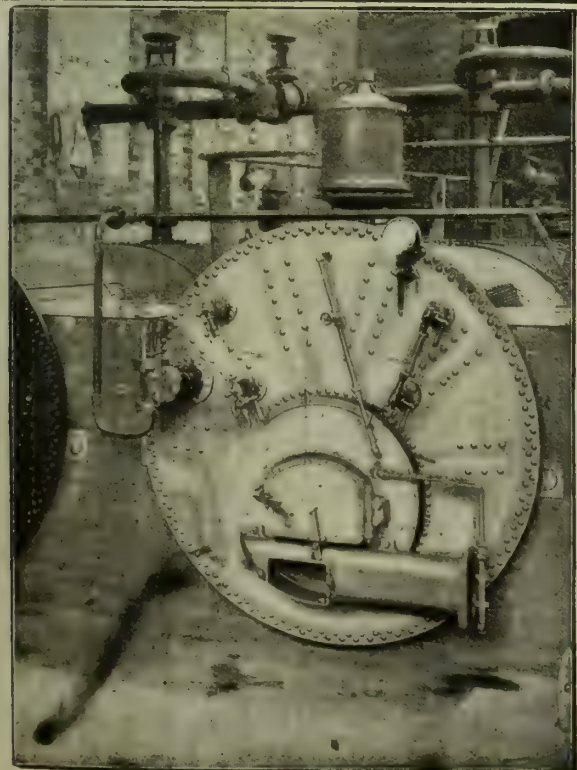
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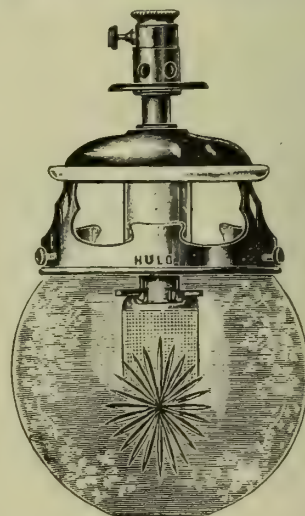
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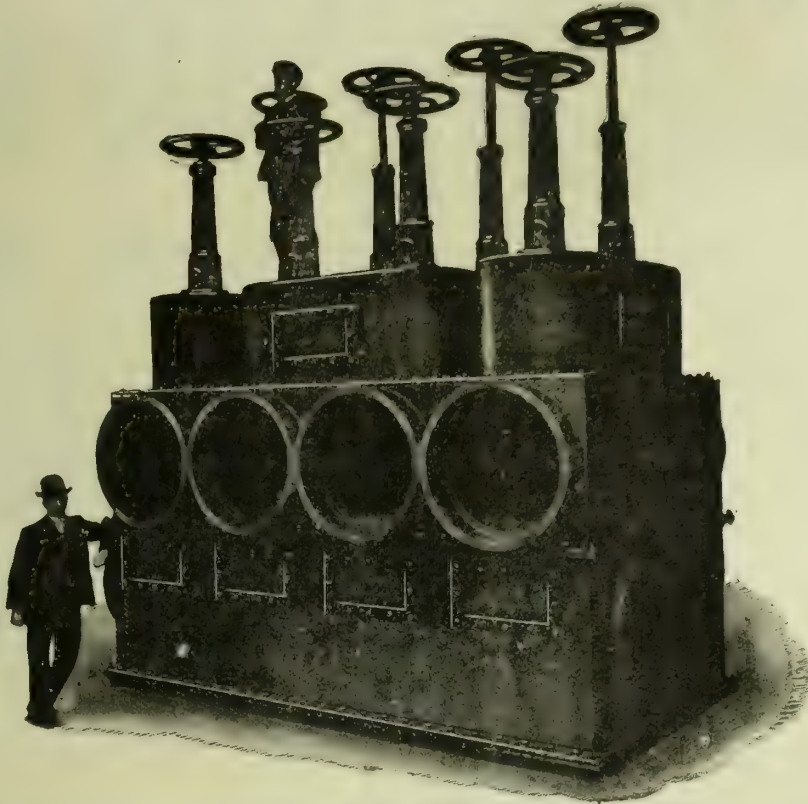
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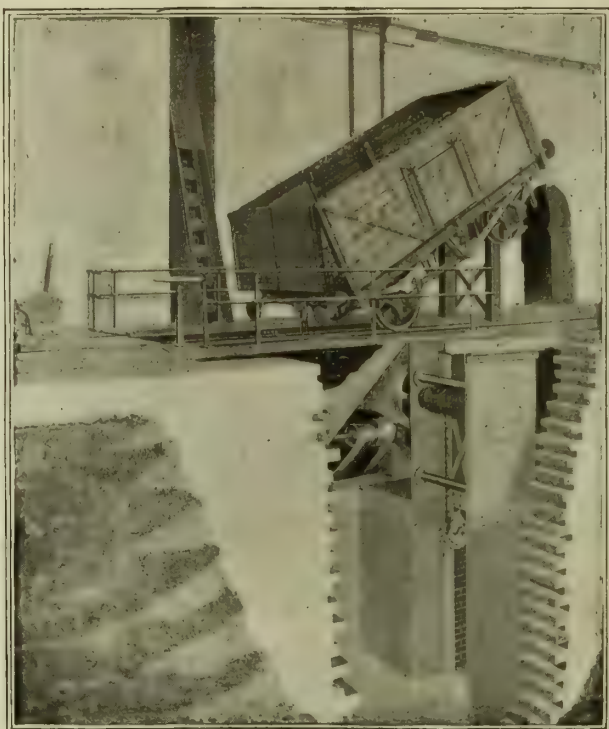
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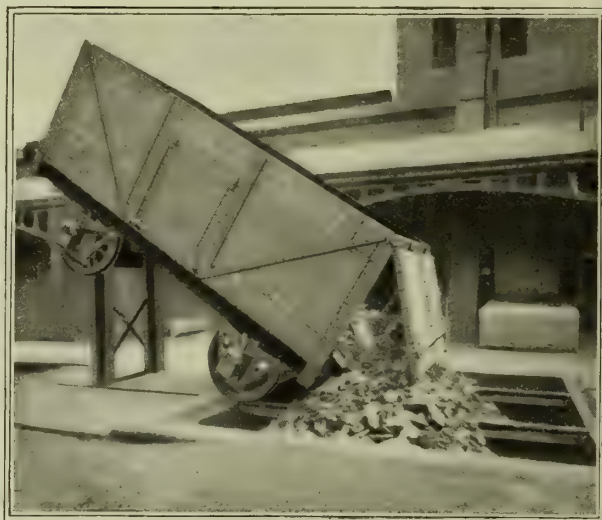
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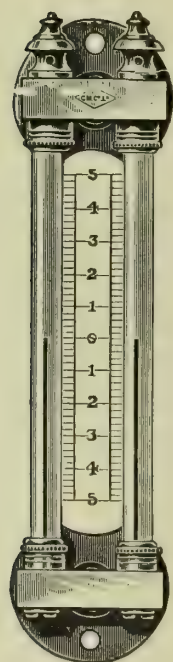
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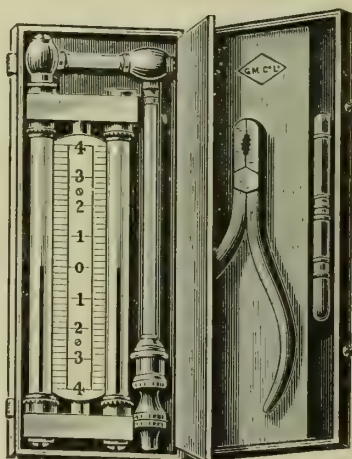
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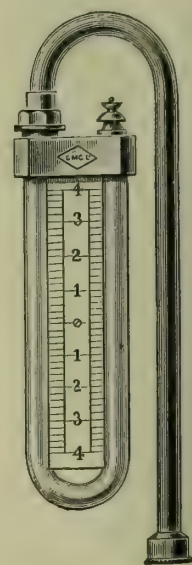
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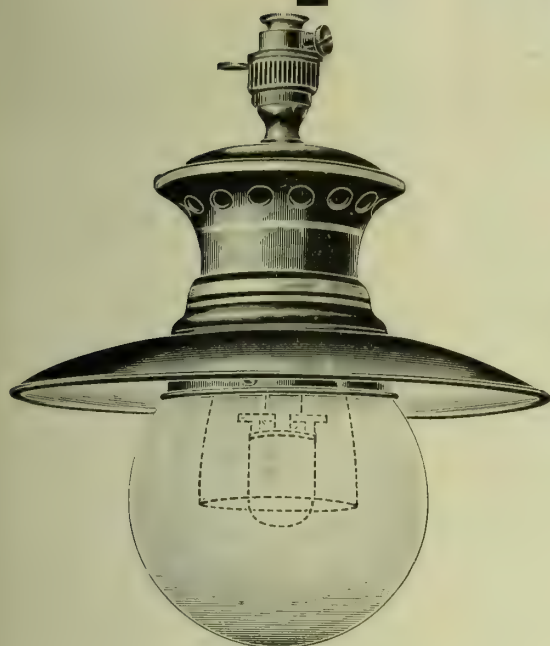
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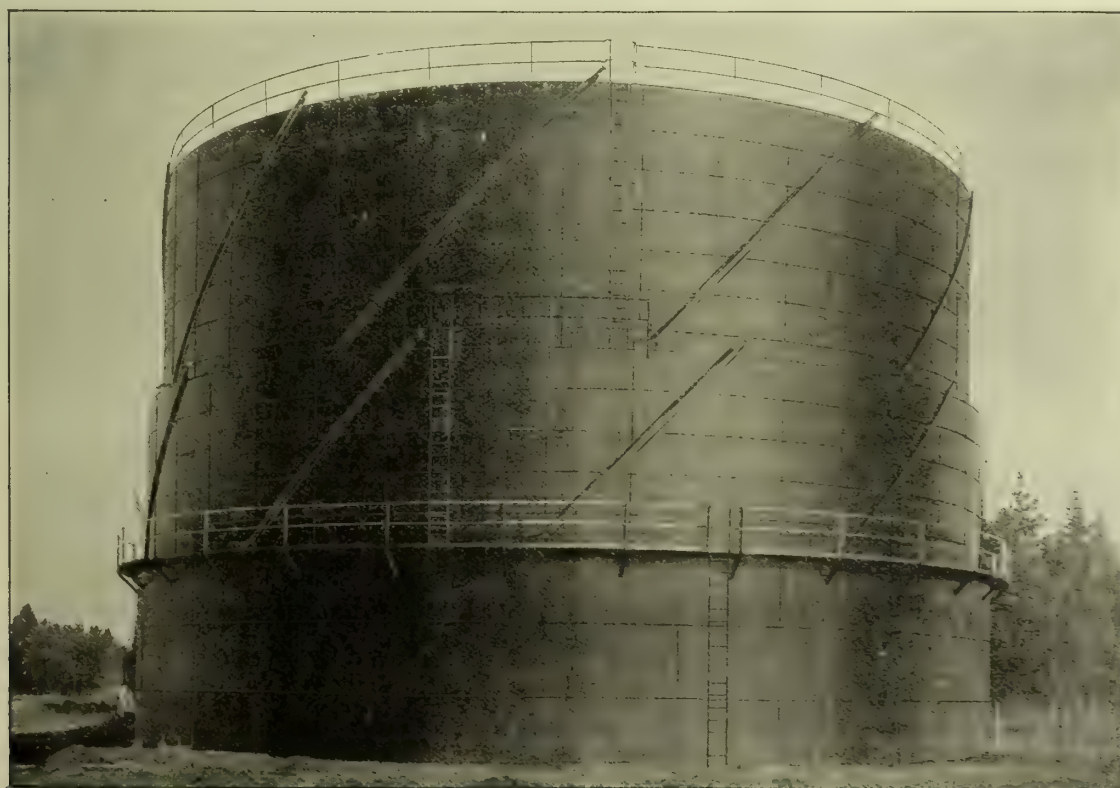
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VOL. CVIII., No. 2424.—TUESDAY, OCTOBER 26, 1909.

EDITORIAL NOTES—GAS, &c.

Mr. Woodall on Technical Training.

UPON the words of no man in the industry would the juniors, or subordinates, in the professional ranks hang with more enthralled interest than upon those directly addressed to them by Mr. Corbet Woodall; for he occupies a place in the industry to which he has cut his way by the sheer and unaided force of personal qualities—intellectual and amiable. His opportunities have been won, not forced upon him, or provided by an indulgent influence; and those opportunities enable his survey—a survey that is as broad as it is long—of the world's gas industry to be classified among the unique. For all of which reasons, the members of the London and Southern Junior Association were honoured by the inauguration of their present session's work by an address from Mr. Woodall. The address was encouraging, was illuminating, was plenial with thought and suggestion, albeit in some parts reflecting a base of contention that has had existence in other minds in the perennial polemics provided by the application of higher technical education to the developing of the practices by which the destinies as well as the value to humanity of industries are, respectively, worked out and enhanced. Encouragement to the individual ran through the address, from the precursory parts to the final. If the principles of personal responsibility and usefulness in regard to the duties of an office, however subordinate, could be laid deeper in many an otherwise excellent nature, there would be the substratum of the foundation to individual ambition in the chosen vocation that would lead to greater things; and this was recognized in impressing the usefulness of position, however humble, in almost the first lines of the address. The men in whom these principles are laid the deepest are those who, by their attainments and successes, stand between the cuts of the whips of those who are ever lashing at the superior lines of technical education, and refusing to see but a limited, if any, compatibility between the higher intellectual and practical developments of the human mind. It is not only by failures but by successes that judgment must go. The very life of our industry in the lighting service has been saved by the fruits of the academical attainments of Bunsen and of Welsbach; and not a small part of our directive carbonizing knowledge of modern garnering has come from the application of science to practice. Practice without science is to-day in danger.

By no means does Mr. Woodall decry collegiate training and attainments in combination with the practical work of the gas industry. It is with him, care in reading indicates, altogether a matter of method in producing the combination; so that between him and those who claim the propriety of a greater infusion of higher technical education in industry, differences are only of degree. His interest in the matter is great. He feels, at the outset, disposed to call a plague on all the perpetual writings on the subject; and then himself proceeds to deliver his soul over several pages of manuscript. The expressions of inspective thought in the address are many; and one and all invite comment. But there must be limitation. Here is one outstanding remark: "All that the best teaching arrangements can do for a man is to put him in the way of teaching himself." What better can a man want? The routinist is developed, the ruts of the formalist get deeper and deeper, without the preparatory guiding knowledge suitable to the position to which a man is called. We do not like throwing a man into a works, and letting him there pick up what he can, without the knowledge that gives the power of analytical and critical discernment. The ways of the works may not be good; and the preparatory technical education will enable the beginner to exercise discrimination, to better understand whether or not particular shop or works practices are such as shall retain a place in his own future practice, to guard against falling into the ruts of routine, and at the same time will

give his intuitive faculty fuller play. The higher the intellectual attainment (always supported and braced by practical experience) befitting the position and character of work, the less reliance has the individual to place on others; the lower the suitable intellectual attainment, the narrower the scope for effecting progress in the practical work. We cannot escape from this truth. If we attempt to do so, we commit ourselves to a negation of the force of intellectual qualities. From the aboriginal state to the state of the present, intellectual development has been at the very root of every fresh measure of progress. "Start," says Mr. Woodall, "cramming a young man upon some *a priori* assumption of what he ought to be taught, and you run the risk of spoiling a good worker, and make a poor intellectual." May we go farther down the address, and cull from it the words, "It all depends upon the quality of the individual mind," which, applied to the foregoing quotation, is another way of saying that it all depends upon the individual whether or not the submission of the cited sentence, and, in fact, the submissions of many other parts of this portion of the address, are reversible.

As we have said, though in places in the address it would almost seem, from the manner of expression, that Mr. Woodall thinks somewhat little of the higher grades of technical education in a man whose life is to be devoted to a practical and commercial industry, it is all a question of degree, and of the mode of acquisition of knowledge, both theoretical and practical. There is a touch of individuality about the observation, "Wherefore, I make no apology for speaking to you of the need of the better education of gas men from the practical, bread-and-butter point of view." Therein is represented the channel through which the whole of the thought courses that constitutes this the main section of the address. But Mr. Woodall would be the very first to regret if any part of the utterances bearing all the influencing authority of his name should be construed as meaning that he in any way sets small store on the highest intellectual attainment that has applicability to the walk in life that a man elects to pursue. Such construction is rebutted by many a sentence, and notably by the one: "I must say I should like to see in young men aiming to qualify as gas managers, superintendents, and for the higher offices in the industry generally, a greater keenness for technical study, and also a better appreciation of the business side of technical matters." What he would like to see, in the training of young men aspiring to become the chief technical and executive officers of the industry, is an intermixing, through one period, of practical and scientific or technical (name it as you will) training such as obtains for naval officers—that is to say, some active division of work and study that would give a few months on the works, then a few months at special study, and so on in rotation, until in due season there is ripeness for the responsibilities of full office to be undertaken.

That is the ideal; but the feasibility would be restricted by personal and geographical circumstances, unless the industry sets about making needful provision for the most promising of its young men. But the gas industry is the most conservative and immovable of all industries of which we have knowledge in matters affecting the future. In the case of a big concern such as the Gaslight and Coke Company, which is a power unto itself in many matters, things are altogether different from those which obtain in the great majority of gas undertakings. Viewed from the standpoint of that Company, things may appear easy that are difficult and impossible to most other concerns. But consulting the highest interests of the gas industry, it would not do for the practical training of the prospective chief technical officers of the industry to be restricted to the big and most (from the business standpoint only) propitiously situated concerns. It would perhaps be quite easy for the Gaslight and Coke Company to carry this particular ideal into effect; it will be a transgression of administrative propriety if the Governor of the Company does not see what can be done in this direc-

tion. He has accomplished much, by the aid and countenance of his colleagues, in putting into practice the views expressed as to the interjunction of the acquisition of technical knowledge and of practical work by fitters in embryo and the artisans in the Company's service. Worthy of acceptance is that pattern of good deeds with lasting beneficial effects. But regarding the intermingling of higher scientific education with practical training for those qualifying for the chief technical offices, it is seen that after all, when thoroughly digested, it all merely amounts to this—that Mr. Woodall prefers one manner of proceeding; some other people prefer another. The end is the same.

Several other topics were touched upon in the address, all more or less scintillating with advice and wise reflection that should be kept ever present in memory. Mr. Woodall confessed that, in inditing the address, he had before him the hope that it might be encouraging, and be not unworthy of being remembered, "for," he reflectively remarked, "I have now borne my own professional equipment for a very long time, and shall have no further use for it when many of you will be entering upon your prime." The words remind one of the flight of time; but the reminder is not pleasant. We do not wish to look forward to the day that will register the retirement of Mr. Woodall from the activities of the industry. As previously said, he has occupied, and occupies now, a unique position, and that an enviable one, carrying with it as it does a high place in the confidence of the industry. That place we do not desire to see vacated for many a long year.

Depreciation, Rating, and Competition.

THE papers presented to the members of the Midland Association, meeting on Thursday under the presidency of Mr. W. Langford, suggest upon their face that the Committee had some difficulty in obtaining technical contributions for the occasion. Therefore, all the more credit to those who came forward with topics for discussion. If distinction may be made, the principal paper, from the point of view of subject-matter, was one by Mr. George Helps, entitled "Notes on 'Income-Tax and Assessments.'" It carried us once more within the bounds of the intricacies of, and controversies over, rating; contributing to the existing confused mass of individual opinions and personally evolved principles on the subject. There are so many authorities of more or less degree on rating, all with their own peculiar *penchant* in various directions, supplemented by statutes and case-law, that the layman, who is generally the victim of it all, is in a complete maze when he has cause to direct his interest to the matter. The recent action of the Board of Inland Revenue has revived in the gas industry interest in the question of the allowance for depreciation in respect of income-tax. Mr. Helps does not think the instructions of the Board to their Surveyors are as bad as they appear to some, and that they ought not to be construed to mean that the Board will not allow any depreciation. To our mind, the Board are rather definite in their instructions: "No depreciation should be allowed in any circumstances in respect of any portion of these undertakings." There is nothing at all doubtful there. But "repairs and renewals may be allowed as working expenses as and when incurred. Exceptional expenditure on *bonâ fide* renewals, where the full effect cannot be given in one year, may be carried forward to the following year or years." It is quite clear from this that the Board regard repairs and renewals as one thing, and depreciation as another, and that they prefer the unstatesmanlike and unsound financial plan of mulcting the year in which renewals occur—be they large or small—with the expenditure, or, if exceptional, to form a suspense account, and wipe off the amount in subsequent years. This does not commend itself as such a rational plan of dealing with the matter as by providing for replacement during the useful life of the subject, and when it is yielding its share of service in providing profit. If Mr. Helps's reading of the instructions be correct—that the Board will make an allowance in respect of what is ordinarily understood as depreciation—we fail to see the object of the instructions; and we do not think such marching orders to the surveyors are issued for the mere sport of the thing by such a sedate body, and one always alert for the main chance, as the Board of Inland Revenue.

If Mr. Helps does not agree with the literal and generally accepted meaning of the instructions, then we cannot understand why he penned the sound statement that appears in

the opening lines of his paper: "The one question in connection with income-tax that affects all of us most is that of depreciation. It must be very certain that everything connected with gas-works depreciates, and that this depreciation has to be made good before net profits can be arrived at. If a gas-works be taxed on receipts, *plus* depreciation, there is something wrong with the Act of Parliament or the administration of it." We know that there is a good deal of depreciation going on all round that is not countervailed by charges for repairs and renewals; and that between the balance-sheet value of a concern and the current actual structural value, unless there be a covering allowance for depreciation, a fair level is not maintained. Administrations of company-owned undertakings are adjured by authorities to, on the one hand, pay greater attention to depreciation, so as to bring down the capital account as much as possible to a reasonable amount for conducting the business on the best competitive lines; while others, who no doubt place themselves on an equal level in the matter of authority, say you must not do this and you must not do that, and impose (as the Board of Inland Revenue have done) obstacles in the very ways to the more stable financial condition. There is indeed a largeness of inconsistency between authorities on the ethics of financial procedure, and generally on points of valuation. It is on the inconsistencies of the law, custom, and personal predilections and inventiveness that valuers live.

Among the many *dicta* of his paper, Mr. Helps (as already mentioned) says that "it must be *very certain* that *everything* connected with a gas-works depreciates, and that this depreciation has to be made good, or allowed for, before net profits can be arrived at." "Everything" includes meters. But—we quote this as an illustration of inconsistency only, knowing that Mr. Helps is not alone in this particular matter, and that there is high authority in his support—he does not allow that there should be this depreciation when once meters are replaced out of revenue; but, in the case of new meters for new consumers that have been charged to capital, there should be an allowance. The submission is hardly logical. The original meters had to be paid for from capital; and whether meters are those originally capital-charged ones or their successors, depreciation continues in use, and the day of replacement is a certainty. It would be just as reasonable to argue that, meters having been replaced from revenue, their representation in the capital account has no further existence, and therefore that year by year rent ought not to be charged. No matter whether the meter in existence is one that has been provided from capital, or is a replacement the purchase price of which has been provided out of revenue, the Income-Tax Authorities should make an allowance for depreciation. If the validity of the author's contention is admitted in this one particular, then there is not the slightest reason why it should not be applied to all the other parts of the gas-works plant, and a beautiful tangle would ensue. The idea of the Inland Revenue Commissioners is to get their full pound of flesh as early as possible, and a bit more if they can by withdrawing depreciation allowances.

The Board of Inland Revenue "know," remarks the author, what gas-works have "done—gas-works which were once new; and perhaps they think they are entitled to receive a little more than their due when they have such an opportunity." There is in this an insinuation of corrupt financial practice on the part of gas-works. It is not the only place in the paper where there are objectionable statements—objectionable because unqualified, or insufficiently so. There are accusations as to badly-kept accounts, and of extravagance in charges to revenue account. There are no doubt instances of both. Immoral and almost criminal action is alleged against directors, through which they and their friends have financially benefited and the shareholders have suffered. These things, it would have been well to have pointed out in the paper, have been the exception rather than the rule, and that the general rule is to find that extravagant charging and illicit practices do not exist. Mr. Helps admits that he has been studying the matter of rating for some years past from the side of the taxing and rating authorities. We believe him, and that he has done so with his eyes partially closed to the other side. Having done this, he has come to "the conclusion that gas undertakings have no reason to wish the law altered." On that current subject of depreciation and income-tax, too, the author was walking the whole time on the border-line of a declaration that he was completely in accord with the instructions of the Inland

Revenue Commissioners in regard to gas-works depreciation, notwithstanding that allowances are made in connection with electricity works. In the paper, there is not much guidance; and, generally speaking, the author's views will be found antagonistic to those prevailing in the industry's professional ranks.

The second paper read at the meeting was not of a pretentious character. It was by Mr. W. J. Rendell Baker, of Malvern; and it dealt with two of the competitors of town gas—carburetted air and electricity. In respect of both, though Mr. Baker occupies the dual position of Gas and Electricity Engineer, he was able to show that, in the matter of economy, town gas far and away takes the lead. Regarding air gas, no gas engineer, where there is a town-gas main delivering a supply at a reasonable price, would look upon its competition with any seriousness. It has a place, but it is not near a town-gas main, unless personal interest and influence come into the reckoning. The trouble of such plant, the question of closing-down at night time, the storage of the carburetted petrol, the capital expenditure, the maintenance, and the attention, are, with others, factors that operate against popularity. But, in the matter of cost, air gas cannot, all points being taken into consideration, compete with normal gas prices. The figure of 2s. 4d. per 1000 cubic feet for petrol only—representing 2 gallons—that Mr. Baker quotes in one part of his paper, must not be taken as being generally applicable. That is for a special form of apparatus to provide gas for use with ordinary incandescent gas-burners. He refers earlier in the paper to another form of plant in which 1250 cubic feet are obtained with a consumption of a gallon of spirit at 1s. 2d. That is about the general run of claim—some go higher—that the makers of air-gas plants put forward. But where they lose ground in comparison with coal gas is in the heaviness, for a given illuminating power, of the consumption of this attenuated gas of low thermal value. That is the rock on which is wrecked the *prima facie* economy shown per 1000 cubic feet, to say nothing of capital and other costs.

Turning to the electricity side of the paper, gas and electricity being under one management, there is not the same competition in Malvern as there would be were the position otherwise. The one department supplies light, heat, and power by gas or electricity; and the consumer can exercise his own choice. There is decided public economy in the arrangement. But it was not a question of administration with which Mr. Baker treated, but the subject of the progress made in efficiency by the electric metallic filament lamp, and yet "a very wide margin" remains in favour of coal gas. The figures as to the tests that he has made with metallic filament lamps show in some instances that the claims of the more enthusiastic electricians are not always borne out by the result. Instead of efficiencies approximating 1 watt per candle, it is seen that there are such efficiencies as 1.7, 1.62, and 1.48 watts per candle. But we should rather like to know something more about the three lamps designated "C." It seems to us there is something wrong with the figures. If the wattage (41.3 and 28.3 respectively) is correct for the 50 and 32 candle power lamps, the efficiency is well under 1 watt per candle power. There is no acquaintance on our part with such metallic filament lamps. The idea that there is some error is rather supported by the 16-candle lamp in class "C" requiring 20.4 watts, or substantially the normal figure for metallic filament lamps. However, perhaps Mr. Baker will supplement his information on this point.

An Effete Bargain.

CONSIDERABLE reverence for parliamentary bargains is evinced by some people. Whether the bargain is worthy of the regard depends upon its character. In the ordinary application of the term, it connotes mutual consideration in some form or other. What the term implies, however, is not always existent in so-called parliamentary "bargains." It does not require much experience of Private Bill legislation to learn that such bargains are frequently one-sided, and are more often than not the result of reluctant concessions by promoters to escape from the penalties of opposition; for penalties obtain whether or not the opposition is successful, and one of the worst of the penalties is the invidiousness that in the case of the defeat of the opposition sometimes unhappily supervenes. Where a company is concerned—a gas company especially—the majority of local authorities regard it as something approaching a sacred duty

to grind down its face on every available occasion, and to the utmost achievable extreme. It is very regrettable that it should be so; but the fact remains. The controlling effects of the sliding-scale, the limitations of funds, the new restriction as to the carry-forward—all of which keep companies within safe bounds in the relationship of their own interests with those of the consumers—have no effect in persuading the authorities that they can safely withhold their hand and hostility in several other matters that do not clash with the welfare of the body-politic. Few companies are given credit by local authorities for honesty of purpose when they approach Parliament, nor for a desire to serve their area to the best advantage, and share with the consumers the proceeds of prosperity. All that can be squeezed out of a company, or that can be gained by the subtleties of parliamentary counsel or the acuteness of witnesses, are therefore referred to as "bargains," and worthy objects of the esteem of all, other than of the victims. There are bargains, too, that were fair enough in their day, but which are now effete, and obstructive to the best service.

There has been much talk, and much talk there probably will still be, in connection with the reduction of illuminating power and the adoption of the "Metropolitan" No. 2 test-burner, as to bargains regarding illuminating power and standard prices. While there is idle contention on the one side regarding these, scientists are trying to make the point clear that the constituents of gas from which the highest direct luminosity is obtained are not the best ones in the interests of calorific power, and that work should be directed to securing the largest percentage of the latter, and therefore the largest quantity of gas from a ton of coal that will give the maximum number of heat units. That is the direction in which work must proceed to give the cheapest gas of the quality necessary for current uses. The incandescent burner, the cooker, the heater, the gas-engine—severally and collectively—demand not sperm value but calorific value. All the day gas that has made such a vast difference to the stability of the industry requires the latter. And yet there is haggling over a so-called "bargain" that is no longer a credible one, that no longer finds support for its continuance, nor justification for the descriptive name of "bargain" that its godfathers—quite correctly perhaps at the time—gave it, but which is now a misnomer by the complete lapse in value of one of the conditions. The authorities who were one of the parties to this particular bargain were only so by virtue of their elective office; they were merely the representatives of the consumers. But the time has come when, by these representatives clinging to the letter of the bargain, the interests of the consumers of gas are not best served. The bargain enforces something that the consumers of the greatest proportion of the gas output do not want, and that enforcement retards the supply at the cheapest possible rate of the heat units that they do want. It is a case of an obsolete condition dragging vigorously at the heels of scientific progress.

And, what is more, these ill-advised representatives of the consumers, these representatives who have no scientific or practical understanding of the position, these representatives who would perpetuate a condition that is as useless as it is obstructive, claim that this useless and obstructive condition as to illuminating power should be made, on the reduction of the standard quality, and the introduction of the "Metropolitan" No. 2 burner, the basis of a revision of the opposite condition in the "bargain"—that is to say, the standard price. The absurdity of this is only pardonable where there is ignorance. Beyond the considerations already advanced are others. There is not a gas-works-owning local council who has been in Parliament this session for additional gas powers who (not already having the authority) has not—and very properly—asked for a reduction of the illuminating power of gas to 14 candles, tested by the "Metropolitan" No. 2 burner, and one of them is down to 12 candles! But where is there any effective bargain in this connection established between them and the consumers? Where is there any assurance that the consumer will obtain any monetary benefit from the change? There is not any assurance, and there has never been any in the case of municipal supply, such as the sliding-scale gives in the case of companies. Any saving that accrues may be devoted, solely on the volition of the local authority, to relief of the rates, including relief of the rates of those who are not gas consumers, but whose lighting is either by electricity or oil. But let the applicants for a reduction of illuminating power and the use of the "Metropolitan" No. 2 test-burner be a sliding-scale

company—under which scale the consumer is abundantly protected—the “bargain” is dragged forward, and paraded before Parliamentary Committees, as something that is really sacrosanct, though its main condition, which once invested it with credit and justice, has been degraded by changed circumstances. It is not the consumer under the sliding-scale company who needs protection. Subject to the prevailing market conditions for raw material and bye-products, he will get the fullest value in heat units for his money, before the shareholders can participate in any financial benefit; whereas those consumers who are under municipal supply conditions can only receive protection by a strict limitation of the profits that can be diverted to purposes other than the legitimate capital and general demands of the undertaking. While gas-owning local authorities come to Parliament—and, we repeat, very properly, too—for the reduction of illuminating power and the use of the “Metropolitan” No. 2 burner, while there is no corresponding “bargain” in connection with municipal gas and electricity supply to that which there is an attempt by local authorities to perpetuate in the case of sliding-scale gas companies, the case for perpetuation and revision, apart from the considerations advanced earlier in this article, is a peculiarly unsound one. For these and other reasons, the Joint Bill (to be promoted under the ægis of the Gas Companies’ Protection Association) for the adoption, by all the companies desiring the change at present, of the “Metropolitan” No. 2 test-burner, should be allowed to go through without opposition. Parliament has given such a very clear indication of its views in this matter by, session after session, applying the modern illuminating power and test conditions, that hostility from any quarter would, in our opinion, be sheer folly.

A New Gas-Works, and Liverpool Policy.

A FEW points of interest are raised by the opening of the new gas-works that the Liverpool Corporation have constructed for the supply of Fazakerley, which suburb was annexed by the city towards the end of 1905. As all in the gas industry know, the city is supplied with gas by a Company, and the Corporation themselves are the electricity authority. This latter circumstance, however, does not weigh with the Corporation in dealing with the lighting of the streets of the city, as the relative extent of the applications of gas and electricity abundantly demonstrates. The same certificate to an independence of consideration and act as between the interests of the ratepayers and those of a municipally owned trading enterprise, could not be given to many towns. To that independence the new gas-works at Fazakerley are a further testimony; and what is more, in view of electricity ownership, they are a testimony to the indispensability of gas. Prior to the Corporation taking over the district, it appears to have been totally fallow ground so far as gas supply is concerned; and all the available evidence seems to lead to the conclusion that there ought to have been a union of Fazakerley to the Liverpool Gas Company’s district before it was brought under the jurisdiction of the Corporation. The Company obviously had mains not far distant, for they have been supplying the Corporation with gas in bulk for the district during the construction of the Fazakerley works. There were negotiations, too, between the Corporation and the Company, in an endeavour to effect terms for a permanent supply for the area, in lieu of carrying out a scheme of new works. But the works opened last Thursday are a monument to the failure of the negotiations, and, *primâ facie*, a confession of an inability to deliver gas in bulk by a great Company on terms that would have rendered a comparatively small isolated plant an economic offence. There may be an explanation which is not before us. But it does cut against the grain to see a Gas Company’s pipes on the borders of an area, and yet learn that it is considered possible to make a better showing by independent works.

There is one point that will operate strongly in favour of the new gas-works at Fazakerley, and that is the low capital expenditure at which Mr. Isaac Carr, M.Inst.C.E., the Consulting Engineer in this matter to the Corporation, has, despite a 15 feet depth of quicksand, put down the works. It makes one smile hugely at the enormous capitals proposed, and sometimes obtained, by the professional gas company promoter who trades on public ignorance, when one sees what can actually be done by an Engineer with a reputation as an economical designer and constructor to defend. Here are these new gas-works at Fazakerley, with a carbonizing

capacity of 35 millions per annum, and all the other plant equal to 60 millions, with a present capital expenditure of only £12,710—quicksand notwithstanding. Everything in the works is good and sound, and of approved type; and all possible steps have been taken to ensure low working costs. But we think it a mistake—Mr. Carr is of contrary opinion—that the Corporation should be setting out to match from these works the character of gas supplied by the Liverpool Gas Company—that is to say, a 20-candle power gas, tested by the No. 7 standard flat-flame burner. Still the selling price will be but slightly in excess of that which is now being charged in the city by the Company. When the Corporation were applying to the Local Government Board for the Provisional Order to enable them to supply gas, the Board suggested the ordinary 14-candle standard tested by the “Metropolitan” No. 2 burner. True to his colours, Mr. Carr resisted this, and had the Liverpool standard established for Fazakerley. The only remark that need be made on this point is that it is difficult to understand anyone deliberately putting a restraint upon liberty in this way. Although the standard in a Provisional Order or Act is the commonly accepted one, there is no limit placed on the point to which the illuminating power may ascend above this. While speaking of the high illuminating power gas supplied in Liverpool, it is worthy of passing note that there are apparently rival claimants now to the questionable credit for the continuance of the super-quality. It has always been understood that the Company were jealous of the maintenance of the illuminating power in this age of a complete transformation in the methods of utilizing gas. But readers may be left to make what they can of these not too clearly reported remarks by Sir Charles Petrie (the Chairman of the Liverpool Tramways, Electric Power, and Lighting Committee), who presided at the ceremony inaugurating the Fazakerley Gas-Works: The Company “had always said if the Corporation “would allow them to reduce the candle power, they could “lower the price; but the terms were such they [? Company “or Corporation] could not think of making the alteration.” Now there is confusion as to whether it is the Company or the Corporation who constitute the stumbling-block in the way of reform.

British v. German Retorts.

The letter from Mr. Charles Carpenter in our issue last week, announcing that an order for the retorts which will be required next year for renewals at two of the works of the South Metropolitan Gas Company had gone to Germany was received just before the “JOURNAL” was going to press, so that comment on it had to be deferred. The letter contains a warning that should be taken very seriously by British manufacturers of the refractory materials required by gas-works. The warning is all the more emphatic in view of the amount and character of the endorsement that it receives. Not only did the recommendations come from the respective Engineers of the two works, but they received the backing of the Chief Engineer (Mr. W. Doig Gibb) in seeking the approval of the Board, over which Mr. Charles Carpenter presides, and upon which is that veteran Engineer, Mr. Robert Morton. There is a weight of authority there that cannot be lightly disposed of by the British manufacturers. We are not by any means inclined to agree that a universal condemnation of the British produce is deserved; but there is admittedly all too much indifferent material about. But a salutary method of dealing with this is for gas engineers to promptly return all goods that are not up to specification. However, there is no other purpose but that of serving the interests of the manufacturers that has induced Mr. Carpenter to make his announcement. For the British manufacturers, the position is one of gravity; and it is for them immediately to stem the damage they will unquestionably sustain if they delay. The right way is to assure, and to prove beyond shadow of doubt, that their products are, and henceforth will be, superior to those of German origin. It is not, or should not be, a question of price. In the material employed in retort-settings, subject as it is to the wear and tear of fierce heating, and the stresses occasioned by intermittent charging and the ever-changing conditions within the retorts, quality is of greater consideration than price. Though the retorts and other refractory material may initially cost more, the durability—the saving in repair and maintenance, and the longer working period obtained—makes a somewhat heavier first cost than for less durable material a

profitable expenditure. It is from this point of view, it is because the duty of Board and Engineers is first to the Company they serve, it is because their particular experience confirms their action, that these retort orders have gone to Germany; and Mr. Carpenter makes it clear that it rests entirely with the British manufacturers whether the orders in future stay at home or again go to the Continent.

Not a Modern Experience.

This is not a new matter for the gas industry, nor for the South Metropolitan Gas Company. It has been having consideration for years. Long before the famous paper (in 1908) by Mr. F. J. Bywater before the Institution of Gas Engineers, there were trials made with German retorts in a works under our immediate observation; and the results were at that time excellent. But, rightly or wrongly, "Patriotism" was allowed in that instance to stand before "Profit." As to the South Metropolitan Gas Company, let us recall Mr. Carpenter's own words in the discussion on Mr. Bywater's paper last June twelvemonth:

He wished emphatically to corroborate the author in what he had said with regard to the German manufacturer. He was to-day the best manufacturer of fire-clay goods. If one wanted the best, one must get them from Germany. Germany had built up this industry, as it had many others, by technical knowledge and education; and unless they in England set their house in order, and conducted their industries in the same way, they would not only not regain the ground they had lost, but would lose still more. He spoke from experience in this respect; and no doubt the author had done so also.

What has been done since Mr. Bywater's paper threw the makers of refractory materials into some consternation through the direct attack upon their reputation and methods? They have been slow to work with deliberation to rehabilitate the confidence of purchasers that was then rudely shaken. It is true the English Ceramic Society have made a move; and that Sub-Committees have been appointed in connection with various industries using refractory materials to consider the questions of standardizing and improvement. There is a Sub-Committee of the Institution of Gas Engineers; and their report concerning the questions they have under consideration appeared in our issue for June 1 last (p. 575). But this is not sufficient. The manufacturers themselves must set to work, and that without delay, to wipe out the bad impression created, to which fresh life has been given by Mr. Carpenter's letter. There must be introspection and action. The real work must be done within their own factories; and they must not keep dark what they have done and are doing. The circumstances are such that the best course is to come out as much as possible into the open, and show that their methods are not rigidly confined to rule-of-thumb and tradition, and that they are (to quote Mr. Carpenter) using brains in the compounding of their retorts and other materials. If the manufacturers sit quietly under this renewed charge of incapacity compared with the German manufacturer, we shall be greatly mistaken in them.

In a Tight Corner.

Edmund Eaton and his coadjutors in company promotion have their dupes hotly pressing them; but outwardly they appear to maintain under the circumstances the same *sang-froid* that characterized them when they were at work imposing their money-making schemes upon the public. Receivers have been appointed in connection with two more of the precious brood of grossly over-capitalized concerns—the Ticehurst and the New Toddington; but the receivers will find the assets are of small value in contrast with the capital and debenture issues. Meanwhile, Mr. C. S. Glover is prosecuting his campaign on behalf of the shareholders of the Ticehurst Company; but he cannot get very far through the Directors continuing their old policy of declining to see shareholders and refusing them information. He has been to Ticehurst and Wadhurst and inspected the works of the Company. His description is summed up in the word "primitive;" his estimate of value, from observation and local inquiry, is placed at, as an outside figure, £5000, though £67,000 in debentures and shares has gone somewhere. The Company are in the possession of two gasholders—one of 10,000 cubic feet capacity and the other about 5000 cubic feet, together about large enough to accommodate the gas from a little more than a ton of coal! If this is not a clear case of something to which a very harsh name could be properly applied, then we do not know the true meaning of the term in mind. An advertisement has appeared calling an

ordinary meeting of the Company for to-day to receive the long-deferred report and accounts, and for other general business. The combined action of the shareholders has evidently assisted to put the Board in motion to discount some of their administrative delinquencies. But, up to the date of Mr. Glover's last circular to the shareholders (Oct. 20), he had not personally received any notice of the meeting, nor a copy of the report or accounts. From further information given by him, he had the doubtful pleasure of meeting Eaton on the occasion of his visit to the Ticehurst works, the plant at which the Company promoter appears to be using for some experimental work in connection with another of his launchings—the Patent Block Tar, Motor Oil and Asphalte Company, a revived venture whose second prospectus was noticed in our columns not long since.

An Internal Combustion Water-Pump.

Those of our readers who attended the Engineering Conference, organized by the Institution of Civil Engineers, in the summer of 1907, may remember that in the course of the discussion on a paper that was submitted by Messrs. Hawksley and Davey, on "The Cost of Pumping by Various Methods," attention was called by Mr. H. A. Humphrey to the low mechanical efficiency—56 per cent.—given for a combined gas-engine and pump, which he considered allowed great room for improvement. He related how, when he was associated with the late Sir Frederick Bramwell, the latter suggested that there ought to be a better means of utilizing gas for pumping, and one that would give a higher efficiency. Mr. Humphrey was asked to think the matter over, and he did so; the result being the designing of the pump described and illustrated in another part of the "JOURNAL." It will be noticed that it has no piston, fly-wheel, crank-shaft, or any of the customary appurtenances of a water-pump. The explosion takes place immediately in contact with the water; and on the occasion above referred to Mr. Hawksley asked whether the pump could be used with water intended for consumption. Mr. Humphrey replied that it could, as the gas need not come in contact with that which was actually delivered.

Socialism in Practice.

A very good object-lesson in practical Socialism is afforded by an experiment in France which has ended in disastrous failure, and the story of which is told by the British Consul at Lyons in a recently-issued report. In 1891, he says, the ill-starred venture was commenced, in the shape of the "Miners' Mine" in the Loire coal-basin; and it was heralded as marking the inauguration of a new golden age of industrial co-operation. A concession consisting of four pits, covering an area of 183 acres, was obtained at a low price; and subscriptions flowed in from all quarters. The essential point about the undertaking was that all profits were to be divided among workers in the mine. It appears, however, that dissensions and difficulties soon made their appearance, never again to depart until the final closing down of the pits in the autumn of 1908. The chief of these disputes arose from the fact that, soon after the opening of the mine, the regular members of the society began to get in outside men to help. These auxiliaries gradually grew to consider themselves just as much shareholders as the original members, and therefore equally entitled to share in the profits. Moreover, it not infrequently happened that when funds were low an all-round *pro rata* reduction had to be made in wages—an arrangement which caused great dissatisfaction among many of the men, who, being unable apparently to grasp the principles of co-operation, demanded their full wage. What they apparently failed altogether to see, states the Consul, was that the principle of co-operation involved their taking the rough times with the smooth. This trouble marked the beginning of the end. Quarrels followed thick and fast. Chairman after chairman was elected, only to be intrigued against and forced to resign; the year 1905 witnessing the election and deposition of no less than five. Serious fires in two of the pits contributed to hasten the inevitable crisis; and the hard times that followed—in which the whole of the Loire basin suffered—found the "Miners' Mine" least of all able to make head against the storm. Money began to run short, creditors became pressing, and at length a Receiver was put in and the pits closed down. This plain unvarnished tale will do little to help the cause of Socialism among those who are able to regard the matter from a practical business point of view.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 267.)

ALL markets on the Stock Exchange without any exception were depressed last week, dominated by the continuous hardening of money. Even one or two which had stood out with hardened hearts had to give way at last. And, with the disagreeable prospect of the not distant settlement, realization and account-closing was the programme, and prices gave way accordingly. Things looked ominous from the very start. Gilt-edged were weak, and Consols dropped materially, although they closed only $\frac{1}{8}$ worse. Rails were rather steadier; but the rest were dull or uneven. The general outlook was as bad on Tuesday. Consols fell $\frac{1}{8}$. All leading departments were dull; and the bullish speculative lines became shaky. The gloom was, if anything, rather intensified on Wednesday, and not a ray of light was perceptible in any quarter. Consols went down another $\frac{1}{8}$. On Thursday, Consols were done more than once at $82\frac{1}{8}$ (the lowest price touched for many a long day); and everything was crushed by the monetary squeeze, which now culminated in a rise of the Bank rate to 5 per cent. On Friday, depression ruled everywhere, especially in the more speculative quarters; but the gilt-edged were a bit steadier. Saturday was just the same, with marked weakness in Americans and South Africans, and prices closed much depressed. In the Money Market, there was a steady tightening day by day. On Thursday, the Bank rate was raised to 5 per cent.—a rate not attained in the last year and three-quarters. Before the close, rates were disposed to be easier. Business in the Gas Market was well up to the mark in point of volume, and was more liberally distributed than usual; some rarely-dealt-in issues providing a fair share of transactions. But, owing perhaps in a measure to the generally prevailing heaviness, the tendency was scarcely so strong. In Gaslight and Coke issues, the ordinary opened at $106\frac{3}{4}$; but it gave way towards the close, and was done once or twice at 105 —a fall of 1. In the secured issues, the maximum marked $88\frac{3}{8}$, the preference from $104\frac{1}{4}$ to 105 (a rise of $\frac{1}{4}$), and the debenture from $85\frac{1}{4}$ to $86\frac{1}{4}$. South Metropolitan marked $121\frac{1}{4}$ on Tuesday, but was done at 120 free on Saturday. Commercial was very firm; the 4 per cent. realizing $110\frac{7}{8}$ and 111 , and the $3\frac{1}{2}$ per cent. 104 and $104\frac{1}{2}$. Among the Suburban and Provincial group, Alliance new changed hands at $17\frac{3}{4}$, Bournemouth B at $16\frac{1}{2}$, ditto preference at $15\frac{1}{4}$ and $15\frac{3}{8}$, Brentford old at 256 (a rise of 1), ditto new at $191\frac{1}{2}$, British at from $42\frac{1}{4}$ to $42\frac{1}{2}$, Portsea "B" at $130\frac{1}{2}$ and $130\frac{3}{4}$, ditto "D" at $101\frac{1}{2}$ and $102\frac{1}{8}$, West Ham at from $124\frac{1}{2}$ to $125\frac{1}{2}$. In the Continental companies, Imperial made from $180\frac{1}{2}$ to $181\frac{1}{4}$, Union $97\frac{1}{2}$ and 98 (a rise of 1), European $24\frac{1}{4}$ and 25 , ditto part-paid $18\frac{1}{2}$, and Malta $5\frac{1}{8}$ and $5\frac{1}{4}$. Among the undertakings of the remoter world, Bombay old changed hands at $6\frac{1}{2}$, ditto new at $4\frac{1}{4}$, Buenos Ayres at from $13\frac{5}{8}$ to $13\frac{13}{16}$, Cape Town preference at $5\frac{5}{8}$, Oriental at from 140 to 141 , Primitiva at $7\frac{1}{4}$, River Plate at $16\frac{1}{2}$ and $16\frac{3}{8}$, and ditto debenture at $96\frac{3}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

Raison d'Etre—Old Stories Set in New Verbiage—Clutching at Straws—On Costs—The "Electrician" on Lighting Competition.

ELECTRICAL station engineers are a sleepy-headed lot if the authority of the "Electrical Times" may be accepted as trustworthy. We have had an opportunity since last Tuesday of reading a little more industriously than time would previously permit the domestic electrification issue of our contemporary, and have concluded it with our former conviction strengthened that there is great poverty of suitable appliances for general domestic electrification, that domestic electrification is not conducive to domestic economy, and that the case presented in favour is particularly thin. In the early part of the special number, there is the evidence of the light esteem in which our contemporary holds the commercial abilities of the central station engineer and their methods and degree of enthusiasm in applying them. The "immediate object," says our contemporary, "in issuing this special number is to arouse electric supply undertakers and installation contractors throughout the land to make the most of the immense opportunities—not yet generally realized—which domestic electrification affords them." In order to emphasize the estimate there is in these words as to the doltish attitude of the administrators of the electricity industry, and their failure to properly appreciate their position, it is further written: "We believe that as regards competition with gas for domestic use, the economical position of electricity has improved to an extent that is not fully recognized even by the electrical industry." Our friends of the electrical industry now know the full measure of their perceptive talents, and of their capacity for putting to the most effective use what they do perceive in the matter of electrical progress. The electrical industry should erect a monument to the "Electrical Times" for the unselfish interest exhibited from time to time in offering stimulant to the commercial workers, though the fortunes of the industry do not disclose any great effect from the lavish and highly flavoured doses that are served out. In the introductory notes to the issue, there is much said about what "we" have done. It was this contemporary that, on the arrival of the first practicable metallic filament lamp, made an

attack on the cheap wiring problem. That was in 1902. This is 1909. What progress has been made in the Septennium? Very little; and the novelty of the metallic filament lamp has rapidly worn off. But it is not only to lighting, but to other matters that this domestic electrification number is dedicated. "The object is to hand our readers, a compendium of all the methods"—legitimate and otherwise—"available for the capture of the household consumer. Be he big fish or little, whether he is forced to wire cheaply or at ordinary prices, here is the array of implements for luring and landing him." "Luring him!" That is a good and exquisitely appropriate expression. There has been so much allurements in the past to get hold of the custom of householders and disappointment in the result, that the difficulty of the present is immeasurably increased. Householders know the bait, and the hook by which it is suspended.

In the other parts of the domestic electrification issue, there is much trivial talk—much in the husk line, but little in wheat. The writings in this "special" and everyday experiences when compared supply a mass of striking contradictions. The preparation of the number, and the character of the material of which it is largely composed, show, as pointedly as anything can do, the hard task that is being experienced in scraping in business under the favourable conditions that the "Electrical Times" fancy it has been the means of discovering, but which the central station engineer, hard pressed as he is for new domestic business, has not by the most microscopic examination succeeded in discovering. But this is an age of discovery more or less useful to the world, of the recognition of heroes, and of the conferment of gold medals, diplomas, and so forth. The "Electrical Times" (as already suggested) should not be overlooked in this distribution of honours, if the electrical industry thinks the discoveries worthy of recognition and reward. Among the discoveries are testimonials (only one of which is signed) from electricity consumers, stating that electricity is cheaper than gas. There are comparisons between gas and electricity, displaying savings by using the latter. But, alas! most central station engineers know that, did they so desire, gas suppliers could collect bushels of similar testimonials and comparisons, disclosing in terms which electrical chicanery could not subvert, that there is a material and not a mere hypothetical economy in employing the modern incandescent gas-lamps as compared with metallic filament lamps.

This is the reason why in "Publicity Powder and Shot," our contemporary finds it necessary to write: "The tradition that gas is cheaper than the electric light dies hard." Cheapness is not only a tradition, but a proved fact; and substantial facts of the kind are somewhat hard to kill. As might be expected, the old allegation peeps out again, that gas computations are only made on theoretical and laboratory conditions. Our contemporary wants its readers to sink intelligence, and to accept the doctrine as to the impossibility of reproducing, with such a simple uncomplicated instrument as the incandescent gas-burner, the theoretical measure and laboratory experience in the matter of efficiency. The absurdity of our contemporary's contention will be apparent to the meanest mental capacity; but there is no restraining the hard-pressed electrician in his descent to the frivolous and the mean, and to the depravity of absolute dishonesty, to serve his purpose. Quotation is made of the celebrated Westminster tests by Mr. Lancelot W. Wild, in which this gentleman constituted himself the judge of what the millions of gas consumers in this country do; and, instead of using incandescent gas-burners in a manner that would give them their most effective duty, he restricted their use to what he, with his narrow experience, believed to be the popular method of application. Against this there was protest at the time in these columns; and Mr. Wild's reply is on record for the perusal of all who choose to read it. Of course, in the eyes of electricians, no one among the 6 million or so consumers of gas supplied by statutory gas undertakings in this country (to say nothing of those served by non-statutory concerns) have had any practical experience of the cost of modern gas-lights, but only of theoretical and laboratory computations. What is more gas for lighting is now "staggering on four legs, not one of which is sound." The electrical industry must wish it was staggering the same way. The claims of gas for health, cleanliness, and so forth, it is said, laugh themselves out of court. We have heard something of the same sort before, and have read of it in the electrical press or central station literature. However, not over much is made of that point now. The electrical people have made themselves the laughing-stock of experienced gas consumers over the point; and, although directly challenged, electricians have declined to fix themselves down to any description of the "noxious" and "poisonous" fumes of which they speak so glibly in their literature.

But we get back on to price. "The public," we are told, "are beginning to find out the contemporary truth about cheapness." "Here and there, they get the enthusiastic testimony of neighbours who have tried the wire lamp, and the leaven is working in the lamp." In view of this, the gratuitous paternal advice to station engineers on the part of the "Electrical Times" appears to be somewhat superfluous; and the reasons adduced for the publication of this domestic electrification number are clearly without solid foundation. There is another side to the leaven working in the lump; and that is the common tale of the lighting units sold by the central station also dropping off in huge lumps. Having regard to the contradiction of facts and words, there is obviously something radically wrong with the arguments and statements of our contemporary; and the experienced electrical

canvasser, in his efforts to capture the domestic consumer, will feel that he requires in his work something more than this liberal supply of froth in the form of misrepresentation and frivolity. We will give our contemporary its due. It does show that where electricity beats gas for lighting, there has been a lavish and wasteful use of gas, by keeping it burning extravagantly in unnecessary positions. The same applies to electricity. The very facility, too, of switching on (switches are also getting common enough with gas lighting), and the neglect to switch off, is accountable for electricity bills being heavier than they would otherwise be in not a few cases. It is a case of familiarity breeding contempt, until the temporary check of the quarterly account comes into force, and even then the householder cannot always be on guard to regulate use.

A great point is made of the flash-jet sometimes (not commonly) used with incandescent burners. The straws at which the electricians clutch with avidity to assist their case are highly edifying, not to say amusing; and it is the best testimony to their nerveless case. Inverted burners from which the highest illuminating efficiency with gas is obtained, are not fitted with flash-jets unless ordered. With these, a light of 20 to 25 candles per cubic foot can be obtained, under ordinary conditions, which means that (at least) 20-candle light can be enjoyed for 2000 hours for an expenditure of 2000 cubic feet of gas; whereas a 16-Hefner unit (14½-candle) metallic filament lamp in the 2000 hours will use 40 units of electricity! Between the cost of the one and the cost of the other, there is a very big margin for lavish illumination with gas. We find that Mr. H. H. Holmes, formerly of West Ham now of Marylebone, has come to the front again in this domestic electrification issue, and is giving hints on how to develop the private house demand. We once put a question to Mr. Holmes which he has never answered. We put it now to the "Electrical Times," and if the answer is not in the affirmative or is in any way equivocal, we will invite our contemporary to put the matter to a photometrical test. Our question is, Are we correct in stating that it is impossible to get more, from a unit of electricity, with the metallic filament lamp than 800 candle-hours; and that it is possible to get, with an ordinary commercial inverted gas-burner (using gas at, say, 2s. 6d. per 1000 cubic feet), from 3d. spent in gas 1980 candle-hours, from 4d. 2640 candle-hours, from 5d. 3300 candle-hours, and from 6d. 3960 candle-hours—the 3d. to 6d. representing prices per unit? The whole of the fulminations of the "Electrical Times," and of Mr. Holmes, cannot dispose of these figures. They are reproducible under like conditions in practice just as easily as they are to be produced in the photometrical room. It will be seen that between the 800 candle-hours, and the figures given for gas, there is a thick and spacious covering for the multitude of sins attributed by our contemporary to gas and gas people. The gas companies publish figures, says Mr. Holmes, which they by no means obtain in practice. That is an old postulation of this gentleman; but he has never had the courage to toe the line in an attempt to prove it or to admit his error. We admit a point made by our contemporary, that there are a number of cheap and inefficient inverted gas-burners on the market; it is likewise true that there are a great number of cheap and inefficient metallic filament electric lamps on the market. But neither gas nor electricity consumers are compelled to buy one or the other.

The "Electrician" specially devoted some of its columns to the question of lighting the same week as the domestic electrification number of its contemporary appeared; and, in an editorial on the subject, there is a decided note of moderation, and a recognition that the virtues of illumination are not all on one side—neither of electricity nor of gas. There is truthful acknowledgment that the inverted gas-burner under ordinary low-pressure supply has reached an efficiency of 20 candles per cubic foot of gas, and that high-pressure gas-burners are now obtainable that return 60 to 70 candles per cubic foot. Similarly the metallic filament lamp and the flame arc lamps are a big advance on, respectively, the carbon filament lamp and the ordinary forms of arc lamps. It is also admitted that the inverted mantle is an advance on the upright in the matter of strength. But still in this connection it is claimed that the metallic filament lamp has a decided advantage. We will not quarrel over this modest claim, though in regard to physical characteristics, every electrician is aware (though it is not proclaimed from the house-tops) that the metallic filament is not all that could be desired. The price of the metallic filament lamp is confessed to be a serious defect; and it is dearly desired to see the cost down to 2s. or even 1s. In a sentence, however, there is admission that electricity has not yet overtaken gas. "At present," it is remarked, "for interior lighting electrical methods are advancing very rapidly in the hope of overtaking gas methods." Also "gas plant, generally speaking, has the great virtue of cheapness, and possesses means of remote control to which there is no equivalent in electrical devices." In side street lighting, it is considered that there is a very great field for the metallic filament in competition with gas. Here, it is stated, electric lighting is forging ahead. The forging ahead is not so much due to merit as to the fact that so many electric lighting stations are under municipal control. Meantime it is noticed that the harbour at Whitehaven which has been lighted for five years by electricity, is now to be lighted by gas, owing to the terms submitted by the Town Council being too high; and, for similar reason, the lighting of the Crystal Palace Parade is to be retained by gas, though the South Metropolitan Electric Light and Power Company sought to capture it by a flame arc scheme.

PROGRESS OF THE DESSAU

SYSTEM OF VERTICAL RETORTS.

WE have received from the Dessau Vertical Retort Company of Berlin an elegant brochure on the Dessau vertical retort-setting and gasification in vertical retorts. It contains reproductions of photographs of the more important existing installations of Dessau verticals, and plans and sectional drawings of works and plant of interest in connection therewith. The text (which is in German) gives a historical account of the invention and development of the Dessau system, and particulars of a number of installations and of the working results obtained with them.

Reference is made at the outset to the failure of efforts made prior to the beginning of the present century to overcome the difficulties involved in the production of a system of vertical gas-retorts which would work successfully on a large scale. It is claimed that Dr. Bueb, working in Association with the German Continental Gas Company of Dessau, was the first to evolve a successful process for the gasification of coal in vertical retorts. The further development of this process was effected in collaboration with the Imperial Continental Gas Association, and in particular with Mr. Edward Körting, the General Manager of the Association's works in Berlin. The patent rights in the process were taken over by the Dessau Vertical Retort Company of Berlin, which now erects the settings in co-operation with the Berlin-Anhalt Engineering Company ["Bamag"] and the Stettin Firebrick Works.

The essential features of the Dessau type of vertical retort-setting comprise the erection of eight, ten, or more vertical retorts 4 or 5 metres (about 13 ft. or 16 ft. 6 in.) in length in a bed, in which the retorts are generally arranged in two adjacent rows. The producers are placed along one side of the bench of settings, while the regenerative flues are on both sides of each setting. Ordinary mouthpieces are fitted to the upper ends of the retorts; but the lower ends are closed by special lids which are manipulated by means of a lever from a single standpoint for each retort. This is regarded as a very important feature of the Dessau system. The relatively high make of gas which the vertical retorts afford is attributed to reduction of the loss of gas at charging and discharging; diminution of the decomposition of the gas *in statu nascendi*; and participation in the formation of gas of the moisture liberated by the distillation of the coal.

Among the figures quoted to show the working results attainable with vertical retort-settings may be mentioned those for the trial run made to check the fulfilment of the contract guarantees in regard to the installation of sixty retorts at the Genoa Gas-Works. The coal carbonized was English (Thornley), and without the introduction of steam the make per ton averaged 12,236 cubic feet, having a gross calorific power of 628 B.Th.U. per cubic foot.

The advantages claimed for the Dessau system of vertical retorts include a reduction of the amount of naphthalene in the gas to a negligible quantity, and of the production of carbon bisulphide by 50 per cent., and an increase in the yield of ammonia. In regard to the latter, the average yields of (real) ammonia obtained in 1908 at the works in Berlin of the Imperial Continental Gas Association are given for each type of retort-setting, and are as follows: Horizontal retorts with stoking machines, 0.24 per cent. of the weight of coal carbonized; inclined retorts, 0.29 per cent.; vertical retorts, 0.31 per cent. The vertical retort tar is stated to contain only 2 to 4 per cent. of free carbon, as compared with 20 to 25 per cent. for ordinary gas tar, and also 50 per cent. less naphthalene than the latter. The amount of cyanogen in the gas is about 40 per cent. lower, as might be anticipated from the increased yield of ammonia.

These and other data relating to the Dessau vertical retorts are presented in a lucid and interesting manner in the brochure before us, which also contains extracts from some reports already given in the "JOURNAL," of the extended trials of installations of these retorts at many gas-works—e.g., Zürich, Cologne, and Mariendorf. The last-named works now has the largest number of these retorts in use—viz., 28 beds of twelves, making a total of 336 retorts. Barcelona comes next with 300 retorts in beds of ten; and the Cologne Gas-Works and the Danzigerstrasse works in Berlin, each have 240 retorts, also in beds of ten. These figures will serve to show that the system, though of so recent introduction, has already achieved a success on which the Dessau Vertical Retort Company and its co-adjutors may be heartily congratulated. The elegant brochure which they have now issued is well worthy of careful study.

National Commercial Gas Association.—We have received from Mr. Lucius S. Bigelow, of New York, the Secretary of this Association, the "Transactions" for the year 1908, embodying the proceedings at the third and fourth annual meetings, held in January in New York and in December in Chicago. The volume contains an interesting chapter on the early official history of the Association, of which Mr. Bigelow was the founder rather more than four years ago; and this is followed by a series of illustrations showing some of the work accomplished in connection with exhibitions of appliances employed for the conversion of gas into light, heat, and power. The contents of the book are a record of good progress on the lines originally laid down.

ADVERTISING BY GAS.

THE numerous stallholders at the Business Exhibition, which was held last week at Olympia, will hardly be likely to quarrel with the assertion that one of the most attractive among the stands was that of Mr. C. W. Freeman, where there were on view various beautiful devices which are of importance to "JOURNAL" readers. Mr. Freeman describes himself as an advertising specialist; and the justice of his claim to the title was admitted by a representative who called upon him, and who, almost before he had had time to look round, found in one of his pockets a nicely got-up diary for 1910, in another a leather match-box holder, and attached to his watch a small memo. tablet. None of these useful articles is, of course, without the name or initials of the giver in a prominent position. This proves that Mr. Freeman is an advertiser; but the style of the goods and the method of their bestowal further show that he thoroughly understands his business.

At his stall at the Business Exhibition, Mr. Freeman was making a speciality of gas illuminated advertising signs, &c.; and the number and variety of the designs shown, together with their extreme effectiveness, could not fail to convince any gas man who might see them that by the judicious pushing of these gas-consuming devices, a very useful business might be built up in a direction in which, at the present time, gas is utilized to a comparatively trifling extent. Mr. Freeman's own figure—and it is repeated solely on his authority—is that, of the total consumption of electric light, about 25 per cent. is now used for signs and all other advertising purposes, while the present consumption of gas for similar objects is not 1 per cent., which would mean that gas has practically left the field of advertising free to its opponent. However, Mr. Freeman, with the necessary support of the gas supply undertakings, is prepared to make a gallant effort to alter all this. Of his own enthusiasm in the matter, there can be no doubt; and that he will receive all the aid he desires from gas men seems more than likely from the praise that has already been given to his wares by those who have personally inspected them. Other influential people, also, who have been impressed with this means of advertising, are already considering its adoption on a large scale; and altogether he describes his exhibit as having made "good business."

Mr. Freeman, in the course of a brief interview, expounded a scheme which he sees his way to negotiate and bring to a successful issue, provided gas undertakings will combine and support him. The idea is to provide a universal "poster" illustrating the advantages of gas, to be put up over the country, and then to take suitable premises in different parts, and invite traders to witness demonstrations of what can be done in the way of advertising by gas. A universal poster is suggested so that the funds available may be made to go as far as is possible. In the first place, however, a show-room would probably be fitted up in a central part of London where everything could be inspected by those who might contemplate taking a hand in the scheme. Mr. Freeman would be prepared to visit all parts of the country in connection with the business, and would devote the whole of his time to it, because he recognizes the importance of it from a commercial point of view both to himself and to the gas companies. Here, of course, the scheme is merely touched upon; but full details of the proposal will no doubt gladly be sent to inquirers by Mr. Freeman, if they will address him at No. 107, Cannon Street, E.C. The details can be settled after due consideration; but, broadly speaking, the idea seems to have much to commend it, as a means of stimulating the use of gas for advertising purposes—especially in view of the many ingenious and attractive mechanical appliances that Mr. Freeman has at disposal for the use of traders in this connection.

As to the pictures and signs themselves, these must be seen to be appreciated; hence the great desirability of providing show-rooms where prospective customers can view them in action, instead of relying upon illustrated price lists and printed descriptions. There is, for instance, one sign with which it is possible to get nine different phrasings and nine different colour effects. A model of this is in use now; and arrangements could be made, if thought desirable, for the gas companies to secure the device, and keep it exclusively for use with gas. In other forms, moving pictures are seen, and brilliant flashlights of various hues; and there is also an arrangement in which any pictorial subject can be introduced, and, by means of mechanical contrivances regulated entirely by gas, lights in different parts—in sky, in buildings, &c.—are made to appear and disappear, first in one part of the picture, and then in another. An advertisement of this kind, judging from the picture to be seen at the exhibition, could not fail to prove a good investment. The nine-change sign to which attention has already been drawn (as well as others) is, it may be remarked, controlled entirely by gas. The motive power of the changing mechanism is a small hot-air engine, and the illuminant would be bijou inverted burners.

Mr. Freeman is already confident of considerable support from the gas industry in his projected campaign; and it is hoped that this brief reference to the subject may be the means of inducing others to carefully investigate the matter with a view to joining in the movement. There is certainly much that can be done in the way of increasing the use of gas for advertising purposes; and as a possible means of at all events doing some of it, this scheme is worthy of favourable consideration.

NEW GAS SUPPLY FOR FAZAKERLEY.

Origin of the Scheme.

ABOUT four years ago, the township of Fazakerley, a suburb of Liverpool, was brought within the domain of the Corporation; and in the course of the proceedings incidental to this event, a promise was made that a supply of gas should be provided as early as possible. Up to that time, the greater portion of the district had been without any means of obtaining such a supply, owing to the Liverpool Gas Company's area terminating at the boundary of Walton, and the Company not considering it worth their while to obtain parliamentary powers for the extension of their limits so as to include the Fazakerley district. Accordingly, at a meeting of the Lighting Committee of the Corporation on Nov. 17, 1905, it was decided to take the necessary steps for obtaining a Provisional Order authorizing the Corporation to supply gas for public and private purposes within the township; and on April 20, 1906, the Order was sealed by the President of the Local Government Board.

Early in the following August, Mr. Isaac Carr, of Widnes, was appointed Consulting Engineer, and requested to prepare and submit a scheme for the erection of the works, together with an estimate of the cost. In March, 1907, the Committee decided to make an application to the Local Government Board for their sanction to the borrowing of £25,000 for the erection of the works, the laying of the mains, services, &c.; and, further, that, pending the completion of the works, arrangements should be made with the Liverpool Gas Company for furnishing a supply of gas in bulk for distribution by the Corporation to the consumers in Fazakerley. Meanwhile, the Company made several offers to the Corporation in regard to the matter; but, as they were not considered sufficiently favourable, they were declined. On Jan. 15, 1908, the Local Government Board Inspector held an inquiry on the subject of the application of the Corporation; and the following March the necessary sanction to the borrowing of the money required for the works was received. Mr. Carr was then authorized to proceed with the work of preparing quantities and advertising for tenders for the pipes, and the preparation of plans, specifications, and quantities for the buildings and plant. The following June he submitted three alternative schemes for the erection of the works; and the one chosen has been satisfactorily completed, and was formally inaugurated last Thursday.

Though the Corporation applied for a loan of £25,000, only £20,635 was granted, apportioned as follows: Mains, £2100; services and stoves, £2713; buildings, plant, &c., £15,822. Of the amount sanctioned, £12,710 has been expended to date—viz., for mains, £1764; meters, services, and stoves, £1072; buildings, plant, &c., £9874. There are $5\frac{1}{2}$ miles of mains, supplying 612 consumers and 68 public lamps. The illuminating power of the gas has been fixed at 20 candles, as tested in the No. 7 standard flat-flame burner (the same as the gas supplied by the Liverpool Gas Company); and the maximum price is 4s. 6d. per 1000 cubic feet—a figure which it is confidently anticipated will never be approached.

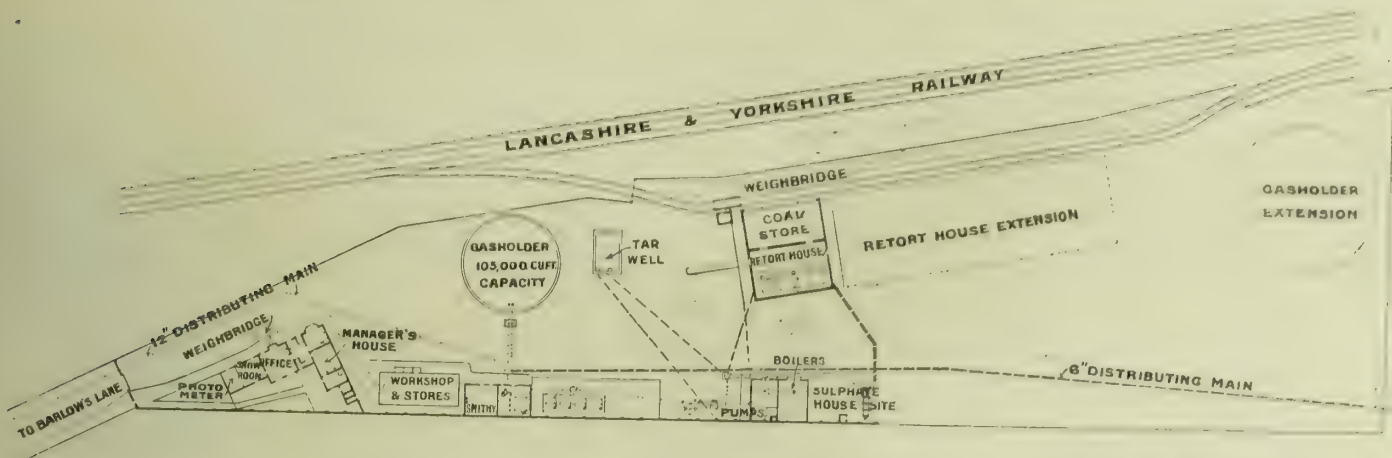
Description of the Works.

The site of the works, which comprises $2\frac{3}{4}$ acres, is situated on the north boundary of the district of Fazakerley, and has the advantage of being at the lowest level. As will be seen from the accompanying plan, the east end is bounded by Signal Works Road, while the west end joins up to Barlow's Lane; and from this end the main entrance to the works is formed. Tenders were invited; and on the 31st of December last that of Messrs. Richard Costain and Sons, of Moorfields, Liverpool, was accepted for the erection and completion of the dwelling-house and office, gas-works buildings, gas plant, foundations, and gasholder tank, for the sum of £3114 3s. 3d. The work was immediately put in hand; and though serious difficulties were encountered in constructing the works, in consequence of the whole site being comprised of quicksand, the work was carried out in a very expeditious manner. The following is a description of the plant.

Retort-House and Coal-Store.—In the retort-house there is provision for four benches of seven retorts, heated by deep regenerator furnaces, only three of which have, however, up to the present, been constructed; the fourth being left until extensions are necessary. The coal-store, which adjoins the retort-house, has a capacity of 500 tons; and there is a private siding communication with the Lancashire and Yorkshire Railway. The waggons run alongside the store, into which the coal and cannel are discharged direct; after which the empty waggons can be run into the coke-yard for reloading, if required. At the siding entrance there is a 30-ton weighbridge, so that all coal and cannel which are received, and coke, &c., sent out, by rail must pass over the machine.

Condensers, Exhauster, Washer, &c.—The condensers are of the annular atmospheric type. The exhauster-house contains one of the Bryan Donkin Company's rotary exhausters, having a capacity of 12,000 cubic feet per hour. It is driven by a steam-engine. After the exhauster comes the washer, then the tower-scrubber, and afterwards the purifiers, which are of the luteless type. There are four boxes.

Gasholder, &c.—The gasholder is of the spiral-guide type, 60 feet in diameter, and capable of storing 105,000 cubic feet of gas. The governor is 12-inch, and is fixed in the meter-house, near



General Arrangement of the Liverpool Corporation Fazakerley Gas-Works.

ISAAC CARR, M.Inst.C.E. | Engineers.
WILLIAM M. CARR

by which is the smithy and fitters' shop. Alongside is a commodious structure in corrugated iron. It was the first temporary building erected on the site, and is for the time being retained as a store for lamps, stoves, meters, and other fittings.

Boiler and Engine House, &c.—There are two Cornish boilers, of ample capacity, for providing steam required for all purposes on the works, including the manufacture of sulphate of ammonia. It is proposed to erect plant for this on the space left for the purpose between the boiler-house and the condensers. Adjoining the boiler and engine house is the pump-house, in which is fixed the pump for dealing with the tar and ammoniacal liquor. In this house there is also fixed apparatus for utilizing the exhaust steam from the exhaust engine and the liquor pump to heat the boiler feed-water. At a convenient point between the pump-house and the part of the siding where the tar-tanks will be loaded is situated the tar and liquor well, which has a capacity of 100 tons. The other buildings comprise the foreman's house, office, photometer-room, and show-room.

The whole of the *débris* from the gasholder tank and other excavations was used on the site, for the purpose of making the railway siding embankment, and raising the yard level a height of 2 feet above the natural level of the land, which was necessary to give the requisite depth for draining the furnace-room below the retort-house.

The following are the names of the contractors for the plant: Gasholder, retorts, and washer, Messrs. R. & J. Dempster, Limited; condensers, the Whessoe Foundry Company, Limited; steam-boilers, Messrs. Thomas Beeley and Sons; exhausters, the Bryan Donkin Company, Limited; scrubber, Messrs. Westwood and Wrights; purifiers, Messrs. E. Cockey and Sons, Limited; station meter, Messrs. J. & J. Braddock; and station governor, Messrs. Peebles and Co., Limited.

The carbonizing plant has a capacity of 35 millions, and the works, plant, and mains a capacity of 60 millions, per annum. But at present less than half the area of the site is occupied; and the works have been laid down with the idea of being easily extended in the future to a capacity of a million cubic feet per diem, or 250 millions per annum. The whole of the buildings and plant have been erected, and the manufacturing operations initiated, under the superintendence of Mr. William M. Carr (son of Mr. Isaac Carr), acting as Resident Engineer. Mr. A. G. Smith, the Lighting Superintendent of the City of Liverpool, has been entrusted with the duties of Manager of the works.

Opening Ceremony.

The works above described—the first municipal gas-works erected in the city of Liverpool—were formally opened on Thursday, under the presidency of Sir Charles Petrie, the Chairman of the Tramways and Electric Power and Lighting Committee of the Corporation, who was accompanied by several aldermen and councillors, including the representative of the ward of Fazakerley (Mr. H. S. Higginbottom). Present at the ceremony were Mr. Isaac Carr, the Consulting Engineer for the works, Mr. A. G. Smith (the Superintendent of Street Lighting), the Manager, Mr. R. Costain (Messrs. R. Costain and Sons), Contractor, Mr. Samuel Glover, of St. Helens, and other managers of works in the vicinity.

Sir Charles Petrie opened the proceedings by calling upon Mr. W. W. Walker (the Chairman of the Lighting Sub-Committee of the Corporation) to turn on the gas and declare the works open. Mr. Walker complied, and gave a few particulars of the works, an account of which had been distributed in pamphlet form. Following this came the presentation to Mr. Walker, by Alderman Frederick Smith, in the name of the Committee, of a silver afternoon tea-tray, suitably inscribed, as a memento of the occasion. He expressed the hope that, as one effect of the erection of the works just opened, gas would soon be cheapened throughout Liverpool. He proposed a vote of thanks to Mr. Walker for performing the ceremony. Alderman Duncan, in seconding the proposition, said he believed the new gas undertaking would develop largely, and would supply manufactories which were sure to be built in the district, which was at present but thinly populated. Mr. Higginbottom supported the motion; saying he was sure Fazakerley would appreciate the new gas-works, which were a sign of the times and of the promise of the district. Mr. Walker, in acknowledging the gift,

expressed the opinion that the Corporation gas undertaking would prove an important venture, and attract many customers.

The company then made a tour of the works, the compactness and up-to-date character of which were admired. Several aldermen and councillors accepted the invitation of Mr. Carr to try their hands at charging a retort; the attempts being more or less amusing.

At the invitation of Mr. Higginbottom, the company returned to Liverpool to partake of luncheon at the Exchange Station Hotel—Sir Charles Petrie again presiding, at the request of the host.

The Chairman proposed the health of Mr. Walker, whose efforts towards the adoption of the automatic lighting of street-lamps in Liverpool he praised. Having acknowledged the economies in gas making which were due to Mr. Carr, he said the Liverpool Gas Company looked with an eye of suspicion on the new gas-works; but the terms upon which the Corporation were informed that the Company's undertaking could be purchased prevented negotiations. For many years some of them had been complaining of the Liverpool Gas Company charging a higher price for gas than that at which it was supplied by other municipalities and companies. They had always said if the Corporation would allow them to reduce the candle power they could lower the price; but the terms were such they could not think of making the alteration. He hoped the Fazakerley works would compare favourably with those supplying Liverpool. Mr. Walker, in response, spoke of his scheme for the automatic lighting of the city gas-lamps, which he expected would save the rates to the extent of from £10,000 to £14,000. He was, however, convinced that it would be wise to defer for about a year the putting of the scheme into operation. As to the new gas-works, he anticipated a large demand for gas for motive power.

Alderman F. Smith proposed "Success to the Fazakerley Gas-Works." He said the Liverpool Corporation had long been watching Widnes, where Mr. Carr gave a high quality of gas at a low price. Thanks to the experience, energy, ability, and research of Mr. Carr, these small works would soon prove of useful service to Liverpool. Mr. Carr, who responded, said he had always been, and would continue to be, a "trier." Owing to the site difficulties, the capital expenditure on the works had somewhat exceeded his anticipations; and he warned the Committee that, as gas was no longer a monopoly, it must be handled without excessive capital. He acknowledged the aid he had received from Mr. Smith, the Contractors, and the firms supplying the plant. Referring to the gasholder, he remarked that it had to be erected on foundations which were beneath 15 feet of quicksand. He was certain that, with the natural and irresistible growth of Fazakerley, the business would be ample, and that the economical manufacture of gas would follow.

The Chairman gave "Our Host;" and Mr. Higginbottom, in reply, pointed to the largeness of the vacant area of Fazakerley, and the many sites available for works and houses. Consequent on the opening of the gas-works, he knew that three firms contemplated the building of works or factories. The works had been erected in the most up-to-date way, and would supply good gas at a fair and reasonable price. Liverpool was a progressive place, and the Corporation had opened these gas-works to make money.

The toast of "Our Visitors" having been proposed by Alderman E. L. Lloyd and duly honoured, Mr. S. Glover responded. He rejoiced at being associated with the Liverpool City Fathers in their new undertaking. Liverpool, he observed, had set an example to other cities in having adopted a beautiful system of street lighting by incandescent gas, notwithstanding its own electric light works and lamps. He came to Fazakerley expecting to see something good; and he was not disappointed. He thought success was assured; but he might be allowed to point out the desirability of regulating the prices of gas in the interests of the consumers. He wished the works every success.

Mr. Higginbottom proposed "Sir Charles Petrie;" and the toast was duly honoured and acknowledged.

High-Pressure Gas Lighting in the City of London.

At the meeting of the Court of Common Council of the City of London last Thursday, the Streets Committee made a recommendation relative to the report on the recent inspection of various systems of public lighting on the Continent, to the effect that the Committee be authorized to arrange for some further experimental lighting in the City thoroughfares as suggested in it. The recommendation was received without opposition, and carried unanimously.

THE PROGRESS OF GAS SUPPLY IN TURIN.

CONTINUED progress, but at a rather slower rate, sums up the results of last year's working of the Consumers' Gas Company of Turin, Italy, the annual report of which lies before us. It possesses the characteristics of former annual statements—full, but concise; frank in its information; and attractive in its form, by reason of its interesting illustrations. The President, Signor Cav. Gioachino Fornas, his co-Directors, and the Manager, Signor Cav. Giacomo Beria, are again to be complimented on the matter

and manner of their report and balance-sheet, which were presented to the shareholders at a meeting held on the 8th inst.

The rather less rate of increase in the amount of gas consumed in 1908-09, as compared with the previous year, is accounted for by technical considerations. This, indeed, is the story elsewhere and pretty generally; for careful regulation, more careful distribution, and most careful consumption by improved and more efficient burners, all tell their tale, and tend in some measure to restrict the former more rapid rate of gas consumption. The customers of the *Società Anonima dei Consumatori di Gas-Luce*—to give the Turin Company its Italian name—took last year 18,014,805 cubic metres (636,221,000 cubic feet) of gas, as against



Fig. 1.—The New Offices and Governor House—Consumers' Gas Company, Turin.

17,649,502 cubic metres (623,320,000 cubic feet) in the previous twelve months. The gas was used in the following proportions: 90.66 per cent. through ordinary meters; 0.93 per cent. through prepayment meters; 5.46 per cent. for public lighting; 1.99 per cent. for industrial purposes; and 0.96 per cent. for motive power. The number of meters went up from 31,403 on the 30th of June, 1908, to 33,243 on the corresponding date of this year. Of these, 33,075 were for heating and lighting, 90 for gas-engines, 78 for manufacturing. The gas sold brought in Lire 2,986,821.53; and the bad debts only amounted to Lire 1915.93—the equivalent, let us say, of a loss of about 6d. in every £40. The public lighting, however, results in a loss of Lire 45,201.83 (£1808).

On the subject of unaccounted-for gas, it is observed that in a large concern it is of the greatest importance to give the smallest detail care and systematic attention. Thus, a general inspection of the whole of the gas-mains, from the largest main to the smallest service pipe for a single consumer has been begun; and by it, it is hoped to reduce the present 6 per cent. of gas lost. Needless to say, the mains have been extended; 5232 lineal metres of new pipe being added, making the total length of gas-mains now about 302 kilometres, or 188 miles. Among the mains laid was one of 1000 millimetres (3 ft. 3 $\frac{3}{8}$ in.) in diameter; and the placing of a pipe of this size was no light matter in a subsoil already crowded with other pipes, drains, electric cables, and water-mains. But the work has proved beneficial in facilitating the regular distribution of gas to the districts furthest away from the works.

During the year 64,925 tons of coal were carbonized, being an increase of 4346 tons. From this tonnage, 19,262,330 cubic metres of gas were obtained, which represents a make of 300 cubic metres per metric ton, or 10,765 cubic feet per English ton of coal carbonized. Advantage was taken of a slight depression in the price of coal last spring to purchase 40,000 tons at an exceptionally favourable figure, which has not since been touched.

A CULTIVATED COKE MARKET.

The coke market in Turin must, we imagine, be in a very different condition to that with us; for there the only trouble is that there is not enough coke to supply the regular and constant demand. "The sales of coke (says the report) commencing as usual on April 1 had, unfortunately, to be closed at the end of the same month; for, in that short time, we had disposed not only of all that had been left over from the last mild winter, but also of all that was available from the existing production." All contracts then entered into have been completely and satisfactorily executed.

Many contracts for the winter supply—that is, from Oct. 1 to March 31—were also entered into; and these are based, not on any fixed price, but with a reservation that the selling price shall be determined month by month. The confidence thus shown by customers is sought to be deserved by care in the treatment of the coke (which is even of more value than the gas), as well as by watching the fluctuations of the market, so as to regulate the prices of a fuel which the climate of Turin has brought into such general use.

Of other bye-products, concentrated liquor and sulphate of ammonia are alternatively produced and sold at remunerative prices. The disposal of tar is a difficulty here, as elsewhere. In Italy, its distillation is in the hands of one important firm, which can use its unique position to the detriment of gas-works seeking to dispose of their tar. At Turin, however, very good results have followed the successful attempts to burn the tar in regenerative



Fig. 2.—Interior of the New Pressure Room.

furnaces. Part of it has also been disposed of for agricultural purposes; and this, it is hoped, will provide an increasing demand.

NEW CONSTRUCTIONAL WORK.

For some years past, it may be remembered, the Turin Gas-Works have been undergoing considerable alterations and extensions. These have now practically been completed; and the latest addition of a large new governor house with offices (shown in fig. 1), well illustrates the decorative but practical style adopted. The interior of the pressure room is seen in fig. 2; the new automatic governors having all been supplied by the Kölnische Maschinenbau A.G. The result of the introduction of these governors last December has been that the daily charts taken from all parts of the city show a constant and equal pressure. This may apparently involve a less rapid increase of consumption, owing to increased efficiency being achieved; but really, by preventing excessive pressure, such apparatus avoids causes of complaint, and eventually conduces to greater demand. Such demand has, indeed, already begun to make itself felt.

In last year's report reference was made to the completion of a new gasholder tank. In this, Messrs. Samuel Cutler and Sons have now built the gasholder, the photograph of which is shown in fig. 3. It is described as "an imposing and strong structure, which æsthetically as well as technically, is worthy of the highest praise." With this addition, the gasholder capacity of the works is more than the actual make, and is equal to the maximum productive power of the plant.

Messrs. Cutler and Sons are also installing a coal and coke conveying plant in connection with a Fiddes-Aldridge stoking machine, which will serve a bench of five double beds with a single producer per bed. The building of this bench is being carried out by the firm of P. Picard (formerly E. Derval), of Paris. Needless to add, excellent results and economical working are expected from this new retort-plant.

In conclusion, it is pleasing to note that in this interesting report of a progressive and enlightened Gas Company it is

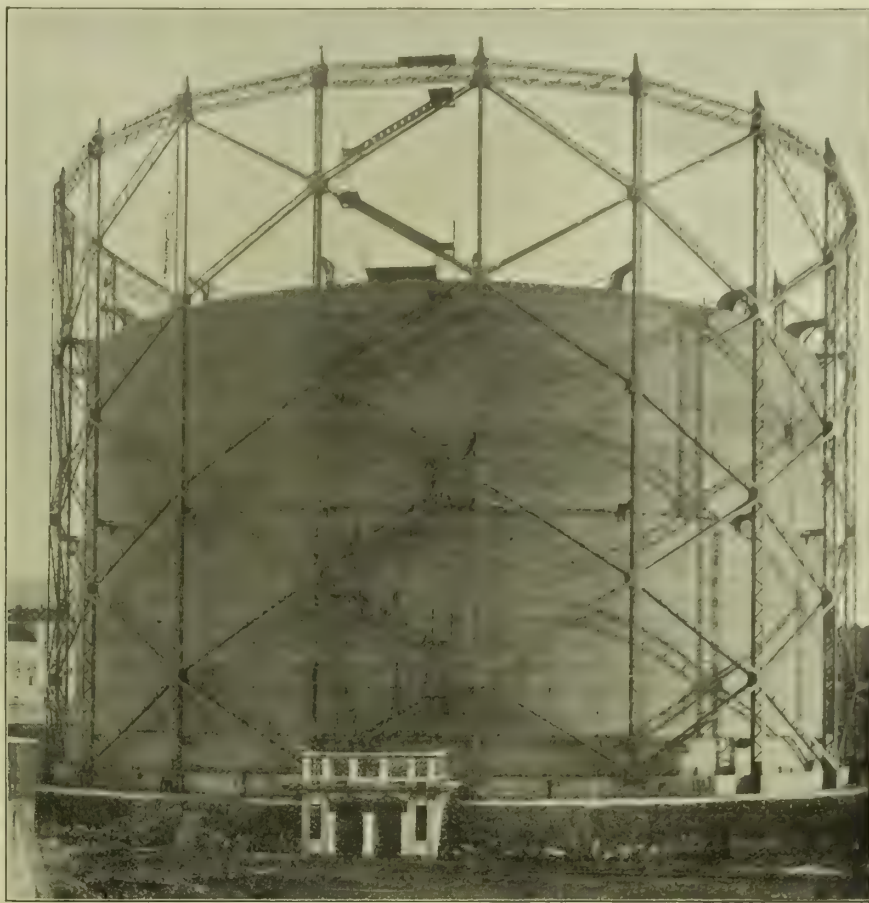


Fig. 3.—The New Three-Lift Gasholder at Turin.

recorded that "the favourable results obtained in the past year were due for the most part to the devoted and willing work of clerks, workmen, and lamplighters," to all of whom the thanks and appreciation of the Company are gracefully expressed and accorded.

JOHN WRIGHT AND CO.'S NEW LABORATORIES.

Inspection by Gas Managers.

A NUMBER of leading gas engineers and chemical experts met at the Essex Works, Birmingham, last Thursday—invited by Messrs. John Wright and Co.—in order to inspect the new laboratories with which the Company have lately equipped their factory, and also the recent further extensions of the works themselves. The visitors were entertained to luncheon before proceeding to the inspection. After lunch, and the reading of several apologies for unavoidable absence—among others from Professor Smithells, Professor Vivian B. Lewes, and Sir Oliver Lodge,

Mr. H. JAMES YATES, F.C.S., the Managing-Director of the Company, who presided, said: I can assure you it gives very great pleasure to myself and my co-Directors to welcome you all here. We know full well that many of you have come long distances, and at great personal inconvenience; and we much appreciate your presence here to-day. It is rather unfortunate that we should have happened to fix upon this particular date, which, quite unknown to us, was the meeting day of the Midland Gas Managers' Association. By the time we learned this, our arrangements had so far advanced that, to our very great regret, it was found quite impossible to alter them. Owing to this clashing of dates, we have been deprived of the presence of some gentlemen with whose company we should otherwise have been favoured here to-day, and some of the gentlemen who are with us will have to hurry off to keep their engagement at that meeting. A number of you have had an opportunity before lunch of seeing round our laboratories. We are, naturally, rather proud of them; and we have great hopes of what we are going to do with them. We know very well that in whatever we do in this way, the primary benefit will be our own; but I think that, indirectly, the result of our research there will ultimately more or less benefit the whole of the gas industry. English manufacturers, we are often told, have been very backward in applying science to their business; but we have recognized for some years past the necessity for this, as is shown by our former test-rooms, which are open for you to see, and in which, in past years, we have done a lot of good work. As regards our laboratory work, a great part of this in former times has been done in a home laboratory. Still, we have done good work, and with our new equipment we hope to do much greater work in the future.

As you go through the works, I think you will be struck very much with what is quite an axiom here, and that is standardization. It is the thing that we have aimed at for years. We have brought it up to an excellent state of efficiency; but we intend to develop it still further. It is no use hoping to excel in a business of this kind without machine tools, plenty of them, and these of the most effective and modern types. There was a time when machine tools were almost unknown in the gas-stove industry; but for some years past we have been increasingly employing them in our work. We have so standardized all our appliances that any article of the same sort produced here is absolutely interchangeable with its fellows; and if you were to take any number of parts of the same class of apparatus and throw them together in a heap, you could pick them up and assemble them into complete apparatus without any difficulty. This is a matter of considerable importance to gas engineers in its bearing on the question of maintenance cost. We have a great deal of further new machinery in preparation; and while what you see to-day in that way will, I hope, be interesting, I can assure you, without any exaggeration, that if you were to walk round these works in six months' time, a great deal of what you will now see in the way of machines would by the time of that visit be replaced by newer types. Last year, I paid visits to several foreign countries to see what they were doing. I had the opportunity of seeing many of the best foundries in the United States and in France and Germany; and we are now having machines built in various places, and some in our own works, so that before Christmas we shall have as remarkable an equipment of modern types of moulding machines as have probably ever been gathered together in one foundry. I hope, indirectly and finally, these developments will benefit everyone, though in the first instance it will, of course, be to our own advantage. As a Director of this Company—and I speak for my co-Directors also—I am only too pleased that you have seen your way to visit us and look round our works to-day.

Mr. JAMES W. HELPS: Mr. Yates has told us that there will be no time for speeches to-day; but I do feel that all of you will wish me to tender to Mr. Yates and to his co-Directors our very heartiest thanks for the opportunity they have given us to visit their works and laboratories, and for the kind hospitality they have extended to us. There is an old saying that sometimes gratitude is a "lively sense of favours to come." But sometimes people construe gratitude as being an expression of thanks for something they have already received. I think we may combine both these expressions of gratitude to-day, because we have already seen the laboratories and already much enjoyed our lunch,

and you are going to see the splendid works of Messrs. Wright and Co. presently. I very much regret that, personally, I shall not have an opportunity on this occasion of seeing the works; but some of us, including myself, have seen them on more than one occasion, and I have been much struck with the methods of the firm in conducting their business. Those who are not with us personally will be very sorry, I am sure, not to have had this opportunity. I most thoroughly appreciate what Mr. Yates said about the importance of applying scientific methods to one's every-day work in connection with business; and I know for a fact that it is the opinion of a great many people that we can learn very much from foreign countries. No doubt that is the case; but, at the same time, I do appreciate that perhaps scientific methods are carried to great excess, particularly in Germany and some other foreign countries. Education and science there are carried out in a way which sometimes leads to too much standardization. I quite agree that standardization is a very important matter; but lately I had a talk with someone who visited Germany to find out what they were doing, and he found that some German manufacturers were only too glad to get British workmen to come out to do certain work for them. When asked the reason, they replied that the men in Germany were brought up on such standardized lines that some of them had practically no initiative; and if they wanted to get someone to open up new work, they had to come to Great Britain in order to get satisfactory men. This is a point we ought not to forget. On the other hand, those of you who have read the letter which appears in this week's "GAS JOURNAL," from Mr. Charles Carpenter, will remember he told us that his Company, after very carefully going into the matter, had decided to place a large order for retorts with a German firm (notwithstanding the increased first cost), owing to the greater skill used in their production. The South Metropolitan Gas Company recognized the importance of adding scientific investigation and research to a manufacturer's every-day business. But in that letter it was not a question of price or of Free Trade or of Tariff Reform. This had nothing to do with the matter. They knew they were going to spend more money in getting their material; but Mr. Carpenter tells us that, notwithstanding the fact that the Germans had no better material than we had in England for making retorts, they had carried out research with the object of finding the proper way of dealing with, and mixing, the various materials, and this had enabled them to make the retorts so that they would stand a far greater heat, and last very much longer, than the retorts made by British manufacturers. It may be said that the course which they have adopted is very hard on British manufacturers; but that course is taken because British houses had not risen to the occasion, and if they are led to follow on the lines adopted by Messrs. John Wright and Co., the drastic lesson pointed out by Mr. Carpenter may not be lost upon them. We hope this will prove of great benefit to all concerned. I will now ask you to join me in drinking the health of the Company, and that of Mr. Yates and his co-Directors, for the opportunities afforded to-day of seeing what they can do. It appears to me that while they will benefit themselves, they are at the same time helping us.

The inspection of the works—fully described and illustrated last week, pp. 168-73—was then commenced.

MILITANT GAS CONSUMERS, AND OTHERS.

By T. EBENEZER PYE, of Chichester.

MUTUAL confidence, in place of mistrust and occasional bitterness, now happily characterizes the relations existent between the best regulated gas undertakings and their customers; the improvement thus gradually brought about being highly beneficial to all concerned.

Competition—in many districts of a strenuous, and here and there of a thoroughly unscrupulous character—has of course rendered compulsory the adoption by gas administrators of a forward, liberal, and even sympathetic policy towards the general public. To this change in policy is mainly attributable the very emphatic benefits just referred to, and for which therefore the said competition may to some extent be indirectly responsible.

SOMNOLESCENCE.

It is noteworthy, however, that, in spite of the manifestly satisfactory results attending progressive and liberal business methods with our customers, there are yet many undertakings, particularly in small urban districts, whose management obstinately clings to the old and bad traditions, and who will not wake up to the fact that there is to-day no such thing (if there ever was) as a monopoly in artificial lighting—not even in gas lighting. The old days have gone, never to return. In large cities and towns, where both gas and electricity supply are low in price, the competition may be more or less on even terms. In the smaller residential centres, having no factories and little or no demand for power, gas at a moderate price should, under careful management, easily remain "top cock." But wherever the price is above 4s. or 4s. 6d. per 1000 cubic feet, it is almost certain sooner or later to discover in acetylene gas, in oil incandescent burners, or in one or other of the newer systems of carburetted air gas, a competition not to be despised, and none the less formidable from the fact that it must

be from the better class of gas consumers that the new-comers will draw most of their custom.

UNREALIZED RESPONSIBILITIES.

To any intelligent observer of the "signs of the times," it is now, therefore, perfectly obvious that, in the interests of the shareholders alone—apart from any other considerations—the excellent "lead" which for some years past has been given us by the managements of many large and not a few small undertakings should, with such modifications as local conditions may render desirable, be universally followed. To fail in this respect is to fail in the discharge of duty. Many directors and members of corporation gas committees have light-heartedly, and perhaps with pride, accepted office without thought of the attendant responsibilities; and the manner in which they shirk those responsibilities and duties is nothing short of a scandal, and constitutes a grave breach of the trust confided to them by shareholders and ratepayers respectively.

"Disputed gas accounts" had been more particularly in the writer's mind when this article was commenced; and a careful study in detail of such a subject promptly reveals its close relationship with the policy under which the respective undertakings are governed. The militant gas consumer may, like the poor, always be with us; but his own virility, as well as his power to influence adversely the neighbouring customers, will depend in direct proportion on such degree of success as is achieved with customers generally by the good management and liberal trading methods of the gas undertaking. Hence the promptings which have given rise to the preceding paragraphs.

Since commencing on the study of his subject, the writer has had occasion to pay a visit to a town where complaints reach him on all hands of bad service of gas, high price, and high-handed treatment of customers—an unholy trinity unfortunately not as uncommon as one would wish—and which complaints certainly seem to constitute a serious indictment against the management. The position is greatly aggravated by the fact that there has to be met a very aggressive and enterprising electric competition. It is not surprising to note that, under the conditions named, electricity practically commands the whole of the more important artificial lighting of the town; and the effect of this success on the gas undertaking appears, to an outside observer, to have been demoralizing rather than stimulating. The position, to the writer, appears deplorable and inexcusable. The neglect and indifference which have allowed such a state of things to come about seem, in view of all the interests concerned, criminal. Unfortunately, the resultant injury to the industry is not confined by the parliamentary limits of the district of the particular undertaking. There is no doubt that gas companies serving adjacent towns have lost good custom as a direct result of the unsatisfactory condition of gas supply just referred to.

THE DISCONTENTED CUSTOMER ANALYZED.

The discontented gas consumer is usually one of three distinct and independent classes of customers. There is the habitual grumbler, whose bark is worse than his bite, but who apparently considers that, in his diatribes against the company and all its works, he is only discharging an important public duty. There is the man who thinks he has a grievance against the company. Unfortunately for him, he is of a similar opinion with reference to all and sundry with whom he may condescend to place his custom. And there are always among our customers a certain number who really have more or less ground for dissatisfaction. Possibly such a one cannot get satisfactory lighting throughout his house, try as he may, owing to the usual trick of the jerry builder, of piping the premises with tubing of ridiculously small bore. Or, worse still, the piping may have been so badly put in as to cause accumulation of water in some inaccessible position—a never-ending cause of trouble and of friction between producer and consumer. Or, as occasionally happens, the meter may register any abnormal amount of gas consumed, the cause of the increase in which is a mystery unaccountable alike to the customer and to the gas officials.

The first-named of our malcontents—the habitual grumbler—is the most readily dealt with. To take him seriously would very probably give him a shock. A final suggestion of sending a fitter round to look into, and report upon, his cause of complaint will probably not be accepted. He derives considerable pleasure in the exercise of his irritating habit, and unless you are sure that there is something that should be done for him, you will not wisely deprive him of that pleasure, and risk his resentment. To smilingly write out the receipt while he grumblingly prepares your cheque will be more diplomatic than to show to him that his complaints are groundless. Such men as these are often enough at heart the best friends of a well-conducted undertaking.

THE MAN WITH A GRIEVANCE.

Of No. 2, I can hear many a collector say: "Oh! he's a brute!" Probably very true; but still you don't wisely tell him so. Here, again, diplomacy is required. These men talk a lot and exert a fair amount of influence. As a rule they are to be taken seriously, and, if possible, must be secured on our side. The grievance probably has some slight iota of foundation which, owing to this man's undue sense of proportion, is magnified into some stupendous rock of offence. It is very curious what fine imposing structures such a man can erect on the flimsiest of foundations. Spare no pains in getting at the very bottom of the trouble. This alone will secure favour, and while confidence in his own case is

weakening, the truth comes to light, and all at once the cherished grievance falls to pieces like a house of cards. You secure a sound and permanent supporter. Gumption does it!

Now as to No. 3, this is where the real tussle begins. Here you have a man who really has cause of complaint; while you on your part are doing, and have done, all that can be expected of you to serve him well. Take the first case stated. It has been stated many times before, and will be again. It is a thorn in the flesh of many a worried gas manager. The writer has a nest of such cases in an aggravated form. An important residential suburb has recently been developed on the outskirts of his district.

FAULTY CARCASSING.

When some years ago the district was being laid out, and the residences were being built, electric lighting was all in the air. As a consequence, almost if not all the buildings were wired for electricity—some were piped with very small gas tubing for just a few points, and long services of $\frac{1}{2}$ -inch and $\frac{3}{4}$ -inch pipes were laid by the builder across the gardens into these self-contained residences. Electricity not being available as promised, the residents naturally applied for a gas supply, which has been given through the service-pipes of small bore. The result can be imagined. The houses having once been piped, the residents naturally decline to have their homes disturbed by troublesome extensions and alterations to the existing fittings. Still less will they have their gardens cut up for the renewals of service-pipes.

The difficulty has to some extent been met by increasing the initial main pressure throughout the district by about 5-10ths of an inch, simply for the benefit of this suburb alone. But at what a cost in unaccounted-for gas! In a few cases, the gas company have been able to successfully intervene before the houses and gardens have been completed. In others, supplementary pipes have been run up in unimportant positions and connected on to the distributing systems, with full success. Now, however, that electric lighting has actually been established in the district, there is no doubt that, if the gas company are to hold their own, they will have to do a lot of this extra piping work at their own cost. To secure a full and satisfactory service, at whatever cost, has now become an absolute essential to the continuance of custom. What an object-lesson in support of the policy of a perfect look-out over all new property in course of erection! This man, then, must be met half-way. If the company cannot give a plentiful and uniform supply by means of his existing system, it becomes a matter of calculation as to how far the prospective business will justify an outlay to provide the means of an efficient supply; and a wisely conducted undertaking will act accordingly.

The same principle must operate in respect of work badly executed. Thoroughly efficient service is to-day an absolute essential to custom, and obstacles to efficiency must go. No hard-and-fast rule can, of course, be laid down as to the extent to which the gas undertaking should at its own expense improve property belonging to others, and in respect of which improvement it can maintain no sort of claim. But the broad principle of control, or at least of access or supervision, from works to burner must be conceded, if the best and happiest conditions of service are to be secured and maintained. The means by which such control is to be obtained must, of course, depend on local and individual circumstances; but firm guidance of the undertaking under a liberal, if sound, policy will, as a rule, settle all such points with wisdom and facility.

VENDORS OF HEAT AND POWER.

We are to-day looked upon as vendors of light, heat, and power, rather than simply as suppliers of gas. Under the old conditions, our duty was held by all parties to be discharged by the provision at the meter-outlet of a full supply of good-quality gas. But the development of heat and light from the various agencies available has now attained too high a scientific level to be fully understandable of the ordinary lay mind; and it is practically impossible for the average customer to secure, without some more or less expert assistance, the best results obtainable from the particular medium of heat or power which he may favour. This fact applies, perhaps, as regards lighting, with somewhat more force in relation to gas than to electricity, owing to the facilities afforded for the regulation of the modern burner, to suit local conditions, up to the highest point of efficiency, and for inexpensive renewals of mantles, the illuminating medium—facilities which are naturally made the most of by the experienced gas-fitter and which, so far, are denied to the user of electric lamps.

The preceding paragraph is not the digression which it may appear to be. It emphasizes a fact often lost sight of by the public, and not infrequently by the gas-supply officials—viz., that the average user of the modern gas-burner is practically dependent upon his supply undertaking to enable or to show him how to obtain the full value of the appliance. Even the "Trade"—i.e., outside the undertaking—often enough fails lamentably in this respect. Quite recently the writer was amazed at the confession of a gentleman—a managing partner in a large ironmongery and gas-fitting business in a neighbouring town—who assured him that "the people of his district couldn't use the inverted-burner because they found that 'it smoked so!'" Neither he nor his fitters knew anything of adjusting the burners. Ignorance of the first essentials to success in the use of inverted burners is, unfortunately, characteristic of the average gas-fitter outside the gas-works staff. Hence the management of the undertaking is lamentably failing in its duty unless it provides every possible facility for the assistance, and even the instruction, of the customer with

regard to the appliances that he has to use, whether for lighting, cooking, heating, or power.

To return now to our malcontent. Whether his trouble be due to bad fitting or to other cause outside his control, or be due to his own ignorance, carelessness, or negligence, or a combination of all three, it is the duty of the supply undertaking to do all in their power to secure for him satisfactory service, and generally to enable him to enjoy the best results possible from the business which he does with them.

THE ABNORMALLY INCREASED GAS BILL.

And now a word about those mysterious increases in the gas consumption as recorded by the meter. First as to the cause. There are occasions when this can never be ascertained. The wilful or accidental neglect of domestics in leaving stoves, cookers, or lights on—perhaps all night, or even for a season—never found out probably owing to the misdemeanant having left the service of the victim ere the gas bill comes in, and such like discrepancies between the reputed "regular habits of the household" and the actual facts as registered by the gas-meter, will often account for the alleged vagaries of the meter index.

An instance is called to mind where one of the meters of a large factory in London showed on one quarter's account a consumption of twice or thrice the normal. The explanation for this was quite beyond the powers of the proprietor or of his staff; and after considerable trouble had arisen between them and the company's collector, the writer was instructed by the engineer to endeavour to ascertain the cause. Gas was being used continuously in the factory; so that the usual test at the meter for leakage could not be resorted to. Eventually, after repeated assurances that everything had been inspected, an attic was discovered at the top of the factory which "hadn't been open for months," but which attic had been used for drying purposes before a large gas-fire. The tap to the fire was turned full on, and had been so for months. The gas was not alight, but it had been escaping into the outside air directly up the chimney, without there being the slightest smell of gas in the room, and without anyone having any idea at all of what was going on. Needless to say that, when the matter was duly reported, there was not much difficulty arranging a settlement of the gas bill.

SAFE LINES FOR COMPROMISE.

The method of arriving at a settlement shall be the subject of the closing paragraphs of this article. Had the engineer insisted on full payment, the account would only have been settled in the Law Courts. And yet the company had legal right to enforce payment for every foot of gas registered by the meter! Palpably, however, owing to the unknown accident of a gas-tap on full bore for months in a closed room, no one had been a bit the better for the gas lost, the customer had received no benefit whatever for the gas that passed through his meter. On this ground, the engineer very wisely decided to compromise the matter and to make a substantial allowance in the account.

It is not, of course, in every case equally obvious that the customer has not derived some proportionate benefit from the abnormal increase in the registered gas consumption of which he complains. But where the company's representatives are what they ought to be, there should be little difficulty in deciding whether the increase be the result of accident, or of carelessness practically beyond the customer's control, or whether he is trying to "rush" the company and is fully alive as to its cause. In any but the latter case, the first step is to make sure of the meter itself, by official tests. If the customer still insists on its being incorrect in spite of tests, every endeavour must be made to bring him to reason; and as long as he will persist in challenging the accuracy of the meter, the company can make no concession. But once get the customer to realize two important factors, and the trouble is over. Let him realize the absolute necessity for the company to stand by its meter—that it is a matter of life and death to the undertaking to tamper with this, its only bulwark—and, on the other hand, that the company desires above all things to be equitable in its dealings, and the problem is solved. The writer has recently dealt with more than one dispute of long standing, of the nature under consideration, in this manner. As a result, the customer has written with reference to the matter somewhat on the following lines:

- (1) An admission that the account as charged is correct as to meter registration.
- (2) That the meter registrations, in view of the official tests, must also be approximately correct.
- (3) That the abnormal increase in registered consumption is absolutely unaccountable, and that all parties are of opinion that, although the gas charged for has been registered, the customer has certainly derived no proportionate benefit from the increased gas consumption, which has been due to some cause outside the customer's knowledge.
- (4) Will the company therefore, in equity, make an allowance in respect of this increase, such application for an allowance being, "of course, without prejudice to their position as regards the meter registration."

The result of this action of the customer is that the company is at once in a position to compromise, without prejudice and without establishing any dangerous precedent; and in such cases as have come under the writer's observation, men who as enemies would prove no mean opponents are secured as staunch friends and supporters of the undertaking.

MIDLAND ASSOCIATION OF GAS MANAGERS.

Autumn Meeting in Birmingham.

The Autumn General Meeting of the Association was held at the Grand Hotel, Birmingham, last Thursday—Mr. W. LANGFORD, of Longton, the President, in the chair.

APOLOGIES FOR ABSENCE.

Letters expressing regret at inability to be present had been received from (among others) Mr. J. W. Morrison, the President of the Manchester District Institution of Gas Engineers; Mr. T. H. Duxbury, the President of the North of England Gas Managers' Association; and Mr. Charles Meiklejohn, the past Secretary of the Midland Association.

DEATH OF A FOUNDER OF THE ASSOCIATION.

The minutes of the previous meeting having been confirmed, The HON. SECRETARY (Mr. Harold E. Copp, of West Bromwich) announced that since the members last met one of the founders of the Association—Mr. John Tindall, of Walsall—had died at the age of 79. He (Mr. Copp) wrote to the relatives conveying the sympathy of the Association with them in their bereavement, and also sent a wreath in the name of the Association. His action had been approved by the Committee.

PROPOSED REVISION OF THE RULES.

The HON. SECRETARY said it had been evident for some time that the rules of the Association might be amended with advantage. In the short period during which he had held office, two or three anomalies had come under his notice; and the Committee felt that the time had arrived when something should be done to recast certain of the rules. Acting on instructions from the Committee, he had obtained copies of the rules of other District Gas Associations; and he suggested that a Committee should be formed for the purpose of dealing with the matter.

The PRESIDENT said he considered that, as an alteration of rules was so important, it would be desirable to have the assistance of some of the ex-Presidents, and any other members they might like to appoint. The suggested Committee could revise the rules and bring them before the next annual general meeting for approval.

Mr. J. F. BELL (Derby) moved that the present Committee, along with the ex-Presidents of the Association, form a Committee to revise the rules for submission to the next meeting.

Mr. A. T. HARRIS (Market Harborough) seconded the motion; and it was carried.

WELCOME TO VISITORS.

The PRESIDENT said he should like, on behalf of the Association, to say how proud they were to have with them the President of the Institution of Gas Engineers (Mr. J. W. Helps). He took it as an honour to the Association that the President should have come all the way from Croydon to be present at their meeting; but it was only another evidence of the interest he had for, and the kindly feeling displayed by him towards, kindred Associations. He (the President) was also pleased to see Mr. Wilson, of Glasgow, a Vice-President of the Institution, and Mr. John Young, of Hull, as representing the Eastern Counties Association. Their presence showed that they were related, and were all working for the same object; and to these gentlemen he extended, on behalf of the Midland Association, a hearty welcome.

READING AND DISCUSSION OF PAPERS.

Mr. George Helps (Nuneaton) then read the paper entitled "Notes on Income-Tax and Assessment," which, with a report of the discussion on it, will be found on p. 248. It was followed by a paper by Mr. W. J. Rendell Baker (Great Malvern), on "Some Aspects of Recent Competition," which is given on p. 251.

ELECTION OF OFFICE BEARERS.

The HON. SECRETARY then announced that the following officers had been elected for the ensuing year:—

President.—Mr. Vincent Hughes, of Smethwick.

Vice-President.—Mr. J. H. Brown, of Nottingham.

Hon. Treasurer.—Alderman W. R. Cooper, J.P., of Banbury.

Hon. Secretary.—Mr. Harold E. Copp, of West Bromwich.

New Members of Committee.—Mr. J. Ferguson Bell, of Derby, and Mr. C. H. Webb, of Stourbridge.

Auditors.—Mr. W. W. Townsend, of Hereford, and Mr. W. J. Rendell Baker, of Great Malvern.

Mr. HUGHES, in acknowledging the compliment paid him by his election as President, said nothing would be wanting on his part to make his year of office a successful one; and in this endeavour he felt sure he could rely upon the assistance of the Committee and members of the Association.

VOTES OF THANKS.

A vote of thanks was accorded the Hon. Treasurer (Alderman W. R. Cooper, J.P.) for his services; and also to the Auditors.

This concluded the business.

The members subsequently had "high tea" together at the hotel—Mr. Langford being in the chair.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION

An Address by Mr. Corbet Woodall.

The Opening Meeting of the Association for the session 1909-10 was held on Friday evening at the Cripplegate Institute, Golden Lane, E.C., when there was a very large attendance of members to hear an address which Mr. Corbet Woodall had kindly promised to deliver. The chair was taken by Mr. W. J. LIBERTY, the President of the Association.

MINUTES OF THE PREVIOUS MEETING.

The HON. SECRETARY (Mr. S. A. Carpenter) read the minutes of the last meeting; and they were confirmed.

THE ASSOCIATION.

The PRESIDENT said that, in welcoming the members to their new session, he did not think he could do better than refer them to the programme which had been issued. Here they would find a variety—lectures, papers, and visits to works—which it would be admitted formed an educational syllabus. In the interregnum between the two sessions, one or two matters had occurred which called for comment. All the members had been very pleased to hear that Mr. J. M. Campbell had been translated from Luton to Margate. Mr. Wilkins had gone from Lea Bridge to take the managership at Godalming, and Mr. C. E. Rosevear had been moved from Goswell Road to Hythe. This was as it should be, and caused them no feelings of regret, because it was for this very purpose that they were banded together in membership. Then the list of their honorary patrons had been strengthened greatly by the inclusion of the names of Mr. D. Milne Watson, the General Manager of the Gaslight and Coke Company, Mr. T. Goulden, the Chief Engineer of the same Company, and Mr. W. Doig Gibb, late of Newcastle, and now Chief Engineer of the South Metropolitan Gas Company, Mr. A. F. Phillips, and Mr. Stanley H. Jones, of the Commercial Gas Company. Among their honorary members, also, they numbered Mr. W. B. Farquhar, the Engineer and Manager of the Ilford Gas Company, who was formerly one of themselves. In addition, there were some new ordinary members, who were present for the first time that evening. Of their patrons, he was pleased to see there, besides Mr. Corbet Woodall, Mr. A. F. Browne, the Hon. Secretary of the Southern Senior Association, and Mr. F. W. Goodenough, Mr. E. W. Pilbrow, of the Gaslight and Coke Company, and Mr. Farquhar. He had now to call upon Mr. Corbet Woodall to give them the remarks which he had prepared, and which they would all be delighted to hear.

Mr. CORBET WOODALL, who was greeted with loud applause on rising, said it had given him great pleasure to meet the members that evening; and he was glad to see among the audience a number of faces that were by no means strange to him. He then proceeded to deliver the following address.

MR. CORBET WOODALL'S ADDRESS.

In addressing an Association such as this, mainly composed of young men occupying, for the time being, subordinate positions in our common calling—posts which are nevertheless of as great usefulness as any of the more conspicuous and lucrative appointments to which you may hereafter succeed—I am very forcibly reminded of the saying about the different kinds of speech that become those who are putting on their armour and those who are about taking it off; for I have now borne my own professional equipment a very long time, and shall have no further use for it when many of you will be entering upon your prime. Therefore, it is natural that I desire the few words I have to speak shall carry encouragement and be not unworthy of your remembering.

The saying to which I have alluded is usually repeated to check youthful presumption; but, regarding it from my point of view, I see in it a warning to the veteran, who is always under strong temptation to fight his battles over again with tiresome prolixity. A wise writer has remarked that the aged can rarely give much useful counsel to the young; and if this means that the men of every successive generation must work out their own salvation in their own way, I agree. Yet the rule should not be overstrained. There are some vicissitudes of life which do not alter from generation to generation; and upon many heads the testimony of experience is properly sought by those who have only been told the plain old truisms in which they are preserved. "I have been young and now am old," is a formula likely to awaken at least curiosity in those addressed.

THE INDUSTRY OF GAS MANUFACTURE AND SUPPLY.

I want to keep clear of the two rocks—of wearisome personal reminiscence, and preachment. I shall therefore try to eschew individual recollections and keep to general views of our industry, and what I believe to be the best course of those who would prosper in it. Our industry—the great national industry of gas manufacture and supply—has often been made a byword for the paralyzing influence of a statutory monopoly, which has been supposed to keep it wrapped and lapped in artificial security. It has never caught the public eye like railroading, steam navigation, harbour making, electricity, or motor-car engineering, to say nothing of the youngest scion of the long engineering family,

aviation. Its triumphs do not make interesting popular reading. Those who enter this calling vanish from the ken of picturesque writers and orators who award what passes for contemporary fame, and they must be content to know that, whatever their services to their time and generation, they will never have occasion to blush for the facts becoming known.

PUBLIC STREET LIGHTING.

Even science has but a distant bow for gas, while cherishing so many other children in her bosom. Yet the followers of our industry can point to a bright record of benefit incidentally conferred upon the community, as an effect of their labours. Consider the single service of public street lighting, now at last receiving something like proper attention in the City and County of London. I speak of it in this way because I have incidentally more than thirty years' close acquaintance with this particular use of gas, and of dealings with the London authorities who are, and have been, responsible for the public lighting of the streets and bridges of the First City of the World. "The Lights of London" are very familiar to me. The earlier of my memories of them are as the recollection of a bad dream. They go back to a London divided among different Gas Companies in a length of street, and covered without system by a larger number of high-way authorities, who, without exception, pursued a cheese-separating policy in the lighting, rather than offering any inducement to the Gas Companies to improve it.

For many years only such inventions and systems as had for their object the saving of expense had the smallest chance of adoption by the authorities. The lamp-columns and lanterns were deplorable fossils—many of them relics of the reign of George IV.; and they were spaced as far apart as any easy conscience in the matter would permit. The idea of lighting even the main thoroughfares so as to increase the attractiveness and security, and to facilitate the night traffic of the capital, had not been born in the minds of the disconnected parish vestries, nor could it be truthfully said that the value of brilliant lighting, as an aid to business, was better understood by the ordinary run of shopkeepers.

Thirty years ago, the Phoenix Gas Company—urged I am bound to admit by what was being done in the direction of electric street lighting in Paris—made an onslaught upon this hoary tradition; choosing for the scene of their operations an important road in the South of London. Their effort was strikingly successful, and may be fairly credited with the opening of a fresh chapter in the history of the public street lighting of England which is still being writ large all over the land.

The system of lighting by high-pressure gas recently introduced provides effects that are singularly beautiful, while the cost, judging from the standard of efficiency, is less than that of any other system. It is to be regretted, however, in the interest not of our industry only, but of the general public also, that efficiency is not always the first consideration, especially where municipal ownership of electric undertakings obtains, in awarding judgment.

The smallest towns provided with gas are now brighter and more cheerful at night than the West-End of London was at the period of which I speak. Not merely are the means of public street lighting better, but they are appreciated by the people. A great deal more money is now found for this service; and it is money well spent—of course, when the illuminant is gas. As to this point, however, I imagine that few of you are unprepared to demonstrate off-hand that gas gives better value for money than electricity, so I will not waste time in telling you what you know.

INDOOR LIGHTING, ETC.

What is true of our streets is equally true of the homes and places of business or public buildings lining these brightened thoroughfares. The incidental benefits of the cheap gas of to-day would baffle any but the most encyclopædic mind to distinguish. Of course, gas supply is not a philanthropic enterprise; and the social, not to say moral, bearings of any respectable calling are not to be dwelt upon too much by those who follow it for the sake of a livelihood—that way lies self-righteousness. All the same, I think we have the right to feel comfortably pleased, apart from business considerations, over the reflection that, whenever a slot-meter installation replaces something less convenient in the house-keeping arrangements of a cottage or tiny flat dwelling, or a gas-cooker lightens kitchen labours, or a gas-fire dispels chills and helps to clear the sky of smoke, it is of the nature of a good deed, to be scored up to the credit of the industry.

DEVELOPMENT OF THE GAS INDUSTRY.

You who have entered into the service of this important and necessary industry will be safe in regarding the development it has exhibited during my time as an earnest of its vitality and capacity of further expansion in the future, when it will be your turn. From year to year I see no evidence of exhaustion, or even diminution, of the prospects of improvement. There certainly never was more activity of mind and invention operating in this direction than at the present time. Therefore, the chief object of your present solicitude should be, and doubtless is, as the existence of the Association proves, the proper equipment of yourselves for the work that awaits you. This thought brings up the ever-recurring problem of suitable education for men of your stamp, which cannot be ignored on such occasions as the present. I am sure we are all wearied of the incessant talking and writing about technical and professional education which is forced upon our attention at every turn, in season and out of season. I feel

strongly tempted to exclaim sometimes, when one professor declares it to be necessary that every gas manager must first be a chemist, another that he must take a degree in physical science, another that he must spend three or four years at college before going into the shops, and so forth and so on—I feel like crying "A plague on all your houses; throw the man into his job, and let him find out for himself what it is desirable he should know." All that the best teaching arrangements can do for a man is to put him in the way of teaching himself. Start cramming young men upon some *à priori* assumption of what they ought to be taught, and you run risk of spoiling good workers to make poor intellectuals. It seems desirable to protest to-day that it is quite possible to have too much higher education, after the fashion of the schools. I read the other day some remarks of a returned Colonist who, after extolling the free educational facilities of his Colony, naively went on to say, in answer to an inquiry about emigration prospects, that good workmen, agriculturists, and domestic servants were in great demand at high wages, but clerks, " &c., " were already too plentiful local products. He possibly did not see the irony of his statement.

THE QUESTION OF EDUCATION AND TRAINING.

Wherefore, I make no apology for speaking to you of the need of better education of gas men, from the practical bread-and-butter point of view. Let it be understood at once that education never stops while the man remains on the active list. His youthful schooling is only preparation, for there are none other than preparatory schools in existence. There lads are supposed to learn how to learn. In a gas-works they see what to learn, which is where the college ought to come in useful. The difficulty—and it is a grave one—has been, and is, how to render the advantages of college study and instruction available by the most promising men in the service. The Royal Navy has the advantage of being able to arrange this without breaking a man's employment. When he is judged to be in a fit condition to further assimilate the fruits of quiet study and association with the most eminent experts, a naval officer takes a turn ashore, be he lieutenant or rear-admiral. Afterwards he goes to sea again.

Some such division of both active work and study would, in my opinion, be helpful in the great industries. The Gaslight and Coke Company have recognized this need in the case of certain of their employees, and are trying to meet it. They have erected a set of shops at Horseferry Road, primarily for the education of boys entering the service as fitters. These lads are in charge of capable artisans, and are taught the practical work which will later fall to their lot. But on three afternoons each week they attend the London County Council Technical Schools in Vincent Square, and are able to push on with appropriate studies, the value of which they learn to appreciate in the shops. So also with the elder men, lectures and classes are held through seven months in the year, by which it is sought to instil a knowledge of the principles underlying their work—a knowledge they had no means of acquiring before entering the service.

Meanwhile, it is your part to be continually knocking at the doors of the board rooms for help and guidance. You must show eagerness to improve your minds by making the best of what is already provided. I must say I should like to see, in young men aiming to qualify as gas managers, superintendents, and the higher offices in the industry generally, a greater keenness for technical study, and also a better appreciation of the business side of technical matters.

It appears to me that young men going in for gas employments might in some respects take a leaf out of the book of the corresponding order of electrical engineering students, who are nothing if not good theorists—that is to say, they are aware of having everything to learn about their elected science, and know that this cannot be won by the light of nature. The less strenuous sort of young man in gas-works, or in the gas office, whom I have in mind, does not take his task so seriously. There is plenty of hard reading to be got through by anyone who desires to take rank as an expert in gas technics. The history alone is voluminous, and there lies buried in it much that is continually cropping up again, with a difference. I do not recommend any course of study simply for the material reward it may bring. The habit, once acquired, never remains narrowly confined to utilitarian literature. There is controversy over the place of general culture—what used to be called the "Humanities"—in a modern practical educational curriculum; but I really do not share the anxiety expressed, lest the acquirement of useful information should prevent the broadening of men's minds by humane letters. It all depends upon the quality of the individual mind. If this is only adequate to the grasping of the indispensable elements of knowledge, it is better that the man should have these put in his way than have his mind choked by the correspondingly small smattering of useless "scholarship," which is all that remains of many a costly schooling and college course of the old-fashioned sort.

Our industry belongs, I think, to the same order of callings as seafaring and farming, as an occupation that has to be lived in, and be followed early if it is to be fully mastered. Gas manufacture and supply constitute a trade—a trade based upon science and technics, truly, but still a business calling for aptitudes and personal qualities not to be found in books. There is very much to think of in managing a gas-works that would hardly be suspected by anyone who had not grown up amid such cares, until the foresight thereby engendered becomes habitual. Against this grinding-in, however, must be set off sometimes the defects of indifference to outside, or theoretical, suggestions on one side,

and ignorance of ordinary commercial principles and ways on the other. Thus men exclusively brought up in gas-works may not easily shine either as scientific men or as men of business. While young especially, and under superior officers, they are apt to fall into the rut of routine, recognized elsewhere as the "public institution" habit of acting by rule and regulation, where the smile or the frown of the superior are supreme. When his own master, the mere routineer, without a stain upon his character, may yet prove an unprofitable servant. He is liable to be too fond of his own office chair, and his regular morning stroll through the works. Worse, he may limit his care and interest so exclusively to the affairs of his own company as to feel indifference when neighbouring concerns happen to show a slower rate of increase, or be less prosperous than they should be. This is not a right spirit, nor is it good business. The industry, as a whole, commands our allegiance, and expects every man to do his duty by it. Therefore, I hope you will always be ready to help a brother with information if he can use it to his advantage, and with sympathy at all times.

We have to deal in our industry with two contributaries towards the production of the desired profit—the financial and the human. Capital never sleeps, and never dies. Every pound called up has to be paid for, practically in perpetuity. Wherefore its increase should be jealously watched, and every possible means of reducing the dead-weight to be carried anticipated and applied. Money spent upon the machinery now so largely employed in manufacture, again—tenant's capital, as we distinguish it—must never be allowed to rest. Machines do not tire; but they grow old. Keep them moving; wear them out, and buy more.

THE TRUE AIM OF CO-PARTNERSHIP.

As to the human factor in our working, I rejoice that I have been permitted to assist in large conversions of salaried men and wage-earners into co-partners with their employers. This also is education. It will, I hope and believe, prove good husbandry, too. I do not mean by this that those who have been admitted to this new position in their own world are merely to be expected to recoup the employer for so much addition to their pay, and there an end. If so, it would justify those who, with small faith in the movement, belittle it by the name of a system of "deferred pay." If that were all, a simple raising of the rates of wage, or a measure of insurance, would be easier to manage. What I seek is a satisfaction of another kind than the quiet conscience of a good employer. It is for the gulf between Capital and Labour to be spanned by a plainly united interest strong enough to carry mutuality of understanding, and eventually of sympathy. The gain must be constitutional, working both upward and downward through the whole organism, not particular to any member.

In a recent important speech of the French Prime Minister, M. Briand, he said: "For himself he could not believe that the conflict of Capital and Labour was bound to be eternal. He felt convinced that some radical solution would gradually be evolved; and he looked to some form of profit-sharing with employees as holding out a favourable prospect of such solution." So held our late friend, Sir George Livesey; and to-day we are mostly, in that respect, his disciples.

There is just now much vague talk of Socialism, Collectivism, Nationalization, and other symbolic expressions pointing to some revolutionary change of the basis of human society, assumed to be a necessary preliminary to the bringing in of a Golden Age; but the underlying idea of them all is that of force, which cannot be a remedy. People are to have something done for them by an abstraction called the "State," to which they need not respond by any change in themselves. The idle and shiftless may remain idle and shiftless still. I believe this to be putting the cart before the horse. We are thankful to see the Legislature engaged increasingly upon plans for the improvement and cheapening of education, upon the better housing of the poor, in aiding temperance, and other social reforms.

So far "we are all Socialists now." All this is good, but from the beginning, true progress has proceeded from the individual, and social amelioration has followed, not led, men's rise to higher things.

THE FUEL STANDARD.

I have witnessed much in gas manufacture and its applications of the adaptation of means to ends, and have watched great and radical changes of methods and aims. The end is not yet. The purely illuminating power standard of the quality of the supply is actually in process of yielding place to the fuel standard, which we have consented to accept provisionally for the Gaslight and Coke Company, without emancipation from the photometric test. This may be regarded by some as a temporizing expedient; but even so, it is in the way of development. It is better to go ahead slowly than to stand still or to incur the risk of having to turn back. The great thing is to be travelling in the right direction; and there is no gainsaying the fact that we are taking a lead along an open road. All modern uses of gas, without exception, come into the category of fuel purposes. This is now our market. We must supply what the public needs, in competition with keen rivals; and it is our business to ascertain the nature of the wants before undertaking to meet them.

PUSHING THE SALE OF GAS.

For this reason, we have opened up fresh trading developments, and now seek custom instead of waiting for custom to come to us. The centre of gravity of our solicitude has so far become

displaced. We still strive unremittently—indeed, more strenuously than ever—after economy of production and working; but it is recognized that good works' management is no longer everything, and must be accompanied by an enterprising sales department. A decimal part of a penny saved in the cost of gas in the holder, or in administration, is of great value; but the cheapest gas needs a market. The industry at large (outside London and the suburbs and other growing districts) is apparently passing through a period of arrestation of growth, consequent upon the adoption by consumers of more economical ways of using gas for lighting and heating—a movement, be it said, initiated and led by ourselves—and also due to slackness of trade. Yet when one learns of the remarkable response of certain small, stagnant Irish towns to energetic cultivation of the latent potentialities of gas, it is difficult to believe that like success would not follow similar efforts elsewhere. I have heard of a worthy inspector who, if called to a house with reference to a complaint, thinks he has lost an opportunity if he comes away without an order for another gas-fire or two. This is the kind of man for our business.

CARBONIZING METHODS.

Nothing has been more remarkable in contemporary gas engineering than the openings that have been found for improvement in some of the most settled processes of the manufacture and subsequent treatment of gas. Not to discuss the new carbonizing methods, which are "on the knees of the gods," who would have imagined that, at this time of day, an altogether new system of working horizontal retorts would become the fashion? The whole apparatus of carbonization is in the melting-pot. Everything in and about manufacturing and purifying plant has been subject to much alteration since the beginning of the present century.

GAS-WORKS NEED NOT BE A NUISANCE.

One thing I rejoice at—the old character of gas-works as offensive factories is being materially improved, if not wholly reformed. There is really no substantial reason why gas-works should be a nuisance. This point, of avoidance of offence, will become more important as time goes on, and the holes and corners for hiding works away grow more difficult to find. A well-designed works ought not to be ugly. We have many which are an example of what factories should be; and the number is increasing.

CONCLUSION.

In conclusion, I am afraid that the architecture of this address is somewhat of a patchwork order; but I know you are very divided in your positions in the industry, and I trust that some of you will be able to appropriate here and there something that appeals to you. Whatever your connection with the industry, I wish you one and all a successful future in it.

A VOTE OF THANKS—AND SOME SPEECHES.

Mr. L. F. TOOTH (Commercial Gas Company), the Senior Vice-President, in proposing a hearty vote of thanks to Mr. Corbet Woodall for his interesting and instructive address, remarked that they had heard a great deal of good practical advice which would be of advantage to all of them. Mr. Corbet Woodall, as they well knew, had very few spare moments; and they ought to feel proud that he had consented to come there and address them. To him (the speaker) the lecture was a book; and he hoped that when it appeared in print, every member would carefully study it. Then when reading, or seeing Mr. Corbet Woodall's name, they would be able to say, "That is the man who opened our eyes."

Mr. T. F. CANNING (Ilford), the Junior Vice-President, seconded the vote; remarking that they had heard an address which required study, for Mr. Corbet Woodall had put forward many points with regard to the management of a gas-works. But the whole matter was put in a nutshell by the one statement that economy in carbonizing was not of much use if they had not a sale for the cheap gas that they made. The presence of Mr. Corbet Woodall there that evening should arouse in the juniors an ambition to attain in the industry as high a level as possible. Of course, there could be only one leader, as in a race there could be only one winner; but those who came after had allotted to them places according to their merit, and so could they, by striving to better themselves, obtain positions in the industry in proportion to their ability.

The PRESIDENT then called upon several of those present to support the vote.

Mr. F. W. GOODENOUGH remarked that the Association were to be heartily congratulated on the auspicious opening of the new session, and upon having secured for that opening the presence of Mr. Corbet Woodall, who, as Mr. Tooth had pointed out, had so many calls upon his time. It was, he thought, especially appropriate that Mr. Corbet Woodall should address a Junior Association, because, though he had referred to himself as almost aged, his (the speaker's) knowledge of him told him very clearly that he was the youngest man in the industry so far as related to his lively interest in everything that was new, his vitality, and his keenness for the welfare of the gas business. He (Mr. Goodenough) never made a suggestion of any kind to Mr. Corbet Woodall in connection with the service of the Company in whose employment he was proud to be, without him entering into the question with all the zest of the youngest of them. Mr. Corbet Woodall was one of the most striking examples of the man who grows younger the greater the number of his years; and in this respect he gave them a lead which he (the speaker) hoped they would all do their best to follow—namely, that they should not

allow their interest in their work to flag for a single moment. It was only by taking an interest in their work that life was made worth living; and it was because he had always taken this interest that Mr. Corbet Woodall found himself so youthful at the present day. It had been a great pleasure to be there that evening and hear Mr. Corbet Woodall and meet the members; and he wished the Association every success during the session just opened—a success ensured by them having as their President again this year the indefatigable and enthusiastic Mr. Liberty.

Mr. HENRY AUSTIN, after remarking that he had never lost an hour through being late during the 25 years he had been in the service of the South Metropolitan Gas Company (of which he is now an Employee-Director), said he had been delighted with the address, which would stimulate each one of them in the journey through life. He had been particularly pleased with the references to the system which helped a man to help himself, by assisting him to become his own employer. To-day many of the work-people in the South Metropolitan Gas Company enjoyed a return of £6 or £7 every half year by way of dividend; and this was of great use to them, and made them feel better men in the world. Co-partnership was one of the very best systems ever established between masters and men. It eliminated the prejudice which had previously existed between Capital and Labour. Instead of Labour fighting Capital, it was enabling the labourer to become his own employer. In his own Company, the employees held a very great amount of stock; and the system had been the means of enabling many men to better themselves in life by emigrating to the Colonies. He hoped Mr. Corbet Woodall would live for many years to lead the greatest Gas Company in the world.

Mr. A. F. BROWNE said that he shared to the full the feelings of gratification with which they had seen Mr. Corbet Woodall among them that evening, and with which they had listened to his full, instructive, and encouraging address. Now, what was Mr. Corbet Woodall's advice to those who wished to attain success in the gas industry to-day? Well, he advised them not only to study words but things; and it was the finest advice that one who knew could ever give to those who were seeking to learn. There was much which they all felt might very easily degenerate into cramming in the education of the present day. It all depended upon the way in which the student approached his task. When they had this advice from Mr. Corbet Woodall, they might take it that his desire was to see the young men who were rising in the industry fully qualified to face the difficulties, the competition, and the scientific knowledge which was necessary to carry on this great industry in the future; and he encouraged them by telling them he believed the future was bright and rosy. Now, if there was one Company who had done more than another for the students in the gas industry, it was the Gaslight and Coke Company. Mr. Corbet Woodall had that night alluded all too modestly to some part of the work that the Company had undertaken for the benefit of the young men. He spoke of apprenticeship or practical instruction in shops. They all knew how this country was suffering from the disappearance of apprenticeship. Youths left school as soon as they had passed the requisite standards, because it was necessary for them to earn a living at the earliest possible moment. As a rule they took anything that turned up; and in a few years, in many callings, they became too old for the work, and were sent into the world again knowing nothing—thus going to swell the ranks of the unemployed. He was struck by Mr. Corbet Woodall's remark about reading. Certainly, it was very wise to read what had gone before. He said they would find in the records of the history of the industry during past years many problems which were continually cropping up afresh, with a difference. It was just this "something new" that they had to be abreast of; and this would take them all their time. He had had something to do, as they knew, with the Gas Examinations; and whether young men were students or had ceased to be such in the ordinary sense (for, as Mr. Corbet Woodall had pointed out, none of them ever ceased to learn, or should not do so), he would venture to urge upon them all not to be in a hurry. They should take their time. To those men who crammed and tried to stuff themselves with a great deal of technical knowledge merely to pass examinations, he would say, "Do not do it." It was not necessary that they should pass these examinations or take these diplomas. What was necessary was that they should qualify for any position they were to take. This would occupy them for years. The address had taught them all a great deal; and he was sure they would study it when it appeared in print, and derive even greater benefit from it than they had done by listening to it.

The PRESIDENT said that, in putting to the meeting the resolution which had been so ably supported, he must say they were all under a deep debt of gratitude to Mr. Corbet Woodall for coming and addressing them, and giving them something to think about. He was reading a little while ago that there was very little thinking done now in the Universities—most of it was done in the factories and workshops. Whether or not this was really true, he would not venture to say; but he would say that there was much more thinking in the workshops and factories to-day than there was formerly, and this thinking was done, not only that men might advance themselves, but to aid the industry with which they were connected. What was required was that they should think intelligently; and it was by listening to such an address as they had just heard that they received the help they needed.

The vote of thanks having been carried with acclamation,

Mr. CORBET WOODALL, in acknowledgment, remarked that if any thanks were due to him, it was perhaps for having furnished the peg on which the interesting series of speeches which they had since heard had been hung. What Mr. Austin had said was enough to cheer and invigorate all in the room; and they were grateful to Mr. Browne for his good counsel. As to the length of his (the speaker's) connection with the gas industry, he was thinking the other day that he was probably one of very few left who were original members of the British Association of Gas Managers. He believed he attended the very first meeting, which could not have been far short of fifty years ago; and at that time he was already the Engineer of a gas undertaking. His retrospect therefore went back very far indeed. During his experience he had filled pretty nearly all the offices that went to make up the total service of a gas undertaking. Beginning at Woolwich as Assistant to his dear old friend Mr. Robert Morton, in a very junior capacity indeed, he had to be at the works at 6 o'clock in the morning; and he was quite sure he was none the worse for it. It had been a very sincere pleasure to him to be with them that evening; and he would only add to what he had said a word to this effect—that while one realized all the advantages that Mr. Austin had pointed out in connection with co-partnership, and the improvement in the outlook of the workmen and co-partners generally, he himself would be sorry to lay too much stress on the mere accumulation of a banking account. The question of character should be kept as prominently to the front, at any rate, as any other form of advancement; and on this point he need not lay emphasis, because he was sure it would commend itself to them all. If there was to be real and true success, there must be strenuous application. If they were not to be content with merely following in the rut, but wished to get out of it and make a name and a place for themselves, then even in their industry it must be done by using to the utmost the opportunities that fell in their way. Success did not come by luck or chance, but by real solid striving and work.

PRESIDENT OF THE INSTITUTION OF GAS ENGINEERS.

The PRESIDENT mentioned that Mr. J. W. Helps, the President of the Institution of Gas Engineers, had been particularly anxious to come and hear Mr. Corbet Woodall's address; but, unfortunately, another engagement prevented him from doing so.

THE TRANSACTIONS AND A DINNER.

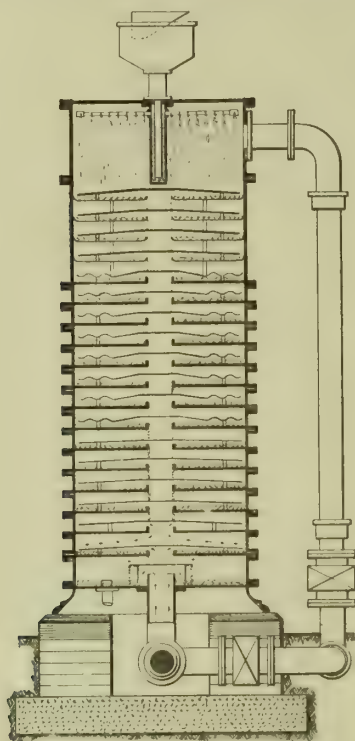
The PRESIDENT, referring to the printed volume of "Transactions" for the session 1908-9, said the members would remember that a copy had been promised to them without any extra charge beyond their subscription. But, unfortunately, the work had proved a little more expensive than was at the time anticipated, and financial considerations made it necessary on this occasion to charge 1s. a copy to the members. They would agree that the book was well worth the money; but still, in view of the promise made, this explanation was called for. He saw no reason why in future years copies should not be given to the members on payment of their subscription. It had been suggested that they should now and then hold "Coffee Meetings," at which they could freely and informally talk over things which they might not care to discuss in public; and if the members agreed with this, arrangements could be made. They did start such meetings at one time; and the Manchester Junior Gas Association had adopted the idea. Then as to a dinner. Last year, it would be recalled, a very satisfactory one was held; but it was not the wish of the Council to commit the members to any extravagance in the way of dining, without an expression of opinion. If the members approved of a similar function next spring to that which took place at the Horse Shoe Hotel last session, they might let the Council know.

At the close of the business meeting, there was an informal social gathering, at which light refreshments were served.

Boosting Gas Pressures.—We learn from "Engineering Record" that an installation of Westinghouse gas-engines for boosting the pressure in its gas pipe-lines has recently been contracted for by the Public Service Corporation of New Jersey. At the Hoboken and Passaic plants, four Westinghouse vertical, 13 in. by 12 in. gas-engines, equipped with special regulating mechanism, will be employed to drive direct-connected Root blowers delivering gas at pressures varying from $\frac{3}{4}$ lb. to 4 lbs. per square inch, as desired. The delivery of gas by the blowers is automatically made to conform to the demand on the pipe-lines, by increasing the speed of the engines as the pressure in the mains tends to fall. To accomplish this, a special controlling valve has been added to the engine equipment, which throttles the fuel admitted to the engine—adjusting its speed between 290 and 125 revolutions per minute, as the demand for gas varies. While it is estimated that the minimum demand on the lines will probably absorb the delivery of the blower at its lowest speed, any possible abnormal rise in pressure is prevented by the provision of relief-valves which automatically open a bye-pass round the blower, enabling the engine to run light while performing no other work than circulating the gas in its local circuit. The engines are each of 90 B.H.P. capacity, and use illuminating gas from the mains, with a heat value of approximately 600 B.Th.U. per cubic foot. They are direct-connected to the blowers through rope flexible couplings.

AN IMPROVED COLUMN GAS-WASHER.

WE give below an illustration of a new form of gas washer or cooler which has just been devised by Mr. William Blakeley, of Messrs. Firth Blakeley, Sons, and Co., Limited, and for which he has applied for a patent. It can be utilized as a condenser, an ammonia or naphthalene washer, a water-cooler, or for other purposes. The principle upon which it is designed is the passing of a thin stream of gas over the surface of a liquid, whereby intimate contact is obtained, which enables any existing chemical affinity between the two substances to take effect.



Blakeley's Column Gas-Washer.

The apparatus, it will be seen, consists of a series of trays, one above the other, and forming a kind of still. Each tray is covered with a shallow depth of liquid; the depth being governed by a circular flange in the centre. An opening in the centre of the tray, of the same size as the inlet-pipe, is provided for the passage of the gas; and over each tray is fitted a deflecting plate to keep it at the proper distance from the surface of the liquid. The deflecting plates (though shown with a straight taper in the diagram) are made to a parabolic curve, to allow for the gradually increasing diameter, and so leave the area of gas passage between the plate and the liquid always the same. The gas, entering at the base, passes through the centre opening of the first tray; and its only way of escape is through the space between the deflecting plate and the liquid, and thus it goes through the entire series, finally emerging at the top. The action of the gas in passing over the liquid in the trays will be to cause a rippling of the surface, which it is anticipated will greatly increase the efficiency of the apparatus as a washer. To increase this rippling action, it is intended to make some or all of the deflecting plates with circular corrugations, as shown in the middle portion of the diagram; these corrugated plates causing a wave-like action both of the gas and the liquid.

When used as a condenser for coal gas, cold water will be passed in at the top; and as the gas enters at the bottom the process of condensation will be a gradual one, and regulated to any suitable temperature by the quantity of water put in. As an ammonia washer, the working would be the same; and by regulating the water or liquor supply at the top, any strength of liquor could be obtained from the base, exactly the same as with a scrubber-washer. In the case of its use as a naphthalene washer, for which it is considered to be eminently suitable, the washing oil would be regulated by a tap at the top, so that on the arrival of the oil at the base it would have done its full amount of work. When employed as a cooler for water or other liquids, the reverse operation to gas condensation would take place. The dotted lines in the diagram show the level of water in the trays, and how it overflows from one to the other. The second tray from the bottom is without these lines, to show how the feet are provided for each deflecting tray; there being three of these to each, and of the same length.

It is claimed for the apparatus that it will give very little back-pressure beyond that caused by the additional friction. This would enable it to be placed before the exhaustor, and thus prevent a great deal of tar getting to the machine, which always causes trouble, sooner or later.

Mr. Hilliard Stephens, A.M.I.Mech.E., A.M.I.E.E., has joined the staff of the Davis Gas-Stove Company, Limited.

GAS-FIRES—A SEASONABLE COMMUNICATION.

THE change from muggy weather to the cold and bracing state of the atmosphere experienced yesterday and to-day turns one's thoughts to the heating arrangements of dwelling-houses and business premises during the winter. Most appropriately, on this change to a lower temperature, a communication has been received, at these offices, from the Gaslight and Coke Company, addressed to the Editor of the "JOURNAL"—not in that capacity, but as the occupier of the premises. Gas-fires have been the sole means of heating the offices for more years now than perhaps it is well to number, as it only reminds one of the flight of time. Under the circumstances, the communication (which is signed by the District Inspector of the Company) does not in this instance directly appeal; and therefore use may be made of it by reproduction in our columns. It will serve as a suggestion to others; it is certainly a model of what such a communication should be:

The Gaslight and Coke Company,
146, Goswell Road, E.C.,

Oct. 23rd, 1909.

Sir,—May I draw your attention to the many advantages of gas for the heating of business premises?

Gas-heaters give a cheerful, comfortable appearance to an office, make no work, no dirt or dust, can be lighted at a moment's notice, and can be put out the instant the premises become comfortably warm. They are therefore far better suited to our changeable climate than coal-fires or radiators heated from a central boiler.

The prejudice formerly entertained by some people against gas-fires is rapidly dying away, in view of the conclusive demonstration by medical and scientific men that they can be used with advantage rather than detriment to health, and of the satisfactory experience of their use by many thousands of our consumers.

If you are not fully satisfied with your present heating arrangements, will you permit me to call and discuss the matter of gas heating with you?

In the hope that you will do me the favour of seeing me on the subject, I am enclosing a stamped addressed post-card; and if you will kindly advise me thereon of a day and time that will suit your convenience for me to call, I shall be very greatly obliged, and you will incur no obligation whatever other than that of giving me a few minutes' hearing.

Awaiting the favour of your instructions,

I am, Sir, your obedient Servant,

Inspector.

[Name and address of recipient
are given here.]

On the back of the accompanying stamped post-card appears the following:

Date _____ 19____

Please call on:—

(Name) _____

(Address) _____

The most convenient time for you to call would be between the hours of _____ and _____ on _____ day, the _____ or* between _____ and _____ on _____ day, the _____

*N.B.—Kindly give an alternative appointment. Every effort will be made to keep the first-named; and you will be notified if that is not possible.

In this connection, mention may again be made of the communications received by the consumers in the district of the South Metropolitan Gas Company in which were offers to clean gas-fires and replenish fuel free of expense; stamped post-cards being enclosed for acceptances of the offer. This is having a splendid effect in advertising domestic heating by gas-fires. Gas-fires are readily maintained nowadays; and a gas-fire well maintained in any house is an excellent advertisement for gas heating. We learn from consumers in the district that there is prompt reply on the part of the Company to the post-cards; that men courteous to the consumers and expeditious over their work are sent, and that the result of their light labour is complete satisfaction on the part of the consumer. In one instance within knowledge, an old type gas-fire was not giving satisfaction. The fire could not be brought to a proper frame of mind by the local gas-fitter. Friendly recommendation led to a communication on the subject with the Gas Company. Next day the difficulty was righted; the consumer was not troubled with an account from the Company for their services; and the consumer's household and the gas-fire in question have lived together happily ever since. Several other consumers have heard of this single incident from the consumer.

Mr. James Taylor, of Bakewell, for many years a member of the District Council, and a Director of the Bakewell Gas Company, left estate of the value of £18,239.

Among the awards of medals and prizes by the Institution of Civil Engineers for the year 1908-9 is a Telford gold medal to Professor B. Hopkinson, M.A., B.Sc., of Cambridge, whose writings on the gas-engine have been noticed from time to time in our columns.

MODERN DEVELOPMENT OF THE GAS INDUSTRY.

At a Meeting of the Birmingham Section of the Society of Chemical Industry, held on Thursday last, at the Birmingham University, an interesting paper was read by Dr. W. B. DAVIDSON, the Chief Chemist of the Birmingham Corporation Gas Department, who, in the short time at his disposal, gave a comprehensive survey of the present position of the gas industry.

After touching upon the work of Murdoch, Dr. Davidson remarked that during the past half century the development had been very striking; and to-day the proportions of the industry had attained huge dimensions. He said that, estimating roughly, in the United Kingdom 17 million tons of coal, of a value of £10,000,000, were used annually in gas making; 60 million gallons of oil were employed, of the value of £700,000; and 100,000 tons of oxide for purification, of the value of £120,000, were used. The gas sold was 200,000 million cubic feet, of a value of £25,000,000; and the residuals included coke, breeze, and dust, of a weight of 8 million tons, and a value of £5,000,000. Approximately 10 per cent. of the gas made was carburetted water gas. During the eighties and nineties, the rate of increase in the output of gas in this country was seven or eight times the rate of increase in the population; but naturally this extraordinary development could not be maintained for very many years, and the last decade had witnessed a considerable slackening in the demand for town gas. A table giving the output of 24 of the largest gas undertakings in the United Kingdom for the years 1888, 1898, and 1908, together with the decennial percentage increments, showed that the Metropolitan Companies were making less rapid progress than the Provincial undertakings; while London Suburban Companies enjoyed an abnormally high rate of increase. It was gratifying from the manufacturer's point of view that, in spite of economies in the consumption of gas for lighting purposes, the ever-growing competition of electricity for light and power, and the introduction of numerous producer-gas plants in large factories, the average rate of increase in the output of gas was still more than double that of the population.

Turning to the subject of gas lighting, Dr. Davidson remarked that with gas at 2s. 6d. per 1000 cubic feet, giving an efficiency of 20 candles per cubic foot, 1000 candle-hours cost, for gas only, 1s. 5d.; while with electricity at 3½d. per unit, and Osram lamps giving an efficiency of 0.95 candle per watt, the same amount of light cost, for electricity only, 3s. 9d. Street lighting and the illumination of large rooms was accomplished most effectively by high-pressure gas in burners of special construction fitted with strong mantles. There had been considerable development along this line during the last five years. It would have been much greater had it not been for the additional expense entailed by the erection of compressing plants for the different installations. When high-pressure gas was supplied from the gas-works in special mains such as were now being laid in Birmingham and some other towns, no extra outlay on the consumer's part would be necessary, and he would thus be able to derive immediate benefit; while the streets would have full advantage. The best type of high-pressure burner had an efficiency of 60 candles per cubic foot—that was, three times as much as ordinary burners. The pressure of gas required was 50 to 55 inches (water gauge), or 2 lbs. per square inch. The cost for gas only, at 2s. per 1000 cubic feet (assuming a lower price for gas in bulk), was thus only 0.4d. per 1000 candle-hours. To equal this figure electricity must be supplied with flame arcs (efficiency 3 candles per watt) at 1½d. per unit. So successful had high-pressure gas proved itself for street lighting that electric arc lighting already installed had had, in a large measure, to give way to it. Berlin, which was looked upon as the foremost city in Europe in the matter of street illumination, had decided in favour of the inverted high-pressure gas-lamp; and it would appear that London was going to follow suit, judging from the fact that a deputation of the Streets Committee, after visiting and carefully examining the systems of lighting in some of the principal Continental cities, recommended in July last "that high-pressure incandescent gas-lamps with inverted burners should be adopted as the illuminant; but where gas is impracticable, electricity with open arc and flame arc lamps should be installed." He thought this must be looked upon as a great victory for gas lighting.

As to gas-fires, he remarked that a thermal efficiency of 70 per cent. (half by radiation and half by convection) was probably more than three times as much as that of a good coal-fire. Gas of a net calorific value of 540 B.Th.U. per cubic foot, at 2s. 6d. per 1000 cubic feet, gave 18,000 heat units for 1d.; whereas coal of a calorific value equal to 14,000 heat units per pound, at 18s. 8d. per ton (1d. for 10 lbs.), gave 140,000 units, or eight times as much. On this basis, a gas-fire was more than twice as costly as a coal-fire. But, nevertheless, its convenience, cleanliness, and labour-saving advantages recommended its use to the average householder. With reductions in the price of gas and further improvements in the appliances, it was not too much to hope that gas-fires would be more generally employed in the future. Attention was next given in the paper to Mr. A. W. Onslow's work in the way of heating by high-pressure gas; to the employment of gas for cooking; to the prepayment meter system; and to the use of gas for motive power. On the latter head, the author remarked that some thirty years ago the indicated thermal efficiency of the best gas-

engines was only 16 per cent.; whereas to-day it was 37 per cent. So multifarious were the applications of gas, that gas supply had become quite a science in itself, apart from gas manufacture. This had been recognized by the City and Guilds of London Institute, whose examination papers had been set year by year since 1907 in gas supply as well as in gas engineering—the latter being three-quarters chemistry.

One of the questions of the hour in the gas industry, said Dr. Davidson, was the quality of gas that was called for. A conference of German chemists had given an answer to this query, and, among other things, had expressed the opinion that tests of illuminating power were superfluous. He thought gas chemists in this country would not be inclined to agree with this. "In the use of town gas," he continued, "a luminous flat or round flame is sometimes absolutely necessary; and as the manufacture of a non-luminous gas of the required calorific value is not an impossibility, it is advisable to stipulate an easy standard of (say) 12 candles with the No. 2 argand burner. By the way, this burner is not the very best obtainable. The Grafton burner of similar type is slightly better. Either will suit the purpose, however."

Under the heading of gas manufacture, reference was made to the various efforts put forth by engineers to reduce costs. One of these was working with smaller retort charges or lengthening the period of distillation, which gave a greater yield of gas per ton of coal. But labour costs increased; and this method was not to be recommended. A higher temperature of distillation afforded ready means of increasing the output of gas, and had been quite generally resorted to. Heating by means of producer gas generated in the retort-house and the use of the regenerative effect instituted by Siemens came into general use twenty years ago. In this way, not only was the yield of gas increased, but the consumption of fuel was greatly diminished. There were, however, some disadvantages. Capital and maintenance charges were both largely increased; and naphthalene made its presence felt. Two or three reliable remedies for the latter trouble had, however, been discovered. Another difficulty which became intensified was stopped ascension-pipes; but this had been overcome by various devices. Then as very high temperatures were attained, the defects of fire-clay material became a source of considerable trouble; a portion of the retort-setting not infrequently giving way. Greater attention had therefore to be given to the quality of fire-clay goods used; and steps had already been taken by those interested in the fire-clay industry with a view to improving and standardizing refractory material for use on gas-works. A combination of large charges with high temperatures represented the acme of perfection of modern methods of carbonization. Under similar conditions of temperature and exhaust, the make of gas per ton was not so great in this case as with smaller charges, but the quality was decidedly better. The effect of putting a large charge into the retort was to diminish the free space above the coal, and to lessen the degree of degradation of the hydrocarbons to carbon and hydrogen. The carbonizer found he could use more exhaust in order to bring the gas down to standard; hence the prevalent erroneous idea that heavy charges gave a larger yield of gas per ton of coal. An analysis of the gases would show an increase of nitrogen. Again, manufacturing costs had been greatly reduced not only by higher production of gas, but also by new machinery.

Inclined retorts, vertical retorts, and chamber ovens were then touched upon by the author, who gave the following as a rough comparison of the carbonizing costs (charging, drawing, and firing) per ton of coal for the different systems: Hand labour, 36d.; old machinery, horizontals, 18d.; inclined retorts, 12d.; new machinery, horizontals, 8d.; verticals, 4d.; chamber-ovens, 2d.

The final portions of the paper dealt at large with the progress made in the production of residuals, developments in purification, new appliances, and research work. On the latter point, Dr. Davidson said to his audience: "I would remind you of the bold experiment made by the Birmingham Corporation Gas Department in erecting five years ago, as a test plant, a complete gas-works carbonizing 24 tons of coal per day. Hitherto we have not published any results. I may confidently say, however, that the remarkable improvement in the carbonizing results of the different works of the department is in large measure attributable to the test works, and justifies the considerable expense in erection and working."

At the conclusion of his paper, Dr. Davidson showed several lantern slides illustrating various plant and machinery used on a gas-works. He had also arranged on the table an interesting display of up-to-date appliances, including recording calorimeters, the Féry radiation pyrometer, inverted gas-fittings, the Keith high-pressure lamp, &c., in which the members appeared to be greatly interested.

A short discussion followed, in which the PRESIDENT (Dr. Price, of the Birmingham Municipal Technical School) invited Dr. Lessing to take part.

Dr. LESSING stated that he thought the applause they had accorded Dr. Davidson was a proof of the value of the institution of this type of lecture (which was the second of a series recently started by the Birmingham Section dealing with each department of the industrial side of chemistry). He did not think that those who inaugurated the system ever expected to get a better class of lecture or lecturer than they had had that evening. Dr. Davidson had given them an extremely good survey of the present state of the gas industry in all its varied branches. He did not think

anyone could have done it better, certainly not in a more concise form, than Dr. Davidson had done. Those of the members who were not connected with the gas industry would have gathered from what they had heard how extremely important the services of the trained chemist were in this industry—a fact which was beginning to be recognized nowadays, as it ought to have been in times gone by. As Dr. Davidson had mentioned—and it was a remark that he thoroughly agreed with—gas engineering nowadays meant to a large extent gas chemistry. They had heard in the course of the paper that the Corporation of Birmingham had recognized the value of the services of the chemist by installing an up-to-date central laboratory and coal-testing plant; and the improvement in results which Dr. Davidson had shown to be effected after the experience gained by scientific and practical experiments on a fairly large scale, indicated the wisdom of their policy. He had had the pleasure of inspecting the testing establishment at the Saltley Gas-Works; and he did not know of any other gas-works laboratory that was better equipped—certainly none better conducted—than the one in Birmingham. The members would have gathered how varied were the duties of the gas chemist, and how manifold the problems he was confronted with. The apparatus they saw on the table was, to a large extent, used in connection with gas supply only. The carbonization of coal was, as indicated by Dr. Davidson, still in its infancy. Very little was actually known of the chemistry of it; and comparatively little had been added to their knowledge concerning it during the period reviewed by Dr. Davidson. This was where, in the future, a lot was expected from gas chemists and from establishments of the kind that Dr. Davidson now had under his control. The difficulties in connection with research of the kind were, of course, enormous. They would agree with him when he reminded them that the chemical reactions which had to be ascertained took place in rapid succession at temperatures of 1200° and 1400°. The difficulties seemed, indeed, beyond even the modern well-equipped chemist. They were, however, getting nearer; and the invention of new carbonizing plant of different types would certainly help them a good deal in clearing up matters. A movement was started in the gas industry a few years ago to try and scrap the old and well-tried plant altogether, and adopt new appliances, which should be first of all labour saving and overcome other difficulties that were met with in the older types of plant. So far, success had certainly been attained, although the new types had not yet been generally adopted—one reason being the fact that they had not yet overcome all the “infantile diseases.” The capital outlay necessary, too, was, under certain conditions, almost prohibitive. Enormous progress had, however, been made; and it was only to be hoped that they would soon be enabled to solve the various intricate problems they had to face. A paper of the type they had listened to that evening would do very much in not only diminishing the interest of outside chemists, but in giving those in daily contact with problems of the kind an excellent point of view from which to survey the situation at the present moment, judging from it the probable course of development.

A vote of thanks to Dr. Davidson was proposed by Mr. SILVESTER (Public Analyst), seconded by Mr. BATTY (Chemist at the Erdington Nickel Works), and carried with acclamation.

Dr. DAVIDSON suitably responded, and replied at the same time to various questions which had been put to him by one or two of the speakers.

Crystal Palace Old Students' Society.

At the annual general meeting of this Society on the 13th inst., the Council's report on the work of the past year was read, and the report and statement of accounts were received and adopted. They showed that financially and socially the Society made excellent progress during the last twelve months; and although the membership has not increased, the interest of the members has been universally revived to a very marked extent. The principal cause of this has been the concentration of the work at the new headquarters, No. 54, Parliament Street, Westminster, and the personal interest shown by the Hon. Secretary (Mr. Percy Griffith) in each member. The Council and officers for the year 1909-10 were elected, and the new President (Mr. H. C. H. Shenton) delivered an interesting address. The annual dinner was held at the Criterion Restaurant the following evening—the President in the chair. The occasion was marked by the presence, as guests of the Society, of a large number of distinguished honorary members, including Mr. Charles Hawksley, a Past-President of the Institution of Civil Engineers, Mr. A. T. Walmisley, the Engineer to the Dover Harbour Board, and Mr. T. W. Wilson, the Principal of the Crystal Palace School of Engineering. Mr. Hawksley proposed “Success to the School;” and in acknowledging the toast, the Principal supplied interesting records of the work accomplished by old students after leaving the school. It may be mentioned that the position and prospects of the school are entirely unaffected by recent financial difficulties of the Crystal Palace Company.

“The Patent Road to Fortune” is the title of a booklet by “A Successful Traveller on It,” which Messrs. Burt Bros., of Hull, are publishing at the price of 3d. net. The author begins by indicating what to invent, and then goes on to show what to do with an invention. If the following of the advice given should lead a reader to the goal the author has reached, he will not have reason to regret the outlay of a few pence to obtain it.

NOTES ON INCOME-TAX AND ASSESSMENT.

By GEORGE HELPS.

[A Paper read before the Midland Association, Oct. 21.]

Having been asked by your Committee to give a paper on the above subject, I beg to submit my remarks for your discussion.

INCOME-TAX.

There is no necessity to go into the history of income-tax, but simply to deal with the administration of the law in complicated questions of fact so far as gas-works are concerned. Income-tax is a tax sometimes levied on capital and always levied on income; but I must refer you to the Income Tax Acts for what is taxable income and what is not. The one question in connection with income-tax that affects all of us most is that of depreciation.

It must be very certain that everything connected with a gas-works depreciates, and that this depreciation has to be made good or allowed for before net profits can be arrived at. If a gas-works be taxed on receipts *plus* depreciation, there is something wrong with the Act of Parliament or the administration of it, or even those responsible for the control of the gas-works.

How do most of us allow for depreciation? Is it our custom to charge every alteration and extension that is made wholly to capital, or do we, to arrive at the figure for depreciation, give a life to every different part of our plant and apparatus, and depreciate it every year according to that life? We know very well that we do neither of these things. To charge every extension to capital would be as ridiculous as it would be to attempt to depreciate the thousand and one parts which go to make up our whole system on the basis of an average life. What becomes of the average life basis when obsolescence throws plant out of use? I submit it is only theorists who ever dream of talking of such accountancy. In an ordinary way, I can understand no repairs and maintenance account that does not include renewals. The practice, to put it shortly, is that we charge, or we should do, all that we reasonably can—observe, please, I say reasonably—to the expenditure on new works and extensions to revenue, to cover the depreciation which we know is going on all round; and so that we do not overstep the mark either way, we are supposed to keep our eye on the balance-sheet value of the undertaking (the face-value, as it were) and the actual value as represented by the plant both inside and outside the works, and independent of preliminary expenses and goodwill.

Of course, it may be reasonably argued that where a works is absolutely at a standstill—where no extensions are being carried out, where no new customers are being supplied, and where for some reason or another nothing in the way of general repairs to plant happens to be required for a particular year—then an allowance for depreciation which later would arise is undoubtedly called for.

Take meters alone. I can imagine a works scrapping a few thousand meters and putting in new ones in their place. The whole of the new meters would be chargeable to revenue; and if one year would not stand the charge, then the amount could be spread over several years by means of a suspense account. The Income-Tax Authorities would allow this to be done. I do not, however, see why a gas company should grumble when, after several thousand meters had been put in—which, of course, would not require any repairs for several years—the taxing authority would not allow depreciation on those meters to be set aside every year to build up a sum that would pay for the renewals when they again came along, and I do not think we as business men should ask them to do it.

Now supposing the meters purchased, instead of replacing old ones, were for all new customers, then the sum of their cost would be rightly chargeable to capital. In such a case, I should say there would be a very good reason to ask for an allowance for future depreciation year by year, provided the whole of the meters of the particular gas undertaking were kept in such account form that the authorities could see very clearly that the depreciation asked for would not in time reach a greater figure than the original cost of the meters. Herein lies the difficulty which we ought to recognize that taxing authorities have.

Again, consider the position of an absolutely new works put down complete in a town where there has been no gas before. Obviously, to commence with, there would be no repairs, &c., account that would cover the depreciation of the new plant, &c., taking place for the first few years. Should not then depreciation be allowed for here? I admit there would appear to be a reason for some allowance. The local rating authorities would allow for reasonable depreciation; but what would happen with the Income-Tax Authorities is not so certain. The reason for their attitude, whatever it is, must be looked for in the knowledge they possess of gas-works' accounts and management. They know what gas-works have done—gas-works which were once new—and perhaps they think they are entitled to receive a little more than their due when they have such an opportunity.

Rating authorities to-day have a pretty good insight into the manner in which various industries keep their accounts. They know that where one man would make a justifiable claim for depreciation, twelve would make unjustifiable claims.

Apart from the two examples given, it will be generally admitted that, in an ordinary way, if a gas-works has been in operation for a number of years the repairs in all departments vary very little

from year to year, and any serious variation can be covered by a suspense account, which all rating authorities, I understand, will accept, if satisfied that the circumstances warrant it.

Some of the letters which have recently been appearing regarding income-tax assessment, seem to convey the impression that the authorities are endeavouring to tax more than the actual income in the case of gas-works—that is to say, that they will not allow depreciation. I have seen nothing in the circulars or letters from the authorities referred to that conveys to me any such intention.

The positive proof of whether depreciation has been properly allowed for or not, can only be found by making a valuation of any works at the present time and comparing it with the face or balance-sheet value. Further, if it be found by such valuation that the capital per million cubic feet sold has been going up over a considerable period, and that in fact the balance-sheet value shows a far greater sum per million sold than a modern works could be put down for complete in every detail, then those responsible for that gas-works have probably been paying profits out of their capital account at some time or other. I am excluding, of course, the effect of watering capital.

As all the trouble of rating hangs around this question of depreciation, whether the tax be imperial or local, there is no necessity for me to divide my remarks further as to the imperial and local taxes.

LOCAL RATES.

That many gas-works are unduly rated, there is no question. That not a few are under assessed is also true.

The former are often afraid to tackle the complexities of rating; and the latter—well, are lucky in the Assessment Committee with which they have to deal, or in the tribunal before which they may have carried an appeal.

The source whence emanate the deprecatory remarks on rating is not difficult to discover. Rating is a subject that is not often written about, and one which is probably less understood than any other case of expenditure appearing in gas-works accounts. Thus we often hear that—

- 1.—The law is bad concerning it.
- 2.—The people who support Unions and others in applying the law are rogues and worse.
- 3.—The Bench before which a case is heard is generally ignorant.

Now, in my opinion, all these are fallacies. It is one thing to say the law is bad, but quite another to discuss its bad points and definitely suggest amendments that would improve it. I have studied the matter for some years from a standpoint—the side of the taxing and rating authorities—that we concerned with the industry should study it. I have come to the conclusion that gas undertakings have no reason to wish the law altered. We all know that the law is bad—all laws are that we like to avoid; but it certainly has this to recommend it, that, having been in operation for so long, those who set out to become familiar with its working may hope to do so to a reasonable extent. Let us rather seek to have the present law well administered. A bad law well administered is better than a good law badly administered. A new law would more than likely hit us in unexpected places.

There are two aspects from which our rating may be studied.

- A.—One aspect is that presented by a consideration of the rating of one gas-works compared with another.
- B.—The other aspect is that presented by a consideration of the rating of gas undertakings generally as compared with other industries and trades.

I do not propose to deal with rating generally—it would be a task too profound for the purposes before us to-day. It will be well, however, to refer to our chief competitors—the rating of electrical undertakings. If such undertakings be paying a rate of a less sum per co-efficient of 1000 cubic feet of gas than the 2d. or so that we gas companies are paying, it is unfair to us, as it would give our electrical friends an undue advantage.

In judging, however, any case that crops up as between the light and power industries and others, it must be borne in mind that most of the undertakings supplying light and power have special Acts of Parliament; special rights in connection with roads; and other special privileges that do not obtain with all industries.

I have said that many gas companies are over-rated. In this I know you will agree. I will now endeavour to show what is in my opinion the chief cause. In a word, accounts. I wish to discuss the matter on broad lines; but I will promise to get down to such detail as any one may care to provoke in discussion.

Rates still, I think, are calculated on the net income chiefly, although a good many issues have been raised on tenants capital only; the rent a hypothetical tenant would pay being considered to depend on the income that the tenant in possession can make. The income is affected, if not principally, very largely by the manner in which capital and revenue charges are allocated. Let me call your attention to a few facts in connection with capital. Take, for example, works having more or less the same output of gas which have been working for the same number of years, and which are owned and watched over by a Board of Directors in each case and each having the services of an Engineer and Manager. It is no startling news for me to point out that in one case the capital may be round about £300 per million cubic feet sold and in another £1500 per million sold. I have analyzed the capital accounts of over fifty gas companies.

I take fairly extreme cases. It is pretty certain that a works

with the less sum per million sold has been reducing its capital by very liberal charges—charges in my opinion unreasonable—to revenue, thereby showing a far less income for rating than in fairness to the rating authority and other ratepayers it ought to have done. Can such a company expect its balance-sheet figures to be accepted? I can imagine a good many of you saying, "Nonsense, absurd, it's everybody's duty to keep capital down, it would ruin the best of businesses to act in any other way," and so on. I agree that all this is perfectly right so long as the landmarks of reason are respected.

We here are doubtless satisfied that rates are necessary, and that gas companies have the privilege of paying them as well as other companies and persons. It will be also admitted that those people whose privilege it is to pay rates, wish to pay as little as possible. If all ratepayers evade payment in the same proportion, little if any injustice would be done. Where, however, a ratepayer or a collection of ratepayers makes, or causes to be made, false entries in their books, to deliberately show far less profits than are actually made, and thereby are assessed to pay less rates than they should pay, under what category in morals does such an action come?

I have referred to capital per million cubic feet of gas sold as varying from £300 to £1500.

I have no desire to split straws as between capital and revenue charges. I believe in the capital shown in the balance-sheet being amply represented by up-to-date plant in good order at the works, and mains, meters, &c., in good order in the district, thereby allowing distribution to be effectively done at proper pressures, and customers to have all the gas they desire. But I do not believe in capital value of plant, &c., being twice that represented in the balance-sheet.

Now let it be considered what the effect is when this extravagant charging to revenue referred to takes place, and what bearing it has on the question we are dealing with. Why is extravagant charging to revenue illegal, unjust, and immoral? Because:

- 1.—It withholds money from the present shareholder and stores it up for the future shareholder.
- 2.—It causes an undue charge to be made on fellow ratepayers.

If a gas company making 20 per cent., after fairly allocating its expenditure as between capital and revenue, prefers to pays its shareholders only 10 per cent. and put the other 10 per cent. into new plant, is the present shareholder receiving what he is entitled to? How many of us here would submit to such an arrangement were our own money concerned, unless we had some set-purpose in view?

The ordinary lay shareholder does not know that his shares are worth considerably more than they are fetching in the market. The Directors know, however, and sometimes are tempted to act accordingly, and buy up at low rates at the expense of the people who have given them their trust. Any action that puts the few shareholders in possession of knowledge that is withheld from other shareholders, must be wrong. The proprietors of the concern are the joint and not the several shareholders. Further, even if all the shareholders knew the true position, those who at any time wished to realize on their shares, would not be likely to obtain their value, because the interest their investment was actually earning would be hidden in the published accounts. If the matter be looked at from this point of view, there will be found very little that is rational in the too unwisely hoarding-up of value in the undertaking for those who come after to reap the benefit.

Some people who in ordinary business would scorn a man who robbed another in the ordinary straightforward general method of robbery, do not hesitate to rob their fellow ratepayers—incidentally their fellow shareholders—of huge sums in some such manner as I refer to. There are gas companies with hundreds of thousands of pounds which have never figured in the receipts. A private individual is justified in keeping his accounts as he likes; but public bodies are not. Cases could be cited where Directors have drawn on revenue to such an extent as to pay shareholders 2½ per cent. when the earnings have been 10 per cent.; and the effect of this has been that they and their friends have been enabled to buy up the shares at less than one-half their value—in fact, cases are known where 15 per cent. has been earned and yet a loss of 5 per cent. has been shown in the statement of accounts. Directors may be quite justified in arguing that if the capital is kept down in this way, should a bad time come and competition in artificial lighting become very keen, they would be able to hold their position. But it is submitted that the only legitimate manner of providing for such a contingency is by the formation of a special fund, which provision alone allows all shareholders to know—what they are entitled to know—the true position of their business. Such remarks as these may be considered as suggesting the attainment of too high a standard in company government; but such an argument will surely only serve to emphasize their justification. It is difficult to state with mathematical exactitude what constitutes dishonest representation; but there can be little doubt that such a stage is reached when a section of shareholders are (purposely or otherwise) deceived by accounts being manipulated to anything like the degree that has been here described. And if shareholders, then rating authorities.

It is a very simple matter to discriminate between capital and revenue; and the safeguard is to check from time to time the

face capital value as shown by the valuation of works, plant, and mains. There are many ways of doing this with quite reasonable exactness. The bearing that these matters have on rating will I trust be obvious. If accounts are properly kept, few gas companies will have any trouble in convincing the various Unions as to their rateable value. On the other hand, falsify—there is no better word—in some manner, and you must not grumble if the Unions put your rates up to figures that the face of your balance-sheet does not appear to warrant. Some Unions are not too partial to the face profit gas companies show. They like to go to the heart of things a little.

I need not deal with the effect of works management where the capital has to stand all the charges, in some cases to provide the profit.

So far, I have dealt with depreciation. Among other matters that affect rating one of the chief causes of discontent with gas companies to-day is the effect of the slot business and tenants capital generally. Many gas companies claim that, on account of the excessive tenants capital required for the slot business, &c., their assessment should become less and less in spite of increased profit in their business. It is well known that in rating an allowance is made for interest or profit on the tenants capital, which profit is not rated; and it is the amount of this allowance around which so much controversy rages.

There are gas companies who boast of charging all their slot capital to revenue, thereby reducing the net profit earned with all sorts of items of tenants capital charged out at the highest prices that their abnormal appetites for unfair gains allow them to think reasonable, and who expect on these sums to be allowed 17½ per cent., and so reduce their rateable value by such amounts. Is it very much to be wondered at that these practices are not always successful?

Gas companies wishing to have a reserve fund can probably have one as big as they care for by paying the taxes on it.

Discussion.

The PRESIDENT (Mr. W. Langford) confessed to a feeling of disappointment at the manner in which the subject had been treated, because, in the main, of its one-sided character. Mr. Helps wanted to show them, as representatives of the gas industry, that they had nothing to complain about; whereas they had long felt that there were inequalities, not to say evils, which required redressing. This, in his opinion, was the *crux* of the whole matter. He took it that the question of depreciation was a burning one with gas-supplying authorities, especially in the light of recent legislation and the circular issued by the Inland Revenue to Surveyors of Taxes. Those present were, no doubt, aware that this circular specified that no depreciation should, under any circumstances, be allowed with respect to the plant and machinery of gas undertakings; whereas instructions were issued simultaneously to these officials with regard to electric light stations, that, "in addition, a reduction allowance for depreciation may be granted at the rate of 3 per cent. on the written-down value; and on their plant exclusive of loose tools, meters, and office furniture, at the rate of 5 per cent. per annum on the written-down value, in addition to the cost of repairs." As members of a Gas Engineers' Association, it was for them to consider how to secure a redress of the inequalities which existed; and the question arose as to the best way to obtain what they desired, in the interests of the industry in which they were engaged. They had a parent institution—the Institution of Gas Engineers—and they looked to it in times of trial and difficulty; and he thought rightly so. The only question for them, as an Association affiliated to the Institution, was one of ways and means. He was afraid the Institution had not the necessary funds; and he thought the members ought to see if they could not get their Chairmen and Committees to be a little more liberal towards some central agency that could deal with these matters. He had spoken on the subject to his Chairman, who had indicated that, if it could be shown how these inequalities could be dealt with by such an organization as the Institution, they would be willing to contribute. In the discussion which was to follow, he hoped they might arrive at some solution of the question of how joint action could be taken to remedy the grievances they had to complain about.

Mr. H. J. WOODFINE (Wellington) remarked that he did not quite understand what was meant in regard to renewals from what the President had quoted from the instructions issued by the Board of Inland Revenue.

The PRESIDENT said that by the instructions expenditure on repairs and renewals, including extensions and improvements, was, in regard to gas and water undertakings, to be charged and allowed as working expenses, "as and when incurred."

Mr. R. O. PATERSON (Cheltenham), like the President, had also to express disappointment at the paper, because he thought the writer had not gone to the root of the matter in the way he might have done. There was a great deal with which he entirely disagreed, and one feature to which he took serious exception. He did not think the members of an Association like theirs—officials of gas undertakings—should criticize, as the writer had done, the actions of their masters, their superiors, their employers. The paragraphs in the paper to which he objected were those beginning: "Why is extravagant charging to revenue illegal, unjust, and immoral," down to the end, because he did not think these should go forth to the public as emanating from the Association. Such expressions would do them no good. He did not question the right of the author to his opinion; but he thought it would

have been better had the paragraphs referred to been expunged by the Committee before presentation to the meeting. There was no doubt gas companies and those in charge of municipal gas undertakings had grievances on this question of the allowance for depreciation granted them, as compared with those for electric light undertakings; and he thought there was room for a great deal of argument on this point, and the need for redress. On the question of local rating, he was of opinion that Mr. Helps hardly cleared away the difficulties for them, and had left them very much where they were. At the same time, he did not think there was any great difficulty, as the Gas-Works Clauses Act gave plenty of scope in the making up of their accounts—sufficient to cover the expenditure, including renewals.

Mr. J. FERGUSON BELL (Derby) also expressed disappointment at the manner in which the whole subject of the paper had been treated. He thought that Mr. Helps had gone out of his way to attack gas companies and their directors. His experience was that the companies made out their accounts fairly; distinguishing between capital and revenue. He believed they were anxious to do that which was fair, just, and right. There were, of course, anomalies—some companies paying between 3½d. and 4d., and others as low as 1½d. and 1d. This showed that there was something bad in the way the law was administered; and no doubt there were a great number of gas companies who were not fairly treated by the Assessment Committees. If an appeal were made to Quarter Sessions, they were not much better off, because it was really a local Bench of Magistrates. There was no doubt in his mind as to the necessity for an alteration in the law in regard to the assessment of gas companies. He did not agree with the suggestion that gas companies were anxious to get out of their statutory obligations; on the contrary, he believed they were quite willing and anxious to do what was reasonable in regard to the rates.

Mr. WOODFINE said that if electric light undertakings were to have the advantages mentioned by the President, gas undertakings were certainly going to be worse off; but he did not think this could be the case. As to the points raised in the paper, his experience with the income-tax authorities was that gas companies were not allowed to charge to revenue anything in connection with new works and extensions without being taxed. Every year he received an inquiry as to whether he had improved the works; and this implied that if he had done so he was going to be taxed to the amount spent in improving them.

Mr. VINCENT HUGHES (Smethwick), as one responsible for Mr. Helps being asked to contribute his paper, felt, after what had been said, that he ought to apologize. In Mr. Helps they thought they had a champion who would take up their case. They looked upon him as a sort of Balaam, and sent for him to come and "curse these people" as they were "too mighty." But behold, Mr. Helps had blessed them. (Laughter.) And now there was grumbling because they found this Balaam had not quite fulfilled their expectations. (Renewed laughter.) It seemed that if they took him to the top of another hill, he would curse them from there. He (Mr. Hughes) had been thinking that probably on the journey an angel had spoken to their friend. If so, it did not seem to have impressed him much. (Laughter.) Proceeding, after the merriment had subsided, Mr. Hughes said he was quite sure that in what Mr. Helps had said he had no intention of being offensive to the directors of gas companies, or to anyone else. To have adopted the course suggested, and expunged from the paper the references alluded to, would have been most unusual; and he ventured to say that it had never been done before. As to what had been said about rating, he believed gas undertakings did have a grievance, especially in local rating. They were supposed by a good many people to have a monopoly; and this was probably the cause of their grievances. He did not agree with the idea of their having a monopoly. They had very strong competitors in many directions; and he was not so sure that in local rating their electrical friends were very much worse off than they were. He thought the system of rating as fixed was altogether wrong. Why should large undertakings, with a capital ten times as great as theirs, employing ten times the number of men, and making a greater amount of profit, be assessed at an infinitely lower figure than they were themselves? It was all because they were believed to have a monopoly. This was the cause of it. But they had no monopoly. If it had been a question of taxing light, the case was different. They would have to deal then with petroleum, candles, and other kinds of lighting. He wished Mr. Helps had pointed out the way to salvation for them; and if, in reply, he could give them some satisfactory answer, they would all be much obliged to him.

Mr. E. ALLEN (Liverpool) said it was a matter of regret that the writer of the paper had failed to satisfy those who had spoken. Mr. Helps had had an opportunity; but he had championed the rating authorities more than he had done the gas undertakings. No doubt many of them deserved the criticism Mr. Helps had indulged; but it seemed rather hard that the whole gas industry should be pilloried because of the misconduct of a few directors of gas undertakings. What he hoped to have heard was more with respect to the question of valuation. No doubt the law as to assessment was not what it should be. That it should be left to Poor Law Guardians was, in his opinion, an improper thing. As a rule, the Assessment Committees procured a surveyor whose object was to bring in as much money as possible; and the surveyor generally went as far as he could without provoking an appeal. In some gas undertakings the burden was growing, and there was a

feeling that something ought to be done. With reference to the President's remarks about the parent Institution dealing with this matter, he desired to point out that the Gas Companies' Protection Association already had it in hand. At the last meeting of the Committee, Mr. Joseph Cash, of Brighton, was before them giving evidence on this particular subject. It was felt that the recent circular issued by the income-tax authorities was not fair to gas undertakings. As to how far there should be joint action, and what form it should take, he was not prepared to say; but it was evident that something should be done with respect to the matter. To him, it seemed wrong that they should in any way assist those who looked upon gas undertakings as being their lawful prey.

Mr. HELPS, before proceeding to reply, said he desired to emphatically deny having any intention to give offence to directors of gas companies or anyone else. With all respect, he thought the gentlemen who had spoken on this subject had not quite grasped what he had written. Perhaps it was because he had not expressed himself so clearly on the point as he might have done. At any rate, he had endeavoured to do so to the best of his ability. Some speakers had said they were disappointed with the paper. On his part, he was disappointed with the discussion. Not a single point in the paper had been touched upon that he thought would have raised a discussion—in fact, the main one had not been referred to at all. One speaker said he did not tell them anything new, and had not referred to the instructions issued by the Inland Revenue Authorities. He (Mr. Helps) had stated that everything connected with a gas-works depreciated, and that this depreciation had to be made good or allowed for before the net profits could be arrived at. This was what he set out to convey to them; and not one of the speakers dealt with this subject as he expected they would do. He had said that charges for repairs and maintenance included, and must include, depreciation; and he had stated that he could not understand any maintenance account that did not include renewals. The figures he had laid before the members proved his case absolutely—that an undertaking having a less sum per million cubic feet of gas sold, had been reducing the capital by making liberal charges to revenue and so showing a far less income for rating than should be shown. The members should consider the matter from the other side; and this was what he had done in dealing with the question. He had been very careful in getting out the figures and in analyzing the capital accounts of more than fifty gas companies; and when he repeated that in one case the capital was somewhere about £300 per million cubic feet of gas sold, and in another £1500 per million feet, those present must surely recognize that his assertion was correct. It was very simple, and in his opinion unanswerable. He asked them to consider this question on broad lines. They could not set out to depreciate a chair, a desk, &c.—they must take the whole thing; and the rating authorities, as a rule, would allow reasonable depreciation. Mr. Bell said gas companies had no desire to get out of paying what they should pay. He (Mr. Helps) did not agree with him. There were gas companies who did not want to pay any more than they could help; and it was for the rating authorities to see that they did pay what they ought to do. In conclusion, he again expressed his wish to remove the impression that there was any desire on his part to reflect on the directors of gas companies.

SOME ASPECTS OF RECENT COMPETITION.

By W. J. RENDELL BAKER, of Malvern.

[A Paper read before the Midland Association, Oct. 21.]

It has been my pleasure to be connected with the Malvern Gas and Electricity Undertaking, as Engineer and General Manager, for the past five years. I have from time to time been asked for information by our members on the points contained in the following notes; and the few remarks enumerated below will, I hope, prove of interest to the Association and its members in dealing with the subject of the competition of carburetted air, electricity, and coal gas.

CARBURETTED AIR.

There are various forms of apparatus of this class of lighting on the market; the one that I have met more particularly being the "Litz." The "Litz," or the old Economic Company, I am given to understand, were one of the early makers of this class of lighting plant. The apparatus is manufactured in Malvern; and no doubt you are all aware of the type of machine that has been shown in various towns, at exhibitions, &c. The carburettor consists, briefly, of a small hot-air engine heated by its own gas, and a small rotary blower, which introduces a current of air into a chamber fitted with a number of tubes lying in petrol, the depth of which is controlled by a special valve. The petrol is supplied through a reservoir fitted on the same base-plate. The gas is sent through a small container or holder; the bell acting as a governor and controlling the air to the gas-valves, and in this way governing the speed of the engine according to the requirements of the supply.

From particulars I have been able to obtain through the courtesy of Mr. C. C. Broad, the proprietor of the Litz Gas Company, I am informed that, with their special burners, samples of which I have here, they obtain from spirit having a specific gravity of '690', 1250 cubic feet of carburetted air. The consumption of

the burners is as follows: Upright burner (mantle 2½ in. by ½ in.), 7 cubic feet per hour; with the ordinary size inverted burner, 12½ cubic feet; and with the small or bijou type, 7 cubic feet. With this apparatus a special adaptation of the ordinary burner has to be carried out.

The later machine is of a weight-driven type, and enables users to take advantage of the ordinary incandescent burners; the burner being supplied by the petrol vapour from the machine and taking its supply of air in a similar manner to coal-gas incandescent burners. The make of gas with the latter form of apparatus is much lower than with the earlier type of machine; being equal to only 500 cubic feet from one gallon of spirit. The consumption, however, is much lower with incandescent burners. From tests that I have made with the later form of apparatus, the consumption is as follows:

Ordinary Bray upright burner	6 feet
Bray inverted	6 "
Bray inverted bijou	2 "
Graetzin burner	6'5 "

From the foregoing, the consumption is approximately 100 per cent. more than coal gas; and I venture to think that coal gas stands quite safe from any competition as regards costs of such a system. The cost of the carburetted gas, with petrol at 1s. 2d. per gallon, can be taken as 2s. 4d. per 1000 cubic feet; and since the amount of gas required is approximately double the consumption of coal gas with the inverted burner, it resolves itself into the question that coal gas must exceed 4s. per 1000 cubic feet to be in any way affected from this class of competition, and also the fact that with all self-contained plants of this description a consumer has not got the reliable source of supply as is obtained from a coal-gas works.

The heating value of carburetted air is given as equal to 280 B.Th.U. I have not had the opportunity of testing the calorific value; but from Mr. Fowler's paper, his report was 90'85 B.Th.U. Even with 280 B.Th.U., however, the question of competition with coal gas is out of the question.

The cost of this apparatus for 30 lights is £40. I think that if consumers would allow the gas engineer the same amount of money to instal high-pressure gas, then the efficiency of coal gas per cubic foot is so increased that the comparisons with coal gas and petrol are still wider than the comparison above. Therefore, a gas engineer would have no difficulty in clearly convincing his consumers as to the saving that can be made by modernizing his coal-gas installation, more especially when the fact is borne in mind that the best results with petrol are obtained with 6-inch pressure. I need hardly state what we can accomplish with coal gas at a similar pressure.

I might mention that the data supplied and quoted upon by petrol makers is in the form of 1000-candle power per hour. This is very misleading; the layman flying to the idea at once of cost per 1000 cubic feet. I would therefore strongly suggest that, where any of our members have to face this competition, they should submit their comparative costs in 1000 candle-power-hours. With such modern forms of burners as the Graetzin and others, and more especially considering the high-pressure results obtainable, the comparative costs then show exceedingly well in favour of coal gas. Some makers even leave out entirely comparisons with coal gas, and confine themselves to acetylene and other forms of lighting for country residences where a coal gas supply is not available.

There are two Litz plants working in Malvern; and the fact that during the night the plants are closed-down (candles having to be substituted as the only means of lighting after that time) speaks volumes for coal gas.

I have endeavoured to bring before your notice a few facts that I have submitted to some of our members who have met with this competition, and venture to think, as coal gas engineers, we have nothing to fear from carburetted air competition where coal gas is anything below 4s. 6d. per 1000 cubic feet.

In a whole-page advertisement that appeared in the "Daily Mail" some time ago, dealing with Malvern, the Litz light had a small proportion of the space wherein it was stated that this system was used for street lighting in the town. This is distinctly an error; coal gas being the only means of street lighting in Malvern. Petrol gas, as far as I am aware—and I am responsible for lighting the streets—has never been used.

ELECTRICITY.

Electricity has received consideration from the presidential chair of this Association on one or two occasions during recent years. I therefore give below a few facts from the competitive point of view with coal gas and electricity with metallized lamps. It is now possible to obtain a 16-candle power lamp for 100 to 130 volts; the earlier type being of 32-candle power. I have tested a few lamps of various makers as below:—

Make.	Rates, Candle Power.	Watts per Hour.	Cost per Hour at 5d. per B.T.U.
A.	50	87'6	0'43
A.	32	52'02	0'26
B.	30	44'6	0'22
C.	50	41'3	0'20
C.	32	28'3	0'14
C.	16	20'4	0'10
D.	32	40'8	0'20
D.	16	21'42	0'10
Carbon.	32	67'2	0'33

I have taken 5d. per B.T.U.; this being our average price in Malvern.

From the above, it will be noted that between the last lamp (which was an improved carbon type—Pope's "Ritelite") and the sixth on the list (which is an Osram), there is a difference in cost of consumption of 42·8 per cent. It can therefore be held that the introduction of this type of lamp is a very great factor to the electrical industry in competition.

The cost of the 16-candle power metallic filament lamp at present is 2s. 6d.; but there is no doubt that the price will be reduced to the present cost of the carbon lamp before very long. The life of these lamps is given on an average of 1000 hours burning. The writer has made several life-tests on this type of lamp, and can state that the results have been very favourable in comparison with the guarantee. In comparing with this lamp the rated candle power of (say) a 4 cubic feet Graetzin type gas-burner, even on ordinary pressures, the difference in cost is very marked, and certainly leaves a very wide margin in favour of coal gas. The fact of being able to turn out a lamp when not in use has been greatly met by the introduction of the pneumatic and other forms of light extinguishers.

Electricity has made a certain amount of progress in Malvern; but, up to the present, the sale of gas has not shown any signs of decrease.

SUCTION GAS.

It was suggested to me to extend the matter to include suction gas. I am afraid, however, that the small competition that I have met with in Malvern would hardly be of benefit to you; and I feel that there are other members who have had to meet this on a larger scale, and whose facts no doubt would be of greater value. My Committee at the present time have under consideration reduced terms for power.

In conclusion, I may say I have tried to give you a few facts from my own experience in Malvern during the last five years; the data, &c., being taken from actual tests, &c., and therefore perfectly free and unbiassed. I am indebted to Mr. Henry Fowler, M.Inst.M.E., for permission to quote from his paper read before the Institution of Mechanical Engineers in London on Dec. 14, 1906, and Jan. 18, 1907, on "Lighting Railway Premises, Indoor and Outdoor," and his remarks upon the calorific value of carburetted air.

Discussion.

Mr. T. BERRIDGE (Leamington) said Mr. Baker was to be congratulated on bringing forward the matter. They had suffered from this form of competition in Leamington. He was astonished one afternoon to be told that it was intended to introduce the Litz system of lighting at Leamington; and he wrote Mr. Baker on the subject. He was pleased to say that, with the information he got together, he was able to satisfy the Committee that they would be making a mistake by taking up the Litz system, with the result that the order was cancelled; a certain sum being paid as compensation. There was no doubt gas people had a good deal of competition to meet; but he would not mind that so much, were it not that their competitors told such lies—an illustration of which he gave with reference to an electrical lamp that he named. At the end of a twelve months' test with six inverted gas-lamps and a separate meter, the cost worked out at 6s. 4d., compared with £1 13s. 4d. for the electric lamp.

Mr. J. W. HELPS (Croydon), on the call of the President, next addressed the meeting, and asked permission to say something first about the parent Institution, of which he had the honour to be President. The parent Institution, he said, had a great deal to look forward to; but its stability and its usefulness depended in a great measure upon the support obtained from the affiliated Associations. He might mention that one great thing they were anxious to do was to organize the industry in such a way as to have a representative body which could take up such questions as they had been discussing that day, and not have them left to be dealt with by outside organizations on their behalf. He confessed that he was not at all satisfied with the present organization of the industry; and he hoped during his term of office to be able to make a suggestion which, if taken up, would increase the usefulness of the Institution. They wanted some better means of combating the competition which came before them. As Mr. Berridge had pointed out, their opponents were not fair in their comparisons; but, if given the opportunity, it could easily be proved that gas lighting was much cheaper than electricity. At the same time, it must be recognized that the electric light had certain advantages which they could not claim for gas; and in this connection he could not help recalling the dream of the President of the North of England Association (Mr. T. H. Duxbury), that there should be gas in every house and the consumer able to light his gas by simply turning a tap and without the use of a match. Scientific attention was being directed to this and kindred matters; and it probably would not be long before they got over the difficulty. They must admit that the user of electricity, being able to turn out the light every time he left the room, did not take as much of the current as he would do if it was like gas. If the gas consumer could turn on and off his gas as the electric light consumer did his current, a great saving would be effected. His (Mr. Helps's) point was that, with improvements, light for light, gas was a long way in advance. As to suction gas, dealt with by Mr. Baker, this was a very important matter to them. In his address before the British Associa-

tion, Mr. Dugald Clerk referred to suction gas as applied to gas-engines; and when taken to task on the subject, he wrote him (Mr. Helps) asking if he would be prepared to deliver an address on it at the next meeting of the British Association, comparing coal gas with suction gas for gas-engines. He was afraid that he was too busy himself to take up the suggestion; and if he could, he was not sure of getting together the necessary information. Considerable time would be required to bring the proper figures together. They, as an Institution, ought to have some means, and a central body, to carry out these experiments. But he was afraid it would be a long time before they could do this. Still, it was desirable that they should consider the matter, so that they could combat the competition they had, and be able to bring out the truth. With regard to the convenience of the electric light, there were many people who had it installed because they were able to use what he might call "nick-nacks," which they could not have with gas. In mentioning this, he suggested that those present, if they found it convenient, should pay a visit to Mr. Freeman's exhibit at Olympia, and note the beautiful effects which could be obtained from gas.*

Mr. HAROLD E. COPP (West Bromwich) said it was quite time the gas industry had some organization of the kind mentioned by the President of the Institution of Gas Engineers. A friend of his showed him an extract from an electrical paper of the previous week. There was hardly a statement contained in the whole article which was correct as applied to the gas industry, and he was asked to write a reply; but he had not time. He thought there should be some central organization that could take these matters up. Somehow or other their opponents seemed to get hold of what he described as the "secular press." They could hardly take up any of these papers without finding something about other illuminants and improvements; but they very seldom came across anything about the recent improvements made in gas lighting. Several engineers had told him they had contributed certain information to these secular papers, but had been unable to get their communications published. He quite agreed that before they could have an organization to deal with these matters, they must have more liberal contributions from those concerned. Turning to deal with the paper read by Mr. Baker, he said that recently he had come into competition with a form of incandescent lighting by means of oil, and somewhat to his disadvantage; and this was an aspect of the question they would have to face. Mr. Copp mentioned that in these tests he had used the Graetzin lamp, and had been beaten on the question of cost and illumination. As to suction gas, he had been able to demonstrate that the balance was in favour of town gas; and it was satisfactory to know that a number of people who had employed suction gas had resumed the use of town gas.

Mr. S. G. PERRETT (Market Drayton) said that in his town they had had to compete with electricity for the past seven years. When the installation was put down, he was told that gas would be snuffed out before long. Well, the gas-works were still going; and, in spite of the competition, they were 75 per cent. ahead of their sales than when the Electric Light Company came to the town. What was more, he had the satisfaction of knowing that the Electric Light Company had paid no dividend yet.

Mr. THOMAS GLOVER (Norwich) remarked that one serious feature of the competition they had to face was that people having once taken up the electric light were not likely to go back to gas. He thought that much could be done through showing people, by means of exhibitions, the beautiful effects that might be obtained from gas.

On the motion of Alderman W. R. COOPER (Banbury), seconded by Mr. BERRIDGE, a hearty vote of thanks was accorded to the readers of the papers.

Mr. HELPS and Mr. BAKER briefly acknowledged the compliment paid them.

* This exhibit is referred to in another part of to-day's issue.—ED. J.G.L.

EFFECT OF SEA WATER ON CONCRETE.

In order to test the effect of sea water on concrete within the range between high and low tide levels, Professor M. Möller, of Brunswick, built on the North Sea a small structure, partly composed of reinforced concrete moulded in place and partly of slabs moulded elsewhere and placed in the structure forty days after they were made. The structure was a small mound of trapezium shape, with the sloping sides made with plates 7 c. (2·8 inches) thick, and the top and floor with a 5 c. (2-inch) slab moulded in place. The interior was filled with mud and a clayey and easily moved sand. The construction and the effects of the sea water were described by Professor Möller in a paper presented to the Copenhagen Congress of the International Association for Testing Materials, from which the following particulars (reproduced from "Engineering Record") are taken.

The side plates were made with 1 to 2½ to 2 concrete, with crushed gravel as the coarse aggregate, and the bottom and top slabs with 1 to 3 to 3 gravel concrete. The top was covered to a depth of 3·28 feet by the rising tide the day after it was laid. The concrete produced *in situ* hardened only for a time, and afterwards became soft when damp and friable when dry; and whitish efflorescences were formed on its surface. The action of the

waves accordingly made holes in the covering-plates of the little structure in less than four years after its erection. At first, the holes were patched up again; but this process was afterwards given up. In order, however, to reduce the washing-out of the fine-grained muddy sand filling, a layer of coarse sand was put on the top of the cover.

While the freshly-made concrete did not prove satisfactory in the structure, and the upper iron reinforcement, which on its destruction was laid bare, very soon rusted through and disappeared, the plates themselves, the concrete forming which was forty days old before coming in contact with the sea water, and had therefore already become hardened, behaved exceedingly well; and the iron reinforcement of the latter behaved equally well, so far as its condition could be ascertained. The surface of the concrete plates had only become somewhat rough. The little structure was surveyed last month, and then taken down after being subjected to the action of sea water and air alternately for thirteen years.

Professor Möller reported three other cases in which concrete or cement mortar that was brought in contact with sea water too soon after mixing became soft and showed a whitish efflorescence. One of these was the foundation for a lighthouse which had been lowered in the form of a well, another a slab for bank protection, and the last slabs made on ground that was soaked with sea water during a previous flood.

ADVANCES IN INVERTED GAS LIGHTING.

A paper which was read by Herr M. Scholz, of the firm of Ehrich and Graetz, of Berlin, at this year's meeting of the Association of Gas and Water Engineers of Austria-Hungary, at Gratz, has been published in the "Zeitschrift" of the Association. A few particulars of general interest may be quoted from the paper.

The author first called attention to the recent production of a small size Graetzin lamp suitable for replacing electric glow-lamps in places where a powerful light is not required. This lamp has a consumption of 1.06 cubic feet per hour, and gives a light of 30 hefners (or 27 English candles). This burner should efficiently take the place of metallic filament electric lamps of 35 watts consumption which give a light of 29 candles. A tabular statement shows that, at the relative prices of gas and electricity in eleven important cities on the Continent, the cost of gas for this burner will vary from one-sixth to one-fourth the cost of current for the electric metallic filament lamp of approximately the same candle power. In connection with these and the larger sizes of Graetzin lamps, a pressure-regulating nozzle has been introduced, which comes into action at a pressure of 1.4-10ths and allows the outlet pressure to rise by only about one-tenth, even though the inlet pressure reaches 40-10ths. The object of this governing device is, of course, to prevent the formation of soot, when an increased quantity of gas is consumed by the burner through the pressure in the service-pipe rising above the normal. Even when soot is not formed, the duty of the burner falls off if

the rate of consumption exceeds that for which the burner was designed. For the lighting of school-rooms and drawing-offices where indirect lighting is often preferred, the inverted burner is now provided with a hemispherical glass, of which the lower part is matt or frosted. The upper part is clear, and the light issuing therefrom is reflected downwards by a reflecting screen placed round the lamp above the level of the burners. Thus light passes directly through the diffusing surface of the lower half of the hemispherical glass, and is then indirectly reflected downwards by the reflecting screen. The effect is practically that of wholly indirect lighting.

Great advances have been made in high-pressure inverted lighting; and the three-burner Graetzin street-lamp of 3600-candle power gives directly below the lamp an illumination of 190 Lux. Curves of the light distribution from these lamps and from flame arc lamps show that the illumination on the surface of a thoroughfare is far more uniform by gas-lamps than by arc-lamps. Curves and figures obtained by Professor Drehschmidt which have been already given in the "JOURNAL" [Vol. CIII., p. 583] are reproduced by the author. Great importance is attached to the application to these high-pressure street gas-lamps of an efficient automatic pressure igniting device, and an improved form of such a device has recently been fitted to a large number of the high-pressure gas-lamps in Berlin. The durability of the mantles is now considerably greater than in the early years of high-pressure lighting. The average life of the mantles for the two-flame lamps of about 1800-candle power, and for the three-flame lamps of about 3600-candle power is about 200 burning hours. The less powerful high-pressure gas-lamps which have considerably smaller mantles show a much longer life for the latter. It has been shown that the cost of compression according to the experiences gained in Berlin amounts to 2.4d. per 1000 cubic feet, including interest and amortization for the engines and the apparatus, the running charges of the engines, gas consumption of the motors, wages, lubricants, and repairs.

In regard to the relative economy of gas and electric lighting, the author has compiled a tabular statement for eleven towns on the Continent, taking the actual prices of gas and electricity in each of them. He compares five types of inverted gas-burners with five types of electric lamps of approximately the same illuminating power. For instance, the gas-burner of 1.06 cubic feet per hour consumption, affording a light of 27 English candles, is paired with a metallic filament electric lamp consuming 35 watts per hour, and giving a light of 29 candles. A gas-burner of 1.77 cubic feet per hour consumption, giving a light of 45 candles, is paired with a metallic filament glow-lamp of 55 watts per hour consumption, likewise giving a light of 45 candles. The third pair comprises a gas-burner of 3.17 cubic feet consumption, giving a light of 99 candles, and a metallic filament lamp of 110 watts consumption, giving a light of 99 candles. The fourth pair is a lamp with two low-pressure Graetzin burners, consuming 7.4 cubic feet per hour and yielding about 234 candles, and an arc lamp, consuming 160 watts per hour and yielding about 189 candles. The final pair comprises a lamp with three high-pressure gas-burners, consuming 70.6 cubic feet per hour and giving an illuminating power of 3600 candles, and a flame arc lamp with Alba carbons, consuming 825 watts per hour and giving a light of about 2790 candles.

Comparative Working Costs per Hour of Gas and Electric Lighting in Various Towns.

Town.	Price of Gas per 1000 Cubic Feet.	Price of Electricity per Unit.	Lamps with Two Low-Pressure Graetzin Burners, Consuming 7.4 Cubic Feet per Hour and Yielding 234 Candles.	Arc Lamps Consuming 160 Watts per Hour and Yielding 189 Candles.	Lamps with Three High-Pressure Graetzin Burners, Consuming 70.6 Cubic Feet per Hour and Yielding 3600 Candles.	Flame Arc Lamps with Alba-Carbons Consuming 825 Watts per Hour and Yielding 2790 Candles.	Greater Cost of Electric as Compared with Gas Lighting.
	s. d.	Pence.	Pence.	Pence.	Pence.	Pence.	Per Cent.
Berlin	3 6	4.8	0.31	0.77	2.96	3.96	61.5
Vienna	4 0	5.3	0.36	0.85	3.40	4.37	55.4
Bremen	3 10	8.4	0.34	1.34	3.24	6.93	158.4
Cassel	4 6½	8.4	0.4	1.34	3.84	6.93	118.3
Cologne and Dresden	4 6½	6.0	0.4	0.96	3.84	4.95	55.9
Frankfort-on-Maine	4 5½	6.0	0.4	0.96	3.77	4.95	58.6
Königsberg	4 6½	6.6	0.4	1.06	3.84	5.45	71.6
Leipzig and Magdeburg	5 1	7.2	0.45	1.15	4.14	5.94	66.1
Stettin	4 6½	7.2	0.4	1.15	3.84	5.94	87.1

The author sums up the cost of gas per hour for the five types of gas-lamps in each town, and also the cost of current for the electric lamps, and states by how much per cent. the cost of the electric-lamps exceeds that of the gas-lamps. These figures are given in the last column of the above table, which shows also the prices of gas and electricity prevailing at the present time in the Continental towns selected by the author and the figures for the last two pairs of gas and electric lamps, which are those applic-

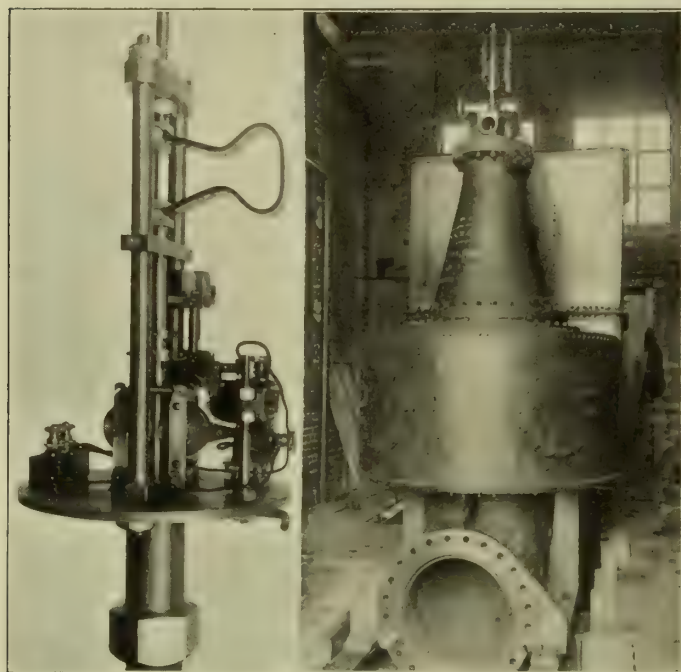
able more particularly to street lighting, whereas the three earlier pairs are all lamps suitable for indoor lighting. It appears that, on the average, the cost of electric lighting in the eleven towns referred to is 80 per cent. higher than that of Graetzin inverted gas lighting, notwithstanding that the candle power of the flame arc lamps is considerably lower than that of the three-burner high-pressure gas-lamps with which they are paired for purposes of comparison.

Researches on Heat Transmission.—At the meeting of the Institution of Mechanical Engineers on the 15th inst., a paper was read by Professor W. E. Dalby, setting forth the results of researches he had undertaken on the subject of "Heat Transmission." The author explained, at the outset of the paper, that his object was to place before the members a general view of the work done relating to the transmission of heat across boiler heating surfaces. In order to do this, it had been necessary to search for papers bearing upon the subject which had been contributed to

the Technical Press and to the various Societies in Europe and America. Upwards of 500 papers had been read, and lists of those relevant to the subject were given in an appendix. Abstracts of the more important papers had been made in a way which would enable anyone specially interested in a particular problem of heat transmission to ascertain whether the original paper contained information likely to be useful in connection therewith. These abstracts (in MS.) were in the library of the Institution, where they could be readily referred to.

HUMPHREY'S INTERNAL-COMBUSTION PUMP.

In the last number of the "JOURNAL," brief reference was made to the new internal-combustion pump designed by Mr. H. A. Humphrey, in which gas explosions are utilized for raising water. The pump was incidentally referred to by Mr. Humphrey in the discussion on a paper by Messrs. Hawksley and Davey, on "The Cost of Pumping by Various Methods," submitted at the Engineering Conference in 1907, and noticed in our columns at the time.* It was also alluded to, as mentioned last week, in the discussion on the paper, on "The Use of Large Gas-Engines for Generating Electric Power," brought before the Institution of Electrical Engineers early in the year by Messrs. Leonard Andrews and Reginald Porter. The pump, which is the outcome of experiments carried on over a period of two years, is of interest to all engineers; and therefore we give some particulars as to its construction and working—the latter being taken from a report on an official test recently carried out by Professor W. Cawthorne Unwin, F.R.S., at Dudley Port.



Ignition Gear. General View of Pump.

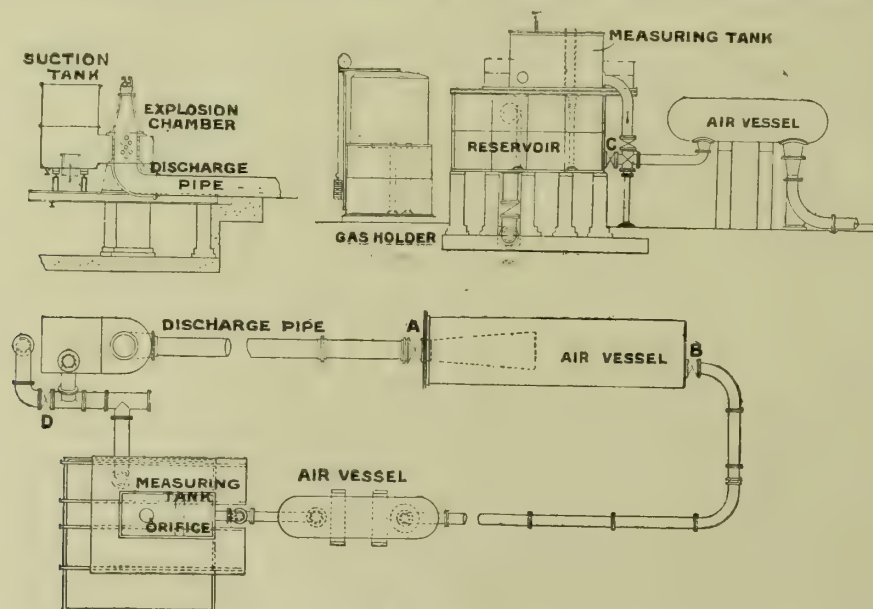
[The ignition apparatus is a combined instrument for firing the charge at the maximum compression pressure incidental to each particular charge or for firing at a fixed pressure.]

The first diagram of the accompanying illustrations shows the arrangement of the pump, which, as will be seen, is exceedingly simple. The cone-shaped explosion chamber has below it the

water valve-box, which is connected by a bend to the discharge-pipe, whereby the water is conveyed to an elevated tank. In the top of the explosion chamber (on the left and right) are fitted the admission and exhaust valves; and, with the exception of simple interlocking gear between these valves, and a small ignition apparatus, there are no other parts to the pump. The supply-tank, to the left of the explosion chamber, has an extension embracing the valve-box, and so feeds water through non-return valves which open inwards. By means of these simple elements, a cycle is maintained giving four unequal strokes, such as theory requires for a perfect thermo-dynamic cycle, with expansion carried to atmospheric pressure. A description of the various steps in the cycle will show how this end is achieved.

Starting from the point at which the compressed combustible charge is ignited at the top of the explosion chamber, the explosion sets in motion the column of water contained between the chamber and the elevated tank, and drives it towards the latter. As the burnt products expand, the velocity of the column of water increases until the pressure of the gases becomes equal to the static head of the raised water. But at this point the column is moving at (say) 10 feet per second, and its momentum is considerable; the discharge-pipe being some 50 feet long. Consequently the flow towards the tank continues, with the result that atmospheric pressure is reached in the explosion chamber, the exhaust-valve falls open by its own weight, and the water-valves open, due to the head of water in the supply-tank. Water immediately flows through the valves, some following the moving column in the discharge-pipe and some rising in the explosion chamber to displace the burnt products which pass away through the exhaust valve. The water which rises in the chamber tends to reach the level of the water in the supply-tank, so that by the time the column in the discharge-pipe comes to rest, and tends to return under the head of the elevated tank, the explosion chamber is already nearly full of water. The return flow in the discharge-pipe drives out more products, and closes the water-valve; and when the level in the explosion chamber reaches the exhaust-valve, the water shuts it by impact—closing all egress, and imprisoning the remaining products in the space shown above the chamber.

Up to this point there was no resistance to the backward flow; and so the column has gained velocity. But further movement involves the compression of the remaining products, which constitute an elastic cushion, and serve to bring the column to rest again. As both the static head and the kinetic energy of the moving column have played a part in compressing the elastic cushion, it follows that the pressure reached exceeds the static head, and therefore the elastic cushion will expand and produce a second outward flow. The shutting of the exhaust-valve locked it, and unlocked the inlet-valve; and as the water level falls in the explosion chamber, atmospheric pressure is again reached at the level of the exhaust-valve. Beyond this, the movement of the water would produce a vacuum; but the suction opens the inlet-valve, and draws in a new combustible charge. It is obvious that, but for frictional loss, the water level in the explosion chamber would, before coming to rest, fall back to the level from which the last upward movement started. But the actual quantity of charge drawn in is a little less than this amount of movement would indicate. The final stage of the cycle, which has now been reached, consists in a second return flow to compress the new charge. The degree of compression will greatly exceed that due to the static head, as the kinetic energy of the moving column is



The Humphrey's Internal Combustion Pump and Connections.

utilized in the work of compression. Everything is now ready for a fresh explosion.

We have next to deal with Professor Unwin's report on the pump as fitted up at Dudley Port, where it is worked by Mond

producer gas. He states that it works absolutely automatically, without attention, when once adjusted, and starts with a charge of compressed air with the greatest ease and certainty. Starting all cold, an explosion occurred in five seconds, and the pump continued acting regularly. It worked throughout the trials with varying lift, without any change in the gas and air mixture, or

* See "JOURNAL," Vol. XCIX., p. 635.

any alteration in the cushion volume, and also without a single misfire or hitch of any description. He adds: "The results are very remarkable. The fuel consumption in these trials, reckoned on the work done in lifting water, was less than in any pumping arrangement, either by gas or steam, hitherto recorded."

The arrangements for the trial are shown in the accompanying diagram. The gas was supplied from a holder, which during a trial was shut off from the gas-main. The quantity of gas used was determined from the fall of the holder during 10 or 12 minutes; the pressure and temperature being noted, and the gas assumed to be saturated with moisture. The explosion chamber with its suction-valves communicated with a discharge-pipe 135 feet in length and 2 feet diameter. This discharged into a very large air-vessel. At the outlet from this was a sluice-valve B, at which a man was stationed, opposite a pressure-gauge. By slight adjustments of the sluice, he secured the maintenance of a nearly constant pressure in the large air vessel. The lift was measured by a mercurial syphon gauge, one leg of which was connected to the suction-tank, and the other to the water in the large air-vessel. The difference of level of the mercury columns is a direct measure of the height of lift of the pump. The valve A was full open during the trials.

From the large air-vessel the water passed through a second smaller air-vessel to a measuring-tank with stilling screens. In the bottom was a 9-inch sharp-edged orifice, through which the water fell back into the water reservoir supplying the suction-tank. The head over the orifice, taken at about 1½ minute intervals during a trial, afforded a means of determining the pump discharge. Valves C D were closed throughout the trials.

The pump ran continuously during the morning and the afternoon; the lift being maintained constant the whole period of each series of tests. These were necessarily intermittent, as the gas-holder required refilling at short intervals; the pump being connected directly to the gas-main while refilling the holder. In the morning, with the greater lift, the duration of each test of the series was 10 minutes; but in the afternoon, with smaller lifts, it was 12 minutes.

Professor Unwin gives particulars in regard to the quantity of water lifted, the pump-horse-power, the consumption and analyses of the gas, the expenditure of heat, and the pressures in the explosion cylinder, and then sets forth the general conclusions at which he arrived as the result of his investigations. In the course of these, he states that the fuel economy effected by the pump is, so far as he knows, unequalled. The following is a summary of the gas and heat expenditure:—

Lift.	Pump-Horse-Power.	Mond Gas Used per P.H.P. Hour, at 760 mm. and 6° C.	Calorific Value of Gas per Cubic Foot. B.Th.U.	Heat Expended per P.H.P. Hour. B.Th.U.	Pounds of Anthracite in Producer per P.H.P. Hour.
Feet.		Cubic Feet.			
32'87	16'15	83'12	147'3	12,243	1'063
25'95	12'32	90'93	143'5	13,037	1'132
20'73	10'99	93'61	145'3	13,596	1'180

Professor Unwin says: "An ordinary gas-engine of three times this power, and using similar gas, would use at full load 72 to 84 cubic feet of gas per brake-horse-power, and 95 to 100 cubic feet at half full power. If set to drive any form of pump, the gas consumption, reckoned on the pump-horse-power, would be considerably greater. The Humphrey pump, lifting water, works with about the same economy as a gas-engine driving itself only."

The Humphrey pump is then compared with a gas-engine and a steam-pump. We gave last week Professor Unwin's remarks on the former; but, for the sake of completeness, reproduce them: "Suppose a gas-engine driving a centrifugal pump required to do 16 P.H.P., on a lift of 33 feet, or the same work as the Humphrey gas-pump tested. On such a lift, the efficiency of the centrifugal pump would certainly not exceed two-thirds, and might be rather less. Hence the gas-engine would have to supply in normal working 24 B.H.P. at the pump-shaft. Gas-engines will not work with an overload; and to be safe, it would be desirable and usual to have a gas-engine of 32 H.P. (maximum), which in normal work, supposing the efficiency of the pump to be as assumed, would develop three-quarters of maximum power. So working, it would require 80 to 85 cubic feet per hour of gas of the quality used in the preceding trials for each brake-horse-power. Hence, it would require 80 × 24 to 85 × 24, or 1920 to 2040 cubic feet per hour. The comparison, therefore, stands thus: Gas-engine and centrifugal pump 120 to 127 cubic feet of gas per P.H.P. hour; Humphrey gas-pump, 83'1 cubic feet of gas per P.H.P. hour. Working with less load, the comparison would probably be more favourable to the Humphrey pump, because as the lift decreased, the efficiency of both the gas-engine and the centrifugal pump would diminish."

In comparing the Humphrey pump with a steam-pump, Professor Unwin remarks that small steam-pumps are notoriously inefficient and wasteful of fuel, and consequently a comparison with them would be useless. But to show how remarkable the fuel economy of the Humphrey pump is, he says it may be compared with large steam pumping-engines of the highest class. Some years ago he made careful and complete tests of a pair of compound and a pair of triple-expansion engines at the West Middlesex Water-Works. They were high-duty Worthington engines, of exceptionally low steam consumption, with boilers

which gave a high evaporative efficiency with picked Welsh coal. The following table shows that these fine steam-engines, with the advantage of much greater lift, did not approach in economy the Humphrey gas-pump; the compound engine requiring twice as much coal per pump-horse-power as the Humphrey pump.

	High-Duty Worthington Engines.			Humphrey Gas-Pump. Sept., 1909.
	Compound. Nov., 1888.	Triple. Dec., 1896.	Triple. Feb., 1897.	
I.H.P.	255'5	379'5	498'4	..
P.H.P.	217'1	320'3	419'8	16'15
Lift in feet. . . .	53'7	92'3	129'1	32'90
Quantity pumped in gallons per minute	13,497	11,450	11,497	1621
Coal per I.H.P. hour	1'696	1'402	1'549	..
Coal per P.H.P. hour	1'996	1'622	1'695	1'06

In the case of the compound steam-engine, the expenditure of heat in the boilers was 494 B.Th.U. per minute per pump-horse-power. The corresponding expenditure in a producer for the Humphrey gas-pump would be 250 B.Th.U.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

The Opening Meeting of the Sixth Session of the Scottish Junior Gas Association—Western District—was held in the Glasgow and West of Scotland Technical College, Glasgow, on Saturday evening. There was a larger attendance than had been for many months at the meetings of this division of the Association.

Mr. A. H. WHITELAW (Glasgow) took the chair, and, in opening the proceedings, said that as his term of office had expired, he would take this last opportunity of thanking the members for the honour they did him in electing him President last session. He thanked the honorary members and the Council for their hearty co-operation with him in the discharge of his duties. There could be no doubt, he said, that, as an Association, they had justified their existence. He would now call upon his successor—Mr. D. Currie, of Stirling—to take the chair, and ask him to deliver his Presidential Address.

Mr. CURRIE then took the chair, and said, before proceeding with his address, he should like the members to accord to Mr. Whitelaw a very hearty vote of thanks for the able and effective manner in which he had conducted the affairs of the Association during the past year. He had taken more than an ordinary interest in it since its inauguration, and he (Mr. Currie) thought it was worthy of their attention that during the past session Mr. Whitelaw had not been absent from a single meeting or visit. He hoped that, though Mr. Whitelaw was retiring from the chair, he would continue to manifest the same interest in the Association that he had done in the past.

The vote having been accorded, Mr. WHITELAW returned thanks.

PRESIDENTIAL ADDRESS.

The PRESIDENT then delivered his Inaugural Address, in the course of which he said: The subject of my address is

NOTES ON THE VALUATION AND SELECTION OF GAS COALS.

In deciding upon this subject, it occurred to me that it might prove interesting to the members of the Association, and at the same time lend sufficient scope for a profitable discussion. The valuation and selection of gas coals is a subject or duty which confronts every gas manager when purchasing a supply of gas coal; and the financial success of every gas undertaking depends to a great extent upon the judicious selection of the coal. When a gas company or a corporation receives tenders for a supply of coal, it will be observed that colliery owners and coal merchants generally supply copies of the analyses of the coals they are offering for sale; and the purchasers largely depend upon these analyses to aid them in the selection of the coal they are requiring. In going through a batch of coal analyses, it will be found that they are signed by various analysts; and in some cases the coal merchants tabulate on one sheet part of the analyses of the various coals they are offering for sale. These tabulated part analyses are generally not signed by any analyst, and are therefore worthless for making comparisons with other signed analyses which give a complete account of the tests.

In making a selection of coal under the conditions mentioned, many difficulties present themselves. In the first place, there is the difficulty of comparing the analyses of different coals tested by different analysts, as it is a well-known fact that it is practically impossible to get any two analysts or chemists to test coal precisely alike; and the question of different test plants has also to be taken into consideration. In order, therefore, to be able to make reliable comparisons of the relative value of different coals, it is necessary that the various coals should be tested by the purchaser; and it is my humble opinion that all gas-works of any appreciable size should have coal-test plants of their own. The advantages of having such plant are many. Firstly, there is the advantage of being able to test the coals at the time of purchase, instead of depending on coal merchants' analyses, which are in

TABLE A.—Tabulated Statement of the Products of Three Coal Tests.

Number of Coal.	Gas per Ton of Coal.	Illuminating Power.	H ₂ S in Gas.	CO ₂ in Gas.	Tar per Ton of Coal.	Ammoniacal Liquor per Ton of Coal.	NH ₃ in Liquor.	NH ₃ in Liquor per Ton of Coal.	NH ₃ in Unscrubbed Gas per 100 Cubic Feet.	NH ₃ in Unscrubbed Gas per Ton of Coal.	Total NH ₃ per Ton of Coal.	Coke per Ton of Coal.	Ash in Coke.	Ash in Coke per Ton of Coal.
	Cub. Ft.	Candles.	Per Cent.	Per Cent.	Lbs.	Lbs.	Per Cent.	Lbs.	Grains.	Lbs.	Lbs.	Lbs.	Per Cent.	Lbs.
1	11,632	21·04	0·75	2·20	147·86	154·60	1·06	1·63	386	6·41	8·04	1436·96	4·80	68·97
2	11,525	18·51	0·40	1·25	122·60	53·84	1·36	0·73	411	6·76	7·49	1618·40	2·20	35·60
3	12,145	20·04	1·50	2·00	152·50	227·81	1·06	2·41	321	5·56	7·97	1357·21	4·40	59·71

some cases over twenty years old. There is also the advantage of being able to test the selected coal from time to time during delivery, to see that the quality is being maintained.

Great diversity of opinion exists as to the reliability of the tests obtained with coal-test plants. In Stirling there is a small test plant capable of dealing with 2·24 lbs. of coal per test, or 1000th part of a ton; and the test results obtained with this small plant, compared with the practical results, have proved most satisfactory. Last year in Stirling over 12,000 tons of coal were carbonized; and the average yield of gas per ton for the whole year was equal to about 95 per cent. of the results obtained in the laboratory with the test plant. This consists of a small muffled retort, heated by means of a series of bunsen burners. The gas leaving the retort is conveyed direct to the condenser, which is a water-cooled one, and provided with pockets for collecting the tar and ammoniacal liquor. After passing through the condenser, the gas travels through two small purifiers in rotation, and is then collected in a graduated counterbalanced gasholder, capable of holding 11 cubic feet of gas. There is also a spare holder which permits of a test going on while the volumetric analysis for impurities, &c., of the previous test is being conducted.

The following is a brief account of the method adopted in Stirling for testing gas coals: A sample is taken from a coal-waggon, a shovelful being laid aside from time to time as the waggon is being emptied. The heap laid aside should be a fair sample of the contents of the waggon, as it consists of large and small coal and also coal dust. The large coal is broken down to a uniform size, and the heap is then turned over a few times in order to thoroughly mix the contents. It is then divided into two portions—one being retained for conducting the test. This portion is again thoroughly mixed, and then divided into two portions. The process is continued until the quantity retained is capable of serving for (say) six tests. I may mention at this point that the accuracy of the results obtained with a test plant depends greatly upon the manner in which the sample of coal is taken. The operation of mixing the coal should be performed on a clean concrete floor. Four tests of each coal are generally made; but the first is not taken note of, as it is merely put through the plant to clear out the gas of the previous test.

When the charge is completely burned off, the inlet of the gasholder is closed, and the retort mouthpiece lid is opened. The quantity of gas in the holder is then taken note of, and also the temperature and barometrical pressure of the gas. The coke is then collected in a clean tray, and allowed to cool in the atmosphere, no water being used to quench or cool it. When the coke is perfectly cool, it is accurately weighed, and a record kept of the weight. The tar and ammoniacal liquor are then collected from the condenser, and the weight of both is carefully noted. The percentage of ammonia in the liquor is ascertained afterwards by means of the distillation test. The gas is then tested for illuminating power, durability, and impurities. The other chemical tests are performed afterwards, and the necessary calculations made. When three complete tests are made, the average of the three is recorded as the analysis of that particular coal.

I may state that, in testing various coals for comparison, great care should be taken to test each coal in precisely the same manner, as otherwise the results would be misleading. Assuming that three different coals have been tested, and it is desired to ascertain the relative value of each, the following method is adopted: The products of the tests, which have a bearing on the valuation of each coal, are tabulated in the order shown in Table A.

When the products of the various coals have been entered up as shown in the table, the products of each coal are valued separately, as per Tables B, C, and D. The price attached to each product must be strictly adhered to when valuing the products of any number of coals, as the whole principle and success of the method of valuation depends upon valuing each product of each coal at precisely the same rate. In referring to Tables B, C, and D, you will observe the form in which the various products are valued.

The gas product, it will be observed, is valued at so much per 1000 cubic feet, instead of on the sperm value basis, as is frequently done. With the almost universal adoption of the incandescent burner for lighting purposes, I consider the gas basis is the proper method to adopt in valuing the gas product. Before the advent of the incandescent burner, when the illumination was entirely dependent on the illuminating power of the gas, the sperm value basis was undoubtedly the proper method to adopt. The deduction for purification, you will observe, is merely for sulphuretted hydrogen, as we only remove this in Stirling. Should lime be employed for the purification of the gas, the percentages of sulphuretted hydrogen and carbonic acid would be

TABLE B.—Valuation of Products of Coal No. 1.

	£	s.	d.	£	s.	d.
Gas—						
11,632 cubic feet, at 2s. 6d. per 1000	1	9	0·96			
Deduct purification—						
0·75 p. ct. H ₂ S, at 0·2d. p. ct. per 1000 c. ft. ∴ 0·75 × 0·2 × 11·632 = 1·74d.			0	0	1·74	
Value of gas product				1	8	11·22
Tar—147·86 lbs., at 16s. per ton				0	1	0·67
Ammonia—8·04 lbs., at 3d. per lb.				0	2	0·12
Coke—1436·96 lbs., at 10s. per ton	0	6	4·98			
Deduct ash in coke—						
68·97 lbs., at 10s. per ton			0	0	3·69	
Value of coke product				0	6	1·29
Total value of coal products	£	1	18	1·30		

TABLE C.—Valuation of Products of Coal No. 2.

	£	s.	d.	£	s.	d.
Gas—						
11,525 cubic feet at 2s. 6d. per 1000	1	8	9·75			
Deduct purification—						
0·40 p. ct. H ₂ S, at 0·2d. p. ct. per 1000 c. ft. ∴ 0·40 × 0·2 × 11·525 = 0·92d.			0	0	0·92	
				1	8	8·83
Deduct cost of enrichment—						
2½ candles, at ½d. per candle per 1000 c. ft. ∴ 2·5 × 0·5 × 11·525 = 1s. 2·40d.			0	1	2·40	
Value of gas product				1	7	6·43
Tar—122·6 lbs., at 16s. per ton				0	0	10·50
Ammonia—7·49 lbs., at 3d. per lb.				0	1	10·47
Coke—1618·4 lbs., at 10s. per ton	0	7	2·70			
Deduct ash in coke—						
35·6 lbs., at 10s. per ton			0	0	1·90	
Value of coke product				0	7	0·80
Total value of coal products	£	1	17	4·20		

TABLE D.—Valuation of Products of Coal No. 3.

	£	s.	d.	£	s.	d.
Gas—						
12,145 cubic feet of gas, at 2s. 6d. 1000 c. ft. ∴	1	10	4·35			
Deduct purification—						
1·5 p. ct. H ₂ S, at 0·2d. p. ct. per 1000 c. ft. ∴ 1·5 × 0·2 × 12·145 = 3·64d.			0	0	3·64	
				1	10	0·71
Deduct cost of enrichment—						
1 candle, at ½d. per candle per 1000 c. ft. ∴ 1 × 0·5 × 12·145 = 6·07d.			0	0	6·07	
Value of gas product				1	9	6·64
Tar—152·5 lbs., at 16s. per ton				0	1	1·07
Ammonia—7·97 lbs., at 3d. per lb.				0	1	11·91
Coke—1357·21 lbs., at 10s. per ton	0	6	0·70			
Deduct ash in coke—						
59·71 lbs., at 10s. per ton			0	0	3·19	
Value of coke product				0	5	9·51
Total value of coal products	£	1	18	5·13		

added together, and calculated at the rate per 1000 cubic feet which it costs to purify the gas.

In Tables C and D, I show a deduction from the gas product for enrichment. In explanation of this item, I may state that we are obliged to supply gas of 20-candle power in Stirling; and when testing coals it is our custom to take into account the cost of enriching the gas up to 21 candles, when the gas of any particular coal does not yield this illuminating power. When the gas exceeds 21 candles, the coal is credited with the difference between 21 candles and the ascertained candle power, at the same rate as the deduction is made when the candle power is under 21. This illuminating power of 21 candles is adopted as a standard. The tar product, instead of being calculated at the rate per gallon, is calculated at the rate per ton, as the tar is sold by weight, not by measure. The ammonia product, you will observe, is calculated at the rate per pound.

In referring to Table A, you will find the ammoniacal liquor is stated in weight instead of gallons. I am aware it is the usual custom to state the quantity of ammoniacal liquor in gallons of so many degrees Twaddell strength; but I am of opinion that the latter method is not a reliable one for ascertaining the value of

ammoniacal liquor, and therefore I prefer the method of weighing the liquor, and ascertaining by means of the distillation test the percentage of ammonia it contains. The ammonia item includes both the ammonia in the liquor and that which is in the crude or unscrubbed gas.

Having ascertained the total value of the products of each coal, the totals are transferred to a table similar to Table E.

TABLE E.

No. of Coal.	Net Value of Coal Products.	Value in Relation to Standard.	Price of Coal at Works.	Purchase Value of Coal in Relation to Standard.	Minus Value in Relation to Standard.	Plus Value in Relation to Standard.
	£ s. d.	Per Cent.	£ s. d.	£ s. d.	£ s. d.	d.
1 (standard)	1 18 1'30	100	0 11 0	0 11 0'00	—	—
2	1 17 4'20	98'01	0 10 8	0 10 9'37	—	1'37
3	1 18 5'13	100'83	0 10 6	0 11 1'09	—	7'09

The purchase price of each coal is entered in the column provided for the purpose, and one particular coal is fixed upon as a standard. We will assume coal No. 1 to be the standard in this instance. The value of the products of the standard coal is entered up as being equivalent to 100 per cent. By proportion, the value per cent. of the products of the other coals in comparison with the standard can easily be calculated, thus:

As £1 18 1'30 : 100 per cent. :: £1 17 4'20 : 98'01 per cent.

and

As £1 18 1'30 : 100 per cent. :: £1 18 5'13 : 100'83 per cent.

When the relative value per cent. has been ascertained, the purchase value in relation to the standard may be calculated in a similar manner, thus:

As 100 per cent. : 11s. :: 98'01 per cent. : 10s. 9'37d.

and

As 100 per cent. : 11s. :: 100'83 per cent. : 11s. 1'09d.

The difference between the purchase value and the contract price of each coal is then entered in the *minus* or the *plus* value column as the case may be, and the coal having the largest *plus* value denotes the cheapest coal. Coal No. 3 in Table E works out as being the cheapest coal.

There are various other items which should be taken into account in making out the relative valuation of coals. For instance, when there is a marked difference in the volume of gas produced per ton of coal compared with the standard coal, an allowance should be made for difference in carbonizing costs. These should include both labour and plant (retorts, &c.), and the necessary addition or reduction of value made on the coal under test. In Stirling, we do not make any allowance for difference in carbonizing costs due to any difference in the volume of gas produced per ton of the various coals under test, as the coals in the vicinity of Stirling which we periodically test give off a similar volume of gas per ton, and any little difference there may be between them would not warrant us making any allowance for difference in carbonizing costs, as our labour is at a minimum, and the plant in use would be the same, no matter which of the coals under test was selected. In large or medium-sized works, where hand labour is employed, this item for difference in carbonizing costs should be taken into consideration.

When the relative value of each coal has been ascertained, it has not to be assumed that the coal showing the largest *plus* value would be the best coal to select, judging from a financial point of view, as there are a few other items which have great bearing on the financial aspect of the question. The first item is the question of moisture, which plays a very important part in the success or otherwise of carbonization in practical working. When a coal contains a large percentage of moisture, it will be found that a proportionately large quantity of fuel is consumed in the producers for maintaining the heats of the retorts to the desired temperature; and it will also be found that a much longer time is required to burn off the charges. In a small test plant such as I have described, with the retort heated by gas, these items cannot be ascertained with any degree of accuracy in order to make the necessary allowance in the valuation of the various coals. The selector of the coal has therefore to bring his practical knowledge and experience into operation to aid him in making allowance for difference in moisture. Another item which should be taken into consideration is the percentage of ash in the coke. When this exceeds 5 per cent., it will be found very difficult to use in the producers, and difficulty may be experienced in getting a ready sale for the coke.

These items of moisture and ash in coke play a very important part in the selection of coal; and I consider that it is only with practical experience in testing and carbonizing coals that due allowance can be made for these items when valuing coal with a small test plant. With a large test plant on a practical working scale, these items can be taken into account without any difficulty; and this is one of the many points where the large test plants have a decided advantage over the small ones.

In these days of high carbonizing results, I consider the question of the relative valuation of coals should be seriously considered. There is a great temptation to purchase coals which give high carbonizing results, in order to be "in the running," as it were, with those who are able to obtain high yields. But it should be borne in mind that high carbonizing results are not everything.

The financial results are what should be considered; and while one manager may be able to procure coal at practically the retort-house door which would give high carbonizing results, it would probably be unwise, from a financial point of view, for a manager (say) 50 miles away to buy the same coal in order perhaps to get a few hundred cubic feet of gas per ton carbonized more than he was capable of obtaining from coal in his own locality. High carbonizing results are desirable when they can be obtained with financial success.

Discussion.

The address having been thrown open to discussion, Mr. ALEX. WILSON (Glasgow) said he was sure it gave them all very much pleasure to see their new session started so auspiciously. Their last session was certainly a great success; and he thought they might look forward to a greater success this year, if such a thing were possible. He did not know any part of a gas-works where exact methods of working and of observation were more necessary than in the testing-house. The President in his address had given full details of coal testing. The foundation of the business they might naturally suppose would be the testing plant; but he did not think so. He believed the foundation of coal testing was the coal sampling. Unless this was carefully done, and in a systematic manner, the best testing plant anyone could have might give inaccurate results. Everything, in the first instance at any rate, depended on the sampling. A good testing plant was what everyone ought to have. At the same time, suppose the plant to be not correct in every detail, if it were carefully handled, and the sampling were done in a systematic manner, the results would be comparative for that works; and he thought this was really what was wanted. They did not want to value the coal for the sake of other people, they wanted to value for themselves; and if the plant were always used under similar conditions, and the sampling were also done under similar conditions, they should expect to have the coal tested in such a way that, for their own undertaking, they would get comparative results. The values of the different constituents, as stated by the President, differed in a great many ways from theirs in Glasgow. But he was not going to criticize that circumstance very fully, because it was just possible that Stirling methods might be better than theirs. It was essential that carbonizing costs should be taken into consideration, especially in large works, where a great variety of coal were used. Where coal was employed for the higher qualities of gas, of course, they were tied down in a manner to one class of coal; but when they came down to lower qualities of gas, they had a much larger field to draw upon. If they used the coal which was lying to their hand, and made the necessary corrections for the carbonizing costs, then they got fairly near the value of the coal to them. The moisture in the coal was a most important matter for consideration. He had always said, against some authorities who dried the coal to a certain extent, that all their coal should be tested as received, because, unless they did this, they did not get the value of the coal to them. The ash in the coke was also a very important matter. He must congratulate them if they were able in Stirling to get a coke with no more than 5 per cent. of ash in it. He would be very glad if he could get down to an average of even 10 per cent. They had to put up with that, but he could assure the President that coke, if it were well handled, though it might contain 10 to 12 per cent. of ash, was quite saleable. They got rid of a lot of such coke during the year. To those who were near the coalfields, it was much more economical to buy the coal they could get, because if they obtained only an average result, the cost would be correspondingly low.

Mr. L. HISLOP (Uddingston) supposed it was round coal which was taken at the standard of 11s. per ton; but if they took the small of this same coal, such as the pearls, it would require to be bought at a matter of 3s. per ton. These pearls would give practically the same results on a small scale; but when they came to carbonize on a large scale, they would be of a rather different value. So far as they knew, there were very few coals in Scotland which gave 2 or 3 per cent. of ash, which, of course, was 5 per cent. in the coke.

Mr. A. SMITH (Tradeston) had noted the remark about the percentage of ash in coke, which seemed to him to be very low. It was difficult for him to get down below 10 per cent.; and in many cases it was 15 or 20 per cent. The table the President had prepared was altogether new to him, in the way in which the different items were stated. The coal-testing plant at Tradeston was capable of dealing with a thousandth part of a ton—that was, 2'124 lbs. The coal was selected from the waggon by a chemist who was well acquainted with this class of work. Perhaps 3 cwt. would be taken at a time. It would be thoroughly mixed on the floor, and then sampled when the occasion arose for testing. Four tests were made. The first was a clearing test for the apparatus; and the other three tests were put into the record, the average of the three being what they considered the value of the coal. The coal was tested four or five times during the year; so that they were always on the look-out to see that it was according to contract. It was of the greatest importance to a gas manager to know the materials he was dealing with. Coal varied from time to time; and it was occasionally not easy to convince the coal merchant that the coal was not what it should be, and that the waggons contained something else than coal.

Mr. J. NAPIER MYERS (Saltcoats) said he made a note of the statement that the coke was allowed to cool in the atmosphere,

and was not quenched with water. He did not think a sample of coke which was to be analyzed should be so violently treated. It ought to be quenched as soon as possible, because combustion went on for a very long time. They would find that heat was given off considerably; and therefore weight would be also given off. He did not mean to say that the coke should be weighed with a considerable quantity of water in it, but that it should be suitably dried, and then weighed. Besides the volume of ash in coke, they had to give some attention to the character of the ash. The inert matter in some coal included clayband, or ironstone, which was apt to flux on and adhere to the bars, and made the operation of clinkering difficult. This was a subject which, especially in works with small producers, required careful attention. The President had set forth an elaborate and complete system of testing coal, where they had a testing plant; but some of those present would probably be connected with gas-works in which there was no testing plant, and in which it would be equally as important that they should exercise great care in the selecting of their coal. He happened to be in a works where they had no testing plant. Probably Mr. Wilson and some others might consider that his whole works was merely a testing plant; and he so treated it in summer time, when they were reduced to one or two ovens. His earliest method of selecting coal was to take, in all honesty and simplicity, those analyses which were submitted to them; and he tried to make a rude selection from his practical knowledge of those coals of which he had had some previous experience. He would try to find a common co-efficient, and to have that expressed in the sperm value of the coal. At Salcoats just now, this was about 0.15 per pound of sperm. In this way, he tried to find out the coal which was likely to give him the best value. But he discovered that some of the statements were so fictitious that, of late years, he had had to abandon the system; and he preferred now to get sample waggons in summer time of the coal he was likely to select. He also experienced some difficulty in making the samples fair samples for testing. He used to trust to the stoker who weighed out the coal; but the stoker, when he knew that a test was being made, thought a record was wanted, and not a test. Nowadays he generally weighed the coal twice, and generally laid down as much coal as would go over the plant twice—once to sweep out all the gas in the plant, and the second to have the test run. In this way, he had fairly satisfactory results. Then these results he compared with the results from one coal which they had used very frequently in Ayrshire—continuously, he might say, for a large number of years, and which he considered their standard. This coal he put down at 100. He took the market value of it, and he judged all the other coals in comparison with it. If the results were better, that was shown in a better percentage. If they were poorer, there was a corresponding fall below the standard unit.

Mr. D. VASS (Airdrie) said that Mr. Myers had described pretty much his (Mr. Vass's) method of testing coal. He put the whole works on the test; and in this way he got a practical test, taken from month to month. During the time of making contracts, he occasionally put the whole works on a coal for (say) eight hours—one coal only, and sending the whole of the gas into one holder, and testing it by itself. This had to be done where they had no testing plant; but he also thought it was a very good check test where they had a testing plant. In the plant described, the retort was heated by gas. It would be a very good check to measure the gas that was used, in testing one coal with another. They might, in this way, arrive at the cost of carbonizing coal—an approximate cost, of course—which would be a very useful figure in any works; and also they would get at the question of the extra cost of carbonizing coal that contained a great percentage of moisture.

Mr. A. M. McLEOD (Dawsholm) made the suggestion that, seeing the trend of the gas industry was towards heavy charges and increased time for carbonizing, it might be time that laboratory testing should follow, and let them see whether they could get an increased yield of gas, equal to perhaps 1000 cubic feet per ton. The President reported his make of ammonia in pounds per ton. Would it not be better to report it in (say) pounds of sulphate per ton? He knew that in the chemical works at Dawsholm, over the whole year, they made about 29 lbs. of sulphate per ton of coal carbonized, and expressed it so.

Mr. J. WEBSTER (Provan) desired to call attention, in the matter of the valuation of coal, to the importance of screening the coal, so as to free it from dirt, if they were to get good carbonizing results. In their works, the machines were fed from a high hopper, with the result that the large coal ran to one side and the small coal to the other—the side next the retorts. In the first feed they were able to put in only about 5 feet. As they went further, they were able to get in 6 and 7 feet; and when they came to the round coal, they could put in as much as 9 feet. Supposing the small coal was of equal value with the round coal in the testing plant, it would not be so economical to use it on a large scale, seeing they could only get a little over 2 cwt. of small coal into a retort, whereas they could get 4 or 5 cwt. of large coal in.

Mr. W. WILSON (Falkirk) remarked that the address was upon a subject which exercised the mind of every gas manager. In Falkirk, they had a testing plant very much on the same lines as in Glasgow. He did not say they went into the matter so elaborately as they did in Glasgow; but one or two items they attended to. Among these were the ash and the moisture, and last, but not least, the commercial value of the coke as produced in their large retorts and their machines. The fact of their getting more

round coal into a retort than small coal, as mentioned by Mr. Webster, he found to be a very determining factor in the selection of coal. Indeed, during the past year or two, they had had to restrict themselves to the purchase of nuts. Round coal they had had to crush up; and what was the good of buying coal to crush it? They confined themselves almost entirely to the use of nuts. With nuts, there was practically no breakage between the waggon and the retort; and, barring weather such as they were having, the percentage of moisture did not affect them materially, though at the present time it was doing so. In ascertaining the value of coal, they took samples of the coke as produced and classified it, having regard to the amount they expected from a particular ton of coal. In a small testing plant, they did not get a proper idea of the value of the coke. He had noticed frequently that the nuts of a coal gave a better coke than did the round of the same coal. He attributed that to this—that when they charged with nuts, the nuts lay very much closer together than did the particles of the round coal, and were therefore more ready to intermix and fuse together. It was a matter of considerable importance for them to remember that they usually entered upon their coal contracts in the early summer, and that therefore the tests were frequently made in the dry weather of summer.

Mr. WALTER GRAFTON (Glasgow) pointed out that no description was given of the condenser used, and he failed to see any statement as to the quantity of liquor obtained per ton. The President said he used a graduated counterbalanced gasholder. He did not wish to criticize the paper adversely; but he wanted to see how he obtained the make of gas per ton which he did. The holder was of 11 cubic feet capacity. From the quantity he used, he could not get more than 11,000 cubic feet per ton; and yet, in every instance, he quoted more than 11,000 cubic feet per ton. The retort was heated by gas. If it were heated by coke produced from the coal being tested, they would see the value of the coke as a fuel. If they were using a coal which gave a bad heating coke, down would go their heats, and all the other evils attendant upon small makes would naturally arise. The value of the coke was well brought out in the address; but they wanted to know the value of it as fuel, apart from its selling value. He presumed that oxide of iron was used in the purifiers. Might he ask if the oxide was new, or had been used before, because this would very much influence the quality of the gas. He noticed that the holder was set at even gauge during the time the testing was in operation. Perhaps the President would bear him out that, when the charge was put in, there might be 5 inches of pressure, and at the end of the test no pressure at all.

Mr. A. H. WHITELAW said that, coming from the same works as the President, he had every confidence in the figures which had been placed before them. As an Association, they had the pleasure, two years ago, of visiting the gas-works at Stirling; and he thought it was a unanimous expression on their part that the works were among the most up-to-date, for their size, which they had ever visited. Although a good many of them there had not had much experience of this work, still they could understand that the paper was a good one; and if they ever found themselves in the fortunate position of being managers of gas-works, they probably could not do better than have these tables beside them. They appeared to him to be among the best he had ever had the privilege of reading. The President's conclusion was that coal No. 3 was the best. He would like to throw out the suggestion that in that case they had a higher yield per ton of coal; but they had a candle less in illuminating value, and consequently had to enrich the gas. This would naturally point to him that the best course to follow, if they had a choice of coal, would be to take the one which gave the higher yield and enrich the gas. He thought the President had made a point for the introduction of carburetted water-gas plant. It would be well to look into this. They had there the cheapest coal giving the highest yield; and though it was the lowest candle power, the President had proved to them that it paid to enrich.

Mr. J. FRASER (Provan) said his experience had been confined to Glasgow; and this being so, he had had no opportunity of testing coal, because this duty was allocated to the chemists and assistants. But it fell to his lot to have the coal under observation daily; and, as Mr. Webster had said, they were very often troubled with the small kind. The observations made about dirt in the coal applied to them also. Beyond regular testing in the laboratory, there should also be careful observation of the coal before it was carbonized, as the one was no good without the other.

Mr. P. McDOUGALL (Helensburgh) considered that the President had treated upon a polemical subject of great importance to gas engineers. There was no standard means of testing coal—each engineer simply proceeded along whatever lines appeared to him to afford the most accurate results. Consequently, they had a great many different ways of valuing. He was satisfied, however, that a small laboratory plant, taking a thousandth part of a ton of coal, was of little use in arriving at the value of a coal to the gas manufacturer. It had been proved that different tests of the same coal in the same plant yielded results which did not agree; and it was not fair to assume that 2.24 lbs. represented a fair average sample of coal from bulk. This was easily noticed, both from the yield of gas and from the varying quantity of ash in the residual coke. In a plant of this type, a test could be worked off much quicker; and while the figures might be far from representing an average sample of the coal, they assisted in forming an opinion as to the various kinds of coal being used. He believed

that the best method of testing coal, in order to arrive at its value to the gas manufacturer, would be to have a setting of (say) six or eight retorts, heated by furnaces of the same type as those in every-day use, with the usual purifying, scrubbing, condensing, and measuring apparatus. To provide this plant would mean extra capital expenditure; and he was afraid that, except in the larger works, it would be out of the question. However, in small and medium-sized works, he did not see any reason why the coal under test could not be used exclusively throughout the retort-house. This was the method now adopted at Helensburgh. If a coal were carbonized under the most favourable conditions, and provided the distillation products were not allowed to be superheated, a fixed yield of gas could be obtained from a particular coal, which would approximately always have the same calorific value. This quantity of gas, multiplied by the calorific value, would give a figure which would represent the valuation figure of the coal. Account should also be taken of the quantity of oxygen in the coal, because the more oxygen present the lower the yield of gas and coke. The oxygen, again, reappeared combined in the tar, and in the form of water which went to make up the liquor, or as carbonic oxide or carbonic acid in the gas. This brought out the fact that a coal rich in oxygen was of less value to the gas manufacturer than one containing comparatively little oxygen. Mr. Hislop, of Paisley, told them that it had always been his practice to test all coal with a content of water equal to two-thirds the total water-bearing capacity of the coal. He agreed that some such basis was necessary. But would it not suit the purpose as well if the coal were air-dried? In testing samples of some of the well-known Lancashire coals, he had found a difference in the same season from the same pit, more particularly in the yield of gas and the percentage of ash in the coke. This showed that it was necessary that an average sample should always be taken. Mr. Hislop worked his valuations out on the sperm-value basis, which was not of much importance now, considering that in most places the illuminating power had been reduced by, in some instances, half what it formerly was, and that calorific power was of more importance now, although it did not necessarily follow that a coal high in sperm value would yield a gas of a high calorific value.

The PRESIDENT thanked the honorary and senior members for their attendance that night. He said, in the discussion, Mr. Wilson mentioned the importance of sampling the coal aright. In his address, he (the President) said the taking of the sample was one of the most important points in coal testing. Mr. M'Dougall referred to getting different results from the same coal. Of course, seams differed; but a great deal depended on the time. If there had been a long period between the testing of two samples, there must be a difference; but taking two samples out of one waggon, he did not see how there should be a great difference if the tests were carried out exactly alike. He had never known, in such circumstances, any great variation in coke or in ash. Mr. Wilson bore him out in saying that carbonizing costs should be taken into consideration. This would determine to a great extent the value of different coals where hand stoking had to be taken into consideration. If they had one coal yielding 9000 cubic feet of gas per ton, and another yielding 11,000 feet, there would be a great difference in the number of retorts which would be required to work both kinds. The more retorts the more men; so that a difference would require to be allowed. In valuing coal, the question of moisture in it was a very ticklish one. The coal they tested was usually air-dried, as Mr. M'Dougall had said. They did not immerse it in water to the extent of two-thirds of its water-holding capacity. At the same time they from time to time tested the coal as they got it in the waggon, and thereby obtained an idea as to what the working results would be. Mr. Wilson had made reference to the percentage of ash in the coke. In Stirling the largest percentage was 4.8, and the lowest 2.2. Mr. Hislop dealt with the use of pearls; and Mr. Wilson, of Falkirk, also touched on this point. He did not think it was possible to get the same quantity of gas per ton out of nuts as they got out of round coal—at least, he had never been able to obtain it in Stirling. As a matter of fact, they did not get 20 cwt. of nuts in a ton—they had always a certain quantity of water. In comparison with round coal, they would need to get nuts about 2s. 6d. per ton cheaper. Mr. Myers dealt with the testing of coal in the works retorts in summer. This method, in a small works, was often better than testing in a testing plant in large works. The results should be more reliable than with a testing plant. The same remark applied to Mr. Vass's observations. Mr. Vass said it would be interesting to know the quantity of gas used in heating the retort. He never thought of that; but he would carry out the suggestion. Mr. M'Leod asked why not adopt heavy charges in testing plant? In Stirling, they had adopted heavy charging; and it was practically in the laboratory where the heavy charging started, not in the retort-house. It did not matter whether the ammonia return was stated as sulphate or not—they could adopt either method of stating. Mr. Webster had spoken of experiencing some difficulty on account of the coal flowing better towards the end of a run. In Stirling, they were not really bothered by this. They could put in either dross or round coal equally well. It was just a question of the speed of the machine. The coal-breakers might have something to do with this. The condenser used was simply a rectangular hose, with a number of iron tubes through it. The holder had only capacity for 11 cubic feet; but they had two holders, and the gas could be put into either. When they got as much as 10 cubic feet into one holder, they could open the

other and put in the remainder. After the test was over, they blew out part of the gas in the 11 feet holder, so as to get the gas into the other one, as being the gas of the charge. The oxide in the purifiers was not new; it was simply taken out of the bin of oxide used for the ordinary purifiers. The holder did show a pressure immediately after the charge. But there was always a workman standing by, at the valve of the holder; and when the charge was put in, the door was closed and the inlet to the holder was opened simultaneously. He might explain that the liquor he dealt with was the liquor from the four tests, and the product divided by four. Mr. Whitelaw dealt with coal No. 3 being the one which gave the best value—of course, taking enrichment into account. This gave them an idea as to whether it was better to use a coal which was giving a high yield of gas or otherwise. So long as it was kept within certain bounds, he was inclined to think that, invariably, the coal which gave the most gas per ton was really the cheapest. Mr. Fraser was quite right—no matter what results they got in the laboratory, they could not expect to get the same results in the retort-house, unless it were practically under the same supervision. Mr. M'Dougall remarked about tests varying. Of course, they varied a little; but they got them fairly approximate when they took the samples of coal correctly, and conducted all the tests in the same manner. He thanked them for their kind attention to his address, and for their discussion of it.

Mr. J. BELL (Kirkintilloch) moved a vote of thanks to the President for the way in which he had conducted the proceedings, and for the very valuable contribution he had made to the "Transactions" of the Association.

This was cordially agreed to.

THE GOLD MEDAL.

The PRESIDENT intimated that the gold medal for the best paper read during the past session had been awarded to Mr. G. H. M'Cowat, for his paper on "Distribution of Gas: Main Laying." The medal would be presented at the annual dinner. The meeting then terminated.

PROGRAMME FOR THE SESSION.

The syllabus for the session contains the following items after that of last Saturday: Nov. 6, paper by Mr. T. Orr, of Motherwell, on "Carbonization Fifty Years Ago." Nov. 20, visit to Greenock Gas-Works. Dec. 4, paper by Mr. F. L. M'Laren, of Dumbarton, on "Producers and Internal Combustion Engines." Dec. 18, annual dinner. Jan. 8, paper by Mr. V. M. Evans, of Glasgow, on "High-Pressure Gas Distribution." Jan. 22, visit to the colliery and coke-ovens of Messrs. William Baird and Co., Limited, at Bedlay, near Glenboig. Feb. 5, paper by Mr. D. T. Marwick, of Dawsholm, on "The Chemistry of Coal Gas and the Bye-Products." Feb. 19, visit to Broxburn Oil-Works. March 5, paper by Mr. G. M. Smith, of Dumfries, on "The Manufacture of Sulphate of Ammonia." March 26, joint visit to Falkirk Gas-Works. April 2, general business meeting, and lecture by Mr. Walter Grafton, of Glasgow, on "Gas Combustion."

Estimation of Carbon Bisulphide in Benzol.—A recent issue of the "Chemical Trade Journal" contained a reference to an abstract, in the "Chemiker Zeitung," of a paper by Herr I. M. Weiss on the estimation of bisulphide of carbon in benzol. Of the sample taken, 2.5 grammes are mixed with 2.5 c.c. of saturated alcoholic potash; and the flask containing the mixture is attached to a reflux condenser. After allowing it to remain at the room temperature for five minutes, the mixture is heated to 60° C. on the water bath, and kept at this temperature for an hour. The whole of the sulphur of any carbon bisulphide originally present will now be combined as potassium xanthate. This is oxidized to sulphate by means of bromine, after expelling unchanged benzol by diluting with water and boiling, and the sulphate determined, as usual, by precipitation with barium chloride after acidifying with hydrochloric acid.

A New Gas Examiner Appointed by the Dublin Corporation.—In the "JOURNAL" for the 12th inst., it was stated that Mr. Henry F. Cotton, son of the late Mr. Thomas J. Cotton, had been recommended by the Lighting Committee of the Corporation of Dublin as successor to his father as Inspector of Public Lighting, Meter Inspector, and Gas Examiner for the City of Dublin. The recommendation was adopted, and the appointment has been made. As Mr. Cotton is only twenty-one, he has reason to congratulate himself on being entrusted with duties so responsible as those appertaining to his office. He seems, however, to be perfectly competent to discharge them. He spent a year under his late father in Dublin; and then went to Liverpool, where he was articled to Mr. C. J. M'Ewen, the Manager of the Linacre works of the Liverpool Gas Company. After serving four years with him, he was appointed General Assistant on the staff of the Company by the Chief Engineer, Mr. Edward Allen; and he was acting in this capacity when he was called back to Ireland on his father's death. While at Liverpool, he had the opportunity of being engaged in extensive tests on one of the first installations of Woodall-Duckham retorts. In addition to the highest references from Mr. Allen and Mr. M'Ewen, Mr. Cotton holds several certificates—among others, three granted by the City and Guilds of London Institute.

ILLUMINATING ENGINEERING IN EUROPE.

[A Paper by Mr. H. Thurston Owens.]

In the notice of the recent annual meeting of the American Illuminating Engineering Society which appeared last week in the "JOURNAL," it was mentioned that Mr. H. Thurston Owens contributed a paper on "Progress of Illuminating Engineering in Europe." The author has sent a print of his paper, of which the following is an abstract.

Coming to the actual subject of this paper, Mr. Owens remarked that the profession of illuminating engineering is still in its infancy abroad, just as it is in America; but the almost universal use of modern high-power luminants has made it evident that the sooner the services of impartial practitioners are obtained, the greater will be the benefits for the greatest number. High-pressure upright gas-lamps were installed for public lighting in Berlin less than ten years ago; but they are to be changed to the inverted type, as they have become obsolete. In America, neither type has been used at all, except in one or two minor instances. The lamps used for lighting the homes to-day were those employed for public lighting yesterday; so that one may predict with fair accuracy that present-day public lamps will soon find their way into buildings.

Americans have heard much of the superior street lighting to be found abroad; but nevertheless Mr. Owens thinks one would have to be decidedly *blasé* not to be forcibly struck by the profusion of lights and the high intensity of the illumination involved. London is divided into a large number of boroughs, and each is apparently trying to outdo the other in providing the best street illumination possible, regardless of expense, with the result that there are all kinds and conditions of lamps hung in almost every conceivable manner. Mr. Owens informed his colleagues that this subject had been recently investigated by a Committee of the Corporation of London, and said their report was a valuable addition to lighting literature.

Referring to Berlin, the author remarked that there is probably no city in the world where the results of active and intelligent illuminating engineering in public lighting are so manifest. The gas-works there are operated by the Municipality, who have brought forward the very best lamps they find in order to satisfy the taxpayers that the results are better than could be obtained by means of the latest designs in electric lamps. Just now, gas has the better of it; there being some 800 electric arc lamps against about twice this number of high-pressure gas-lamps, and if the present plan is completed the whole city will be lighted by gas-lamps within five years at an expense of 7,000,000 marks. With regard to Paris, Mr. Owens thinks it is fast becoming an echo of the past. Low-pressure gas and open arcs no longer produce an effect in keeping with her *sobriquet* of the City of Light; for people judge by comparison. The author summed up, as follows, the principal differences between Europe and America, in the minor details of the practice in public lighting: Circular or boulevard globes on gas-lamps are unknown abroad; but the lack is made up by the use of reflectors, which have been entirely neglected in America. The following types of lamps are used abroad with great success, but have not made any headway at home: Inverted low and high pressure gas-lamps, and vertical and inclined carbon flaming arc lamps.

Speaking of interior lighting, he remarked that when comparing the lighting conditions abroad, it must be remembered that the spirit of competition between the two great luminants, gas and electricity, is much keener there than in America. Gas is used for many purposes and in many instances abroad which are given over to electricity in the majority of cases at home. The result is that gas-fittings are an ornament rather than an eyesore. This is especially true in Germany, where *l'art nouveau* is in great favour, and rightly so, to judge from the beautiful effects obtained. In glassware, other than the very handsome installations, Americans have not very much to learn, as the new high-efficiency lamps which have been used to replace the older types are, as a rule, somewhat larger and do not fit the old glassware. The matter of maintenance receives much more care and attention abroad than is bestowed upon it in America; and broken mantles or dirty bulbs are the rarest exception. The indictment against America on account of having sources of high candle power in the line of vision, must also, Mr. Owens thinks, be made against Europe, especially in the large cities. Europe has anticipated America in the use of these modern lamps; but the latter has anticipated the former by spreading a deeper and better understanding of their use and misuse.

In conclusion, Mr. Owens said: It is indeed fortunate that illuminating engineering has made a strong foothold in America, at a time in advance of the general use of light sources which are a great menace to our eyesight unless properly used. We are making history in lighting to-day; and it behoves us to get together and make history which is worthy of our best efforts. The old luminants will soon be replaced by the new; and we, as illuminating engineers, have a magnificent opportunity to obtain, for the present generation and the generation to come, conditions which will not only tend to conserve our natural resources through the intelligent use of lighting appliances, but also to conserve and protect perhaps better the physical vision of our fellow-beings.

REGISTER OF PATENTS.

Hydraulic Mains.

PARKER, T. & C. H., of Wednesfield.

No. 20,178; Sept. 25, 1908.

This invention relates to the hydraulic mains of apparatus employed for the destructive distillation of coal and other substances, and "especially to such apparatus as is used for the destructive distillation of coal at low temperatures"—say, "Coalite." It has for its object "to provide improved apparatus for sealing the dip-pipes of retorts, and further to provide simple and effective means for the ready removal of tar or pitch that may be condensed in the hydraulic main, and to provide such an arrangement as to permit of the convenient periodic cleaning and flushing of the tar-main for the complete removal of any deposit."

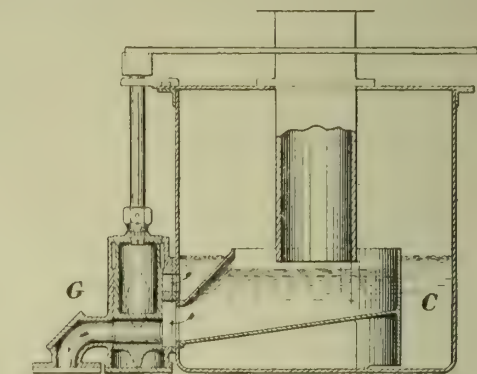


Fig. 1.

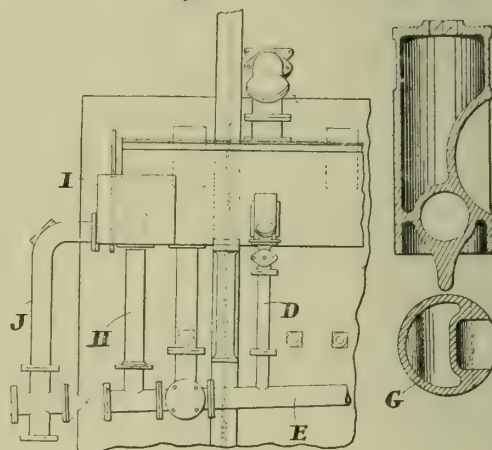
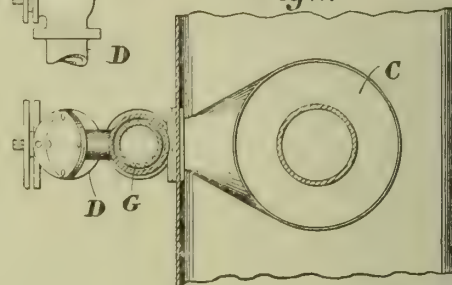


Fig. 2.

Parker's Hydraulic Main Arrangement.

Fig. 1 is a sectional side elevation and sectional plan of a hydraulic main showing the dip-pipe, sealing dish, and valve in position—the valve being opened for normal working. Fig. 2 is a front view showing the hydraulic main and receiver, with sections of the plug-valve.

The hydraulic main has a number of downwardly protruding dip-pipes, through which the gases from the retorts are led. There are sealing dishes C in the hydraulic main, in a position coincident and surrounding the lower ends of the respective dip-pipes, with a passage leading from them through communicating pipes D to the tar-main E, which is at a slightly lower level than the hydraulic main and adjacent to it. At the side of the hydraulic main a number of plug-valves G regulate the outlet from the sealing dishes and from the main. The dishes have their upper edges at one common level.

The valve-plugs are so constructed that in the position shown in fig. 1 (for normal working) communication is made from the sealing dishes to the tar-main; while, when the corresponding retort or "bunch of retorts" corresponding to the dip-pipe is to be isolated, the valve is so turned that communication is made between the dish and the lower part of the hydraulic main containing the liquor, so that the level in the dish rises substantially to the normal level of liquor in the main, and the dip-pipe is sealed.

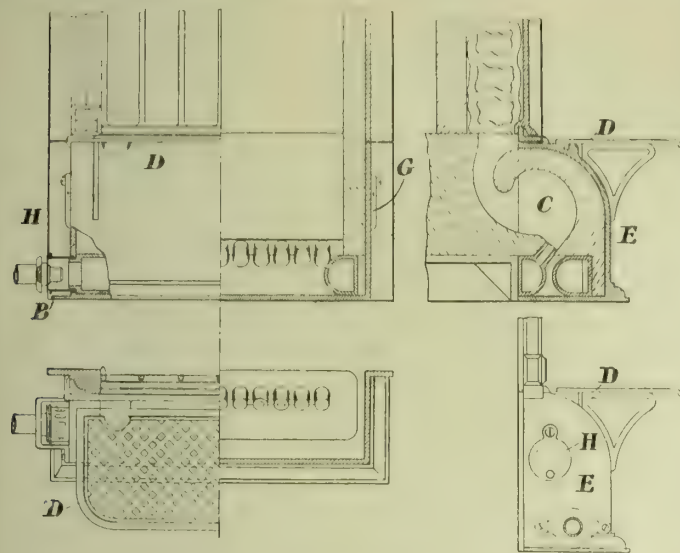
The level of the liquid in the sealing dishes is determined by means of an upstanding pipe H, which extends into a receiver I; and its extremity may be provided with means (such as a socket) by which it may be extended so as to alter the normal level of the liquor in the sealing dishes, and thus the main may be worked with a sealed or unsealed dip-pipe as required. The receiver is constructed of glass, so that the rise of the tar may be seen. The tar passes out from the tar-main through the outlet pipe J of the receiver.

Burners of Gas-Fires and the Like.

HISLOP, G. R., of Paisley.

No. 23,657; Nov. 5, 1908.

This invention relates to gas-fires, gas-cooking stoves, gas-heated radiators, water-heaters, or the like, where a mixture of gas and air issues from a chamber having a number of outlet nozzles and is passed through a combustion chamber in which the inner surfaces of the walls are curved away from one another and are brought closer together towards the outlet, so that the gas-air mixture is caused to take a sinuous path prior to contacting with the article to be heated. The invention consists in "combining with the combustion chamber or chambers a gas and air mixing chamber or chambers of a known type."



Hislop's Gas-Fire.

The illustration shows the arrangement of devices applied to a gas fire or stove.

A is the mixing-chamber, which is of the kind wherein the supply of gas and air passes along a branch or branches prior to issuing through the burner-nozzles. The gas is supplied to the mixing-chamber by a jet B, and the air is admitted by a regulator as usual; the chamber having a gas and air inlet at one end (as shown), or having a gas and air inlet at each end, in which case the chamber is provided with a partition. The mixture of gas and air passes along branches provided with inclined nozzles, from which the mixture issues and is ignited within, and impinges against the inner surfaces of the walls of the reverberating or gyrating combustion chamber C. This is preferably enclosed by a casing E, the walls of which are curved apart and are brought closer together towards the outlet, "so that the ignited mixture of gas and air is caused to take a sinuous path prior to making contact with the article to be heated, whereby, with the gyrating and scrubbing action induced, absolute combustion of the gas is obtained and the heating effect is intensified." The white-hot gas-flame thus produced passes through the outlet of the gyrating chamber to raise to incandescence artificial fuel or iron frets or to heat other articles. In the ends of the casing are sight and lighting openings provided with covers G and H; and over the casing a trivet D is provided for supporting utensils the contents of which are to be heated. The casing, projecting as it does in front of the gas-fire proper, "radiates a considerable amount of heat into the apartment; while it is serviceable for heating and boiling purposes."

Removing Carbon Bisulphide from Coal Gas.

MAYER, M., and FEHLMANN, A., of Carlsruhe, Germany.

No. 174; Jan. 4, 1909.

The methods hitherto used for the removal of carbon bisulphide from gases, particularly from coal gas, have the drawback (the patentees say) that the reaction between the carbon bisulphide of the gas and the purifying agents is too slow; so that a long time is required for the purification of the gas. The present invention has for its object to accelerate the reaction, by treating the gas with a mixture of amines and insoluble metal oxides or metal salts—i.e., metallic oxides or salts which are insoluble in alcohol, oil, such as petroleum or amines.

Accordingly, when using metal oxides, the reaction is effected in such a way that the carbon bisulphide, the metal oxides, and the amines combine to form alkaldithiocarbamic acid salts, which are formed as an intermediate product prior to the development of the sulphuretted hydrogen. This intermediate product is formed so rapidly that the carbon bisulphide present in the gas is almost instantaneously removed in the form of such intermediate product, which has the property of forming slowly, with excess of amine, substituted thiourea, metal sulphide, and sulphuretted hydrogen—the latter escaping quantitatively. The same effect as is obtained with metal oxides can also be obtained with metal salts; but this method is said not to be an economical one, as the reaction is generally slower, and, besides, the consumption of amines is considerably larger owing to the formation of a compound with the acid remainder of the metal salts.

The final products of the reaction consist essentially of substituted thioureas and of their derivatives—such, for instance, as triphenylguanidine and metal sulphides. From the thioureas (hitherto of no value) the amines can be recovered by heating the waste mass with such metal hydroxides—for instance, hydroxide of iron—as will enable the regeneration of the amines to take place.

For the purpose of the present invention, the amines which come into consideration are of the aliphatic and aromatic kind—for instance, phenylamine (aniline, toluidine, xylydine, &c.), while the oxides may be

any metal oxide or peroxide—for example, oxide of mercury, peroxide of lead, minium, lead oxide, oxide of copper, oxide of manganese, hydroxide of iron, or oxide of calcium.

The invention may, in practice, be carried out in the following manner: A washer (of any kind) is charged, for instance, with a mixture of finely powdered bog iron ore and aniline—the two substances being mixed, for instance, in a proportion of 500 grammes of bog iron ore to 1500 grammes of aniline. The gas is washed with this mixture. As, owing to substituted thioureas separating out, the mixture becomes thicker, it is necessary to either add suitable quantities of aniline or to so carry out the washing operation that the mixture traverses the washer continually on the counter-current principle. The waste sediment containing thioureas, guanidine, and metal sulphides (besides unchanged hydroxide of iron) is filtered, and mixed with hydroxide of iron, in the proportion of 300 parts by weight of filtered sediment to 200 parts of hydroxide of iron. The mixture is slowly heated to about 350° C., in which operation about 80 per cent. of the aniline, which was present in the form of thioureas, &c., is driven off. The residue in the retort remaining after distillation consists of pyrophoric sulphide of iron and sulphur.

Instead of effecting the purification in a wet manner as described, it may also be carried out in such a way that metal oxides are impregnated with amines.

As regards the arrangement of the washer in the gas-works, it is preferably placed behind the sulphuretted hydrogen purifier, or between the third and fourth purifiers.

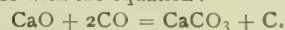
Removing Carbon Monoxide from Gases and Replacing it by Hydrogen.

JOHNSON, G. W.; a communication from the Chemische Fabrik Griesheim-Elektron, of Frankfort-on-the-Maine.

No. 2523; Feb. 2, 1909.

It has been proposed to remove carbon monoxide from water gas, the patentees point out, by causing it to be absorbed by a solution of cuprous chloride and calcic carbide, or by liquefaction (see "Zeitschrift für Calciumcarbidfabrikation, Acetylen-und Kleingasbeleuchtung," Vol. II., 1907, part No. 41, p. 322). But these methods are said to be "troublesome and costly." The present invention consists in "an improved process for freeing water gas, or other gases, from carbon monoxide in an extremely simple and economical manner, whereby a perfect replacement of the carbon monoxide by hydrogen is effected with very efficient utilization of the reagents employed."

The process consists in passing the gases over heated calcium oxide, or heated calcium hydroxide, while steam is blown into the reaction chamber; the temperature being kept below the temperature of dissociation of calcium carbonate. Experiments have already shown that when carbon monoxide is passed over calcium hydroxide, the carbon monoxide disappears and hydrogen is produced (see "Berichte der Deutschen Chemischen Gesellschaft," 1880, Vol. I., p. 718); but in these experiments, steam was not passed over the calcium hydroxide along with the gases. The patentees have found that the introduction of steam is absolutely necessary in practice, because at the temperatures under which the reactions take place, a large portion of the water of the hydroxide is uselessly distilled, so that the calcium oxide, or calcium hydroxide, is "very inefficiently utilized." They have also found that when steam is not introduced, although the carbon monoxide is at first replaced by hydrogen, after a short time the carbon monoxide disappears without the production of the equivalent amount of hydrogen, because, in consequence of the lack of water, carbon is separated as such in accordance with the equation:



The reaction given in the "Berichte der Deutschen Chemischen Gesellschaft"—namely, $\text{Ca(OH)}_2 + \text{CO} = \text{CaCO}_3 + \text{H}_2$ —takes place properly only when an excess of steam is present.

The operation may be considerably accelerated by an admixture of metal—apparently because this admixture facilitates the decomposition of water.

The following example will illustrate how the invention is worked. Water gas containing 40 per cent. of carbon monoxide and 50 per cent. of hydrogen, and heated to about 500° C., is passed, together with steam, in a suitable apparatus—for instance, a retort with a stirring apparatus—over calcium oxide, or calcium hydroxide. The carbon monoxide disappears and calcium carbonate is formed; while, at the same time, for each molecular proportion of carbon monoxide a molecular proportion of hydrogen is split off from the steam, as well as from the water which separates from the hydrate.

As a considerable amount of heat is evolved during the process, extraneous heating is not required after the process is started; there being, indeed, an excess of heat, which, if necessary, is removed, so that the temperature in the reaction vessel is always below the temperature of dissociation of calcium carbonate (preferably 500° C.). The superfluous heat may be employed to evaporate the water required for the reaction, or be utilized for any other operation requiring heat. The reagent is always regenerated. If iron powder (about 5 per cent.) be added to the calcium oxide, or calcium hydroxide, the operation is said to be greatly accelerated.

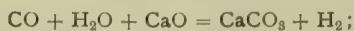
Caustic lime has before been employed for the production of hydrogen from water gas; but this has been done, it is claimed, in a manner quite different from the process according to this invention, and is unprofitable. It is known that if water gas be produced at low temperature a mixture of hydrogen and carbon dioxide, with but little carbon monoxide, is obtained. This carbon dioxide has then to be absorbed by caustic lime in order to obtain approximately pure hydrogen. This method is unprofitable, because the process has to be kept going by the application of external heat which is costly; and there is very poor utilization of the steam blown in (see, for instance, "Handbuch der Chemischen Technologie," by Dr. F. Fischer, 1900, Vol. I., p. 48, and Haber's "Thermodynamik Technischer Gasreaktionen," p. 121). This process need not, however, be considered here, it is pointed out, especially as it is suitable only for the removal of carbon dioxide and not of carbon monoxide.

The advantages which the process in accordance with this invention,

for the removal of carbon monoxide, have over those hitherto known are therefore: (1) that for each molecular proportion of carbon, two molecular proportions of hydrogen are obtained in accordance with the equations:



and



whereas, according to the processes first mentioned, only one molecular proportion of hydrogen is obtained for each molecular proportion of carbon; (2) oxides, or hydrates, are used as absorbing agents; (3) the absorption process yields a considerable amount of heat; and (4) the absorption agent can be easily regenerated.

Automatic Ignition of Illuminating Gas.

SOCIÉTÉ CHARLES LUBECK, and PAYET, M., of Paris.

No. 3171; Feb. 9, 1909. Date claimed under International Convention, March 5, 1908.

This invention relates to a catalytic material for the automatic ignition of illuminating gas and to a process for producing the material.

Among the oxidized cobalt ores, the patentees state, the hydrated oxide of cobalt, known under the name of asbolite or earthy cobalt, contains about 30 per cent. of oxide of manganese (MnO) to be eliminated and 20 per cent. of oxide of cobalt to be utilized (CoO), and the rest of what is found mixed therewith is composed of impurities, "and more especially of a certain moisture arising from its hydrothermal origin." For the separation or isolation of the oxide of cobalt from this oxide of manganese, after having removed its moisture by calcination, the best process to be employed is the electrolytic one. However, as there exist in commerce oxides of cobalt of 70 per cent. originating from calcination in the air of the hydrated peroxide or of the carbonate, their reduction is more economical for an industrial business. The present process of reduction is effected by heating in a vacuum a mixture of oxide of cobalt in powder (CoO) with cuprous chloride in powder (CuCl - CuCl); this latter remaining insoluble in pure water, but capable of being dissolved by hydrochloric acid. The ensuing result is that there is obtained after the treatment of the mixture by a reducing gas, and afterwards by hydrochloric acid, a double chloride of cobalt and copper. When the cobalt is afterwards attacked by hydrochloric acid in a liquid state, the cuprous chloride will be dissolved finally by the hydrochloric acid; the double chloride of cobalt and copper falling into a receptacle filled beforehand with natural or artificial pumice-stone, or any other magnesium silicate—the whole forming a magma and a liquor.

After cooling, the mass and liquor are applicable for the automatic ignition of any burner provided with a mantle impregnated with oxides of rare earths. The liquor will serve for tracing with a brush several lines called "excitatives" (excitatrices) in the presence of illuminating gas escaping in front of the meshes of the mantle. Or else it can be wholly or partially steeped in the liquor—that is, the mantle be made by woven or isolated threads impregnated with the oxides of rare earths. Afterwards the mass, which will be composed of the double chloride of cobalt and of copper and of the deposited silicate, will, with a little water, serve for the manufacture of a lozenge, which is caused to adhere to, and dry on to, the tissue of the mantle, or to wires of variable forms. Wires thus prepared may be placed on top of the chimney or near the bunsen burner. Consequently, directly the burner tap is turned, the illuminating gas takes fire, due to the property possessed by the double chloride of cobalt and copper of becoming incandescent in the presence of hydrogen or carburetted hydrogen.

In many processes where use has been made of platinum, this latter was often oxidized, it is said, in a short time by moisture, which rendered it unsuitable; but this drawback does not occur with the present invention.

Automatically Lighting and Extinguishing Street-Lamps.

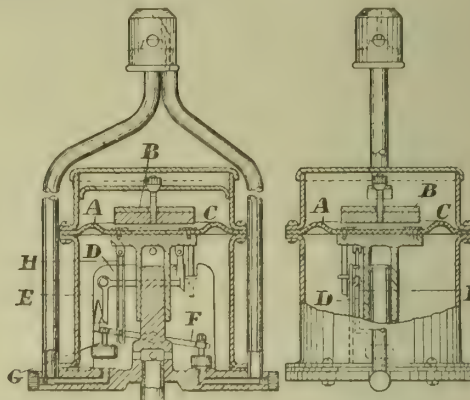
BEDFORD, A. J., of Melbourne.

No. 4333; Feb. 22, 1909. Date claimed under International Convention, Oct. 15, 1908.

This invention relates to street gas-lamp lighting and extinguishing devices in which different pressures, regulated by governors at some central station or the gas-works, operate a flexible diaphragm enclosed within a cylindrical metal casing attached to, and between the burner and the gas supply pipe of, the lamps. The object of the invention is to cause the flexible diaphragm and adjustable loading weights to automatically operate so as to cause the weights to occupy predetermined positions for admitting gas by predetermined variations of pressure through passages to the burner, and for the simultaneous extinguishing of the pilot light—the same means also providing for automatically extinguishing the burner light, cutting off the gas supply to the lamp burner, and simultaneously lighting the pilot light.

The cylindrical casing (as shown) is comprised of two separable sections with flanges, between which is inserted a flexible weighted diaphragm A. The compartment below the diaphragm is employed as a gas-cylinder, in which are contained the various parts of the valve mechanism, which is operated to either admit or shut off the gas supply to the lamp burner or pilot light. Where it is required that a certain number of lamps should remain lighted after other lamps have been extinguished, the suspended loading weights BC are made to occupy a higher position in the upper compartment; and extra loading weights are added upon the top side of the diaphragm for further resisting its upward movement, according to the pressure conditions under which the lamp is to be lighted and extinguished. A vertical plate D is provided with a bottom flange secured to the bottom end cover of the casing; and on it is pivotally mounted, on a projected stud, a bell-crank lever E, the arms of which are of two different lengths, proportioned in weight, in order that the long arm will be heavier than the short one, and thus, after the valve operating mechanism has shut off the gas supply to the burner, it will open the supply of gas to the pilot light.

On the vertically depending arm of the bell-crank lever is a projecting lift catch which engages a catch extended upwardly from one end of the pivoted rocking lever F, from one side of which project two lugs, in each of which an elongated hole is formed. In one hole is pivotally mounted the upper end of the valve-stem G, to the bottom end of which is attached the burner gas-outlet valve, to engage the seat of the lateral gas-port leading to the gas-outlet passage. The stem of the pilot-light valve is fitted to move freely in the other elongated hole of the lug, and is provided at its top end with an adjustable conically-shaped milled nut, and at its bottom end with the pilot-light valve, which engages the seat of a lateral gas-port leading to the gas-outlet passage provided in the bottom cover for the pilot light.



Bedford's Automatic Lamp Lighter and Extinguisher.

In using the device for street lighting purposes, the gas is introduced at a maximum pressure of (say) 45-10ths of an inch, to operate the parts of the valve mechanism to the "first position"—that is, for lighting the burner and extinguishing the pilot light. As the gas is admitted it passes into the cylinder and lifts the flexible weighted diaphragm A, which co-operates with the suspended loading weights B C and the slidable spindle. The upward movement of the diaphragm brings the lower end of the slotted link H into lifting engagement with its pin, thereby actuating the pivoted rocking lever F and simultaneously raising the burner outlet valve, so as to allow gas to pass into the gas-outlet passage and thence to the burner. The same upward movement of the diaphragm places the valve-operating mechanism in the "first position," previously referred to, while the rock movement imparted to the pivoted rocking lever F shuts down the pilot-light valve upon its seat, and prevents the exit of gas to the pilot-light tube. The suspended trip pawl, as it moves upwardly, is also diverted outwardly, to occupy a disengaged position; while the catches of the bell-crank lever and the rocking lever engage with each other. The maximum gas pressure thus retains uplifted the diaphragm and valve operating mechanism in the position for lighting purposes from sunset to midnight or thereabout, when the maximum pressure is reduced to a minimum pressure of (say) 18-10ths. In this case, the lower end of the slotted link H slides in-operatively past the pin of the rocking lever F, while the trip pawl slides downwardly against the fixed guide-pin until its notch engages with the free end of the bell-crank lever E, for suspending the valve-operating mechanism in the "second position" as shown. The gas is maintained at the pressure of 18-10ths until daylight, when it is increased to 25-10ths, to partially uplift the diaphragm A, so that the valve-operating mechanism will be released to occupy the "third position," where the catches are freed from each other, and the trip pawl is disengaged from the bell-crank lever E to permit of the burner gas-outlet valve closing the port for extinguishing the burner light, and allowing of the raising of the pilot-light valve and the opening of the gas-port for the supply of gas to the pilot light for simultaneously lighting it.

Burners for Incandescent Gas-Lamps.

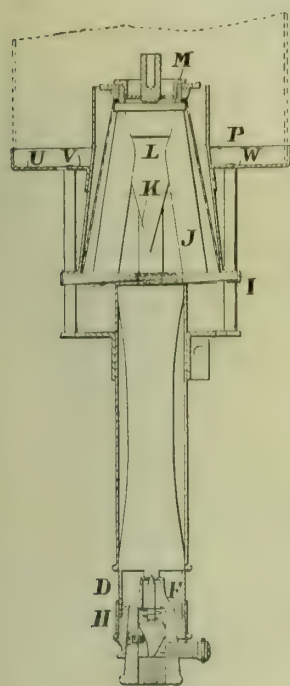
WELSBACH INCANDESCENT GASLIGHT COMPANY, LIMITED, and RULER, W., of Wimbledon.

No. 6542; March 18, 1909.

This invention relates to Kern gas-burners, and more particularly to the larger forms of such burners, suitable for street lighting. It has for its object such a construction of burner that "a flame is produced of sufficient size to light the mantle equally without the employment of a multiplicity of burner-tubes and at the same time give an efficient light at ordinary gas pressures."

Heretofore, in constructing burners of the type referred to, the patentees point out, it "has been found necessary to provide a number of bunsen tubes in order to obtain a flame of sufficient size to illuminate the mantle. With such an arrangement difficulties are met with in regulating the supplies of gas and air to each of the separate bunsen tubes so as to obtain an even light. The present invention consists in the provision of means for supplying air to the centre of a burner of the type indicated supplied with a mixture of gas and air by a single bunsen tube in such a manner that the flame produced is caused to spread so as to illuminate the mantle around its whole circumference."

In carrying the invention into effect according to the form illustrated, there is provided, as is usual in Kern burners, a double truncated cone burner-tube surrounded by a cylindrical casing and connected to it at its upper end. The lower end of the tube is provided with ports D, forming the air-intake for the bunsen burner and screws into a socket mounted upon a nozzle containing a needle valve F, for regulating the gas supply and provided with a screw thread for connection to the gas-supply pipe (not shown). The amount of air taken in at the ports D can be regulated by means of a sleeve H, screwed upon the socket; while to the upper end of the burner-tube is screwed a flange I, upon



A Modified Kern Street-Lamp Burner.

which rests a perforated cone J. Within this cone are three tubes K, converging into an inverted cone-shaped chamber L, to convey air from the outside of the burner cylinder. "A device comprising converging tubes for the purpose of leading a central air supply to a gas-burner is not in itself new, and the same does not form the subject of the present invention."

Screwed into the top of the chamber is a cap M, provided with ports for the passage of the central air supply of the burner and a socket for the mantle support rod. A hollow cone P, having a rim with hooked projections, is placed upon the flange I, and is fixed to it by the engagement of the projections with the underside of the flange. The slots are provided so that the cone can be removed by being turned round into such a position that the projections register with the slots.

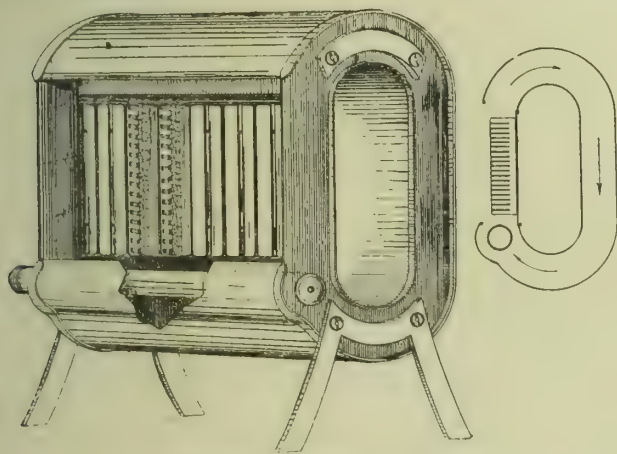
A serrated washer is placed (as is usual in this type of burners) on the top of the cone, and provides the requisite circular passage of the mixture of gas and air between its edge and the inside of the cone. The gallery which carries the chimney support U is of a diameter to allow of an annular air-passage W, between its inner edge and the outer edge of a flanged ring V, placed around the cone P. This air-passage can be regulated by raising or lowering the gallery in relation to the flanged ring.

Incandescent Gas-Fires.

BOUCHER, A. L., of Asnières, France.

No. 7815; April 1, 1909. Date claimed under International Convention, Sept. 7, 1908.

This invention relates to gas heating-stoves and the like "where no discharge shaft is employed and the partially consumed gases are led back to the burners, where they undergo further combustion after circulating through a heating-chamber." The products of combustion circulate in a heating-chamber comprising an annular casing through the centre of which the surrounding air can pass, and afterwards the partially consumed gases join the incoming mixture of air and gas at a point below the burners, whence they flow in a direction parallel to the burner flames on to and around "incandescent radiating members comprising removable and interchangeable metallic elements arranged above the burners."



Boucher's Incandescent Gas-Fire.

The apparatus comprises a double casing formed of two end plates to which are connected side walls comprising two metal sheets between which is left an annular circulating chamber. The front portion of the walls is cut away to form two rectangular openings, the front one of which constitutes the mouth of the radiator. The rear opening is closed by a removable cast-iron plate, which engages projections of the end plates and is provided with nickel plates or flanges riveted thereto and adapted to serve as vertical guides for removable and interchangeable metallic radiating members mounted above the burners.

Carbon Monoxide in Gas.—In the House of Commons last Thursday, Mr. George Roberts, a Labour member, asked the Home Secretary if his attention had been directed to a case of carbon monoxide poisoning arising from the fumes of the gas now largely employed for heating the metal-pots attached to linotype composing machines, and whether he would cause an inquiry to be made with a view to the disease being scheduled under the Workmen's Compensation Act. Mr. Gladstone said the case to which the honourable member had referred appeared to be one of gradual poisoning by carbon monoxide. Such cases were extremely rare; and not another of the kind in connection with linotype work was known to the Department. The question of scheduling carbon monoxide poisoning as a disease was considered by the Industrial Diseases Committee; but they were unable to regard the evidence as sufficient to justify their recommending its inclusion. In view, however, of the case mentioned, he would give instructions for the matter to be carefully watched by the officers of the Department.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Illuminating Power of Vertical-Retort Gas.

SIR,—Owing to absence from home, my attention has only just been directed to the remarks made by Mr. John Young, on vertical retorts, in the course of his excellent inaugural address to the Eastern Counties Gas Managers' Association at Hull last month.

Mr. Young said that the illuminating power of the gas made in vertical retorts on the Continent is only 10 to 12 candles. He, however, made no mention of the fact that this is a result obtained where steaming is resorted to. Where steaming is not resorted to, there is no difficulty in maintaining higher candle powers. In proof of this, I may remind him of the report of the Carbonizing Committee of the Institution of Gas Engineers (signed by Mr. A. E. Broadberry and Dr. H. G. Colman), in which is mentioned, as one of the advantages of this system, "the satisfactory average yield, the purity, and the lighting and heating value of the gas"—this being supported by the average yield of a three days' test of 11,410 cubic feet per ton of 16·10-candle gas (No. 2 burner) and a net calorific value of 540 B.Th.U.

At the Genoa Gas-Works, as pointed out in my letter to you of June 24 last, the average production by this system is upwards of 12,000 cubic feet of 14-candle gas (No. 1 burner). Nor can it have quite passed out of mind that Mr. Hayman, when closing the discussion on the paper which he read last year before the Institution of Gas Engineers, gave, as the result of an extended trial, a yield of 14,522 cubic feet of 14·59-candle illuminating power (No. 2 burner) with a calorific value of 559 B.Th.U.

It is, of course, quite true that the Dessau system of vertical retorts lends itself to the production of high yields of what we are accustomed to term low-grade gas—the gas in all probability of the future; but it is equally true that it is capable of satisfying, with unsurpassed economy, the ordinary candle power requirements of to-day.

17, Victoria Street, S.W., Oct. 19, 1909.

CHARLES HUNT.

The St. Helens Vertical Retort Results.

SIR,—In your issue of Sept. 28 appears a letter from Dr. H. G. Colman, commenting upon an article by me; and while that letter is a vindication of the attitude taken in the article—viz., that complete information was necessary for estimating the value of a new process—it raises a question to which perhaps a reply may be expected by some of your readers.

Dr. Colman, after admitting that I was obliged to make an assumption before I could compile a balance-sheet, says "he has taken the water yield as 29·6 gallons in the first case and 21·7 gallons in the latter. Such figures would, if true, certainly be very abnormal—especially the former—and in point of fact are much above the actual yield in both instances." As to this remark, while thanking Dr. Colman for supplying a missing link—viz., the virgin liquor—it may be asked, Where was the writer's unreasonableness in assuming 10 gallons of scrubber water per ton of coal?

Further, Dr. Colman's figures leave the matter of total ammonia liquor in some uncertainty, for they apparently lead to the following deduction:—

	Test No. 2.	Test No. 3.
Total ammonia liquor equivalent to 10 ozs.		
Liquor	406 lbs.	325 lbs.
Virgin liquor	141 lbs.	121 lbs.
Leaving ammonia liquor unexplained	265 lbs.	204 lbs.

The words apparently and equivalent are italicized because probably they afford a clue to the misunderstanding; for in the original report the ammonia liquor is stated as an equivalent and not as an actual quantity realized. That mode of statement does not, however, conduce to a clear comprehension of the water production. Certainly no gas engineer would have assumed anything like these figures of 265 and 204 lbs. respectively for the scrubber liquor, and they are much less antecedently probable than 29·6 and 21·7 gallons of virgin liquor; for with coal washed or from a wet seam these figures may be reached.

The remainder of Dr. Colman's letter refers to experimental difficulties that exist, which he fears cannot be overcome. However, as knowledge of a disease is often half way towards a remedy, the writer is at work endeavouring to assess the magnitude of their influence.

I have to acknowledge the kindness of Dr. Colman and Mr. John West in furnishing me with some further useful facts relative to the various tests of the interesting installation at St. Helens.

5, Victoria Street, S.W., Oct. 25, 1909.

THOS. HOLGATE.

German v. English Gas-Retorts.

SIR,—The letter signed by Mr. Charles Carpenter, in your last issue, is of considerable interest to myself, and, no doubt, to other retort manufacturers in this country, who are asked: When will the British manufacturer use "brains" in compounding his retorts? The writer has been trying to do this for some time; and Mr. Carpenter was good enough, a few months ago, to put in a sample bed of retorts which had been made on different lines from those usually followed in this country. I venture to hope he will pay some attention to these retorts, to see if our exercise of "brains" has resulted in the production of a British retort which is equal to any made in Germany or elsewhere.

I would remind Mr. Carpenter that the selling price of retorts in Germany is about double that obtained in this country, which may or may not account for the supposed better retort made there. I do not know whether the German makers are told in Germany, as we are told here by many engineers, that the only way to obtain orders is to quote the lowest price. I have not found much enthusiasm among engineers

to encourage me in producing a better, and consequently a more expensive, retort than has hitherto been in use. Something cheap, and the cheaper the better, seems to be in request.

JOSEPH MORTON,
Managing-Director, Joseph Morton, Limited.

Halifax, Oct. 20, 1909.

English Gas-Works Orders for Continental Firms.

SIR,—Doubtless many will have read with surprise Mr. Carpenter's letter in the last issue of the "JOURNAL." Apart from the placing (just now) of one of the most powerful political levers in the hands of those who care to add their whole "Budget" of weight and strength on the "long leg" of the lever, Mr. Carpenter might tell us if the present order for retorts is the first one given to a German firm by the South Metropolitan Company. If it is not, then why has no mention been made of the orders "gone before"? There is apparently aptness even in Time.

Exeter, Oct. 21, 1909.

T. SETTLE.

Scientific Methods of Manufacturing Gas Appliances.

SIR,—I have been particularly interested in reading the article in the Oct. 19 issue of the "JOURNAL," bearing upon scientific methods as applied to the manufacture of gas cooking and heating appliances; and I should like to express my very cordial agreement with the opinions to which you give voice.

At the same time, may I point out that my Company have for many years realized the importance of scientific research work; and when our new works at Luton were built, and we were no longer restricted in the matter of space, considerable scope was allowed to the special department dealing with this section of our business. In spite of this fact, however, our laboratories have recently been so overtaxed that it has become necessary to extend them very considerably.

This particular department is under the charge of a fully qualified gas engineer and staff. The extensions, we expect, will be completed by the end of the year, when our present scientific appliances will be considerably augmented.

Luton, Oct. 23, 1909.

CYRIL G. DAVIS, Managing-Director,
Davis Gas-Stove Co., Ltd.

Gas Coal from Nova Scotia.

SIR,—I can quite believe, as stated in the article on the above subject in the last number of the "JOURNAL," that the Dominion Coal Company of Nova Scotia would not, for a contract of 100,000 tons or upwards, consider a price lower than from 9s. to 10s. per ton f.o.b. at Sydney or Louisberg, because they have a practical monopoly of the trade at these ports; but this would not prevent other mines being opened by the gas companies themselves for their own supply, and so getting the coal f.o.b. for 5s. 3d. The profit made by the Dominion Coal Company is certainly more at the present time than the difference between 5s. 3d. and 9s. or 10s. Other coal companies are now in process of formation, and there are other coalfields to be had; and if the gas companies coalesced with some of these promoters and proprietors, they could get the coal f.o.b. at almost cost price, which would be even less than 5s. 3d. per ton, especially if they did so on a profit-sharing basis with the miners, like the South Metropolitan Gas Company.

15, Walbrook, E.C., Oct. 20, 1909.

EDMUND KIMBER.

[Our correspondent holds that the prices quoted by the Dominion Coal Company carry about 100 per cent. profit. We have no figures by us to affirm or to contest his statement. But he suggests that other companies are in course of formation with which British gas undertakings could enter into agreements for the supply of gas coal at about 5s. 3d. or below per ton. When the provision of large ships to carry the coal is considered, and the cost of transmission and handling is added, there would be many occasions when home market conditions would cause regret that a gas undertaking was saddled with such a contract. There is, too, the unknown future. Present arrangements might be entered into, with new coal companies, on a satisfactory basis; but there is no assurance as to the future. It is morally certain that their plans would be subject to the retaliation of existing companies. A low export price would mean a low price in Nova Scotia; and we should look very dubiously upon the new companies being in a position to absolutely direct the course of market conditions as suggested. Mr. Kimber does not deal with the three practical points as to the large vessels that would be required to bring the coal to this country from Nova Scotia, the cost of conveyance (which is rather more than he originally estimated), and the dangers besetting regularity of delivery from such a distance. Buying coal from so far away would detract from the purchaser's power of control, and from the opportunities for accelerating dispatch, such as obtain when the seat of supply is much nearer the point of consumption. In gas making, regularity of coal delivery is an important factor in economical working. In making these remarks, we should not like it to be thought that there is any opposition on our part to a cheap supply of coal from abroad. What we want to get at is, would it really be cheap, and are there any considerations that for gas-making purposes would need to be weighed against a lower cost?—ED. J.G.L.]

The Bingley Urban District Council have decided to appoint a deputation to wait upon the Bradford Gas Committee and ascertain the lowest price for the purchase by Bingley of the rights of gas supply at Wilsden.

LEGAL INTELLIGENCE.

CONSTRUCTION OF UNAUTHORIZED WATER-WORKS.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Tuesday, Oct. 19.

(Before Lords Justices VAUGHAN WILLIAMS, BUCKLEY, and KENNEDY.)

Attorney-General v. Barnet District Gas and Water Company.

This was an appeal from the decision of Mr. Justice Ridley, granting an injunction to restrain the Barnet District Gas and Water Company from sinking a well at Colney Heath for the purpose of obtaining an additional supply. The proceedings in the Lower Court were reported in the "JOURNAL" for July 13 (p. 125).

Mr. BALFOUR BROWNE, K.C., Sir ROBERT FINLAY, K.C., and Mr. J. D. CRAWFORD (instructed by Messrs. Bannister and Reynolds) appeared for the appellants; Sir ALFRED CRIPPS, K.C., Mr. DANCKWERTS, K.C., and Mr. EUSTACE HILLS (instructed by Messrs. Nicholson, Patterson, and Freeland) represented the respondents.

Sir ROBERT FINLAY, in opening the appeal, said it raised two questions. One was the construction of the Private Act authorizing the Company to carry out certain additional works for the purpose of obtaining water; and the other—which only arose if he were wrong on the first point, and bore on the discretion of the Court in granting an injunction—related to an agreement entered into while the Bill was going through the Committee, which showed that the intention of all parties to the agreement was clearly that the clause in question should give the Company power to do that which the relator was now seeking to restrain them from doing. He proposed first of all to address himself to the construction of the Statute; and he hoped to fully satisfy the Court that Mr. Justice Ridley was wrong in thinking that the authorities cited on the other side (chiefly the Frimley and Farnborough case*) had any bearing on this particular matter. The question referred to a piece of land at Colney Heath, which was substituted, during the progress of the Bill, for a plot at Little Berkhamstead that was originally contemplated. He relied, in the first place, on section 12 of the Water-Works Clauses Act, 1847, which was incorporated with the Private Act, and gave power to the undertakers, among other things, to sink wells or shafts, and erect buildings, &c., for the purpose of supplying water. It was held in the Frimley case that the incorporation of the Act of 1847 in any Special Act did not authorize a company to sink wells except in accordance with the provisions of the Special Act in regard to where they should be sunk. This was the authority on which Mr. Justice Ridley proceeded; but he (Counsel) was going to submit that, having regard to the words of the Special Act in this case, the decision had no application. It was decided by Mr. Justice Swinfen Eady, and confirmed by the Court of Appeal, that the power to sink wells must be read along with the terms of the Special Act authorizing certain statutory water-works; and if by the Special Act only wells at particular points were sanctioned, the power conferred by section 12 could not have any application to other pieces of land which a company might acquire under their Act, but without reference to the construction of wells. The Barnet Company's Special Act of 1904 incorporated in section 3 the Water-Works Clauses Acts, 1847 and 1863, in general terms; but in section 10 there were express words to the effect that the Company might, on all or any of the additional lands to be acquired under the Act, execute, for the purpose of, or in connection with, the water-works, any of the works, and exercise any of the powers, mentioned in, or conferred by, section 12 of the Act of 1847. He submitted that this section authorized the sinking of wells on the land therein referred to. This construction was strengthened by some of the following clauses. For instance, section 11 was introduced for the protection of the county of Middlesex; and it provided that no well should be sunk on any land acquired in that county. Section 12, which was similar in general character, dealing with the county of Hertford, did not forbid the sinking of wells; and it seemed to him plain that if there was no power at all to sink wells, it was quite unnecessary to refer to them in section 11. The learned Counsel went briefly over the remaining sections, then read Mr. Justice Ridley's judgment, and submitted that his Lordship was mistaken in thinking that this case was covered by the Frimley decision.

Lord Justice KENNEDY asked what use the land at Colney Heath would be to the Company if they could not sink a well.

Sir ROBERT FINLAY replied none at all. The Company would have to get an amending Act if the judgment appealed against were sustained. He thought it would be as well to have this question of construction decided before dealing with his second point.

Sir ALFRED CRIPPS assented, and proceeded to open the respondents' case. He submitted, with regard to the construction of section 10, that the principle of the Frimley case was decisive, and that Mr. Justice Ridley was perfectly right in applying it. The principle of that case was that Parliament did not give a water company a roving power to make a well anywhere they pleased, but only power to construct the authorized water-works, and supply water from them; the reason being that persons might not have their rights with regard to water affected without having notice, and having the opportunity to protect themselves. A deep well might affect people many miles away. This was why, in such cases, the Attorney-General intervened on behalf of the district generally. There was also the question of the nature of the water to be supplied. If a company were allowed to obtain it wherever they thought fit, they might procure it from a contaminated source. He submitted that there was nothing in the appellants' Act which gave them what would be quite an abnormal power, such as was entrusted to no other water company. Counsel then proceeded to comment on the various sections of the Act, and on the judgments in the Frimley case, to show that the powers conferred by section 12 of the 1847 Act only applied to the authorized works of the Company.

* See "JOURNAL," Vol. CI., pp. 636, 843.

Lord Justice VAUGHAN WILLIAMS asked what was the present source of supply.

A discussion of some length ensued as to the source of supply indicated by the Company's original and subsequent Acts, one of which (that of 1887) contained a section almost identical in terms with section 10 in the Act of 1904, under which, it was said, three wells had been sunk.

Sir ALFRED CRIPPS said it might be that some of the existing works were really unauthorized. Until the Frimley case was decided, there was a general impression that section 12 of the Act of 1847 entitled water companies to sink wells on any lands they might acquire.

Sir ROBERT FINLAY, in reply, again submitted that the Frimley case was no authority for the present one, the circumstances being so entirely different. He invited their Lordships to look at the original Act of the Frimley Company, in which the source of supply was specifically pointed out; whereas in the Barnet case there was power given in the various Acts of the Company to execute any of the works mentioned in section 12 on any of the lands they then held or might acquire under the Acts.

Wednesday, Oct. 20.

Sir ROBERT FINLAY resumed his reply this morning, and read the relevant sections from the appellant Company's Acts of 1872, 1883, and 1887, in the last of which section 16 was almost identical in terms with section 10 of the Act of 1904; and under it the Company had sunk wells. It was inconceivable that when, in 1904, the Legislature found that the existing wells had been constructed under the powers of the earlier Acts, and reproduced the language of section 16 of the Act of 1887, they did not intend to authorize doing again what had been done already. The learned Counsel proceeded to read from the judgments in the Frimley case, both in the Court below and in the Court of Appeal, to emphasize the point that the circumstances of that case were entirely different from those of the present.

Sir ALFRED CRIPPS asked leave to say something with regard to the points raised on the earlier Acts of the Barnet Company which had been referred to first in reply. He submitted, in substance, that the Acts did not carry the matter any further, and that the wells constructed under the Act of 1887 were also *ultra vires*. Judgment was reserved.

THE WELSBACH COMPANY'S TRADE MARK.

Clerkenwell Police Court.—Saturday, Oct. 23.

(Before Mr. BROS.)

His Worship had before him a summons taken out by the Wolfram (Tungsten) Metal Filament Lamps, Limited, against the Welsbach Incandescent Gaslight Company, Limited, for having sold and exposed goods to which a false trade description had been applied.

Mr. RUFUS ISAACS, K.C., M.P., Mr. H. A. COLEFAX, and Mr. ERNEST LUNGE appeared for the prosecution; Mr. A. H. BODKIN and Mr. WALTER represented the defendants.

Mr. RUFUS ISAACS, in opening the case, said the summons was issued under the Merchandise Marks Act, 1887, against the Welsbach Company, for selling and exposing goods to which a false trade description had been applied; the acts relating to three specific days—viz., the 22nd and 29th of September and the 8th of October of the present year. The Company was incorporated for the purpose of dealing with the inventions of Baron Auer von Welsbach, the inventor of the incandescent gas-mantle now so generally in use. He (Counsel) was not concerned, in any of the summonses, with what had happened in relation to gas lighting. He wished, however, to state that the association of the defendants with Baron von Welsbach was entirely in relation to gas lighting, and had no connection whatever with electric lighting. Baron Welsbach's gas inventions were acquired by a German Company, known in this country as the Auer Company; and they subsequently acquired an invention of his in relation to electric lamps, of which the filament was of metal instead of carbon, which had practically ruled the market. The metal of which the filament was made was called "Osram;" and the lamp was designated the "Osram" lamp. Inventors had apparently been devoting a considerable amount of attention to finding some means of making a metal filament which would be commercially useful; and Baron von Welsbach had succeeded in doing it. But this was never in any way, either as an invention or as a manufacture, acquired by the Welsbach Company. The rights in it were acquired by the Auer Company, who, by agreement, appointed the General Electric Company, Limited (an English Company), as the exclusive agents for the sale of the lamp. After a little time there was an invention which might be described as of great practical commercial utility, which consisted, among other things, of using for the filament a metal known as "Wolfram," or "Tungsten," which appeared to be a cheaper or commoner kind of metal; the result being that it became at once a very useful and most valuable means of making metal filament lamps. The Osram lamp was then made of wolfram or tungsten, under the invention of the Auer Company, who introduced the Osram lamp into this country. It was important to bear in mind that the Auer Company was the pioneer introducer of the metal filament made of tungsten. The German Company appointed at first the General Electric Company as their sole exclusive agents for the purpose of disposing of the Osram lamps in England; and subsequently, under the new Patents Act, a factory was established and lamps were manufactured of the metal by a Company known as the Wolfram (Tungsten) Metal Filament Lamps, Limited, who had the exclusive right of sale of the Osram lamp. Consequently, there was a large consumption and a great demand for it. This lamp, made of tungsten, was not the invention of Welsbach, and had nothing to do with him, except that he had first invented a metal filament lamp of a different make. Also, the Welsbach Company had nothing to do with these electric lamps, either with Welsbach or with the Auer Company. On the 27th of September this year, there was a full page advertisement in the "Daily Telegraph;" and it was

repeated on subsequent days in other well-known newspapers, which bore the words "Welsbach" and "AUR" and the words: "Remember that the electric metallic filament lamp was invented by Baron Welsbach, and see that the trade mark 'AUR' appears on every lamp." Counsel contended that this statement, taken in conjunction with the lamp shown in the picture, was calculated to lead persons to believe that the lamp which the Welsbach Company were then offering was one which had been either invented or manufactured by Baron Welsbach or the Auer Company, which was also associated with Baron Welsbach's invention. On the 29th of September, Mr. Hale went to the Welsbach Company's premises, in Gray's Inn Road, and asked the young lady attendant for some lamps as advertised by the Company, and she produced some. He asked if they were Baron von Welsbach's lamps, and she said "Yes." Thereupon he went to another room, where the salesmen were, repeated the question, and received the same answer. He purchased the lamps, and paid 5s. 5d. for them. On the 8th of October, Mr. Hale went again to the Company's premises and purchased additional lamps; and he (Counsel) desired to call attention to the invoice given with them. It bore the words "Baron von Welsbach." This document was, he submitted, a statement by the Company that the lamps they were selling were invented or manufactured by Baron von Welsbach, which was untrue. The "AUR" was a trade mark which the Company had used. But whether or not they had the right to use it in connection with electric lamps was, he submitted, dealt with clearly under the Patents Act; and it could not be a defence to say that that trade mark was on the register.

Formal evidence of registration having been given, the case was adjourned.

A summons issued against Mr. Laurence Fletcher, the Managing-Director of the Welsbach Company, for "having caused the false trade description to be applied" was also adjourned.

TICEHURST AND NEW TODDINGTON GAS COMPANIES.

Receivers Appointed.

In the Chancery Division of the High Court of Justice last Friday, before Mr. Justice Joyce, Mr. Hughes, K.C., and Mr. Hurrell (instructed by Mr. M. J. Jarvis) appeared in the case of *Locke v. Ticehurst and District Gas and Water Company*. Mr. Hughes said it was a debenture holder's action; and he moved for the appointment of a receiver and manager; the interest being in arrear. There was no question about the right to a receiver; but the Company being a statutory one, he was afraid there was a difficulty about getting the further relief asked—viz., the appointment of a manager. It was an unfortunate case, and probably it would be better for everyone concerned if a manager could be appointed. Mr. Kirby, who (instructed by Mr. Barnes) appeared for the Company, said he was afraid his Lordship had no power to appoint a manager—only a receiver of the rates and tolls. Mr. Justice Joyce said there would be the usual order; the statutory management would still continue to act, as he could not turn them out. Mr. Hughes said it was very unfortunate, because the Directors had not called any meetings, or rendered any accounts for several years; but he was afraid nothing more could be done. His Lordship said in these cases there was a common form of order which would be followed.

The case of *Goodson v. New Toddington Gas Company* was also before his Lordship; the action being on behalf of the debenture holders. No one appeared for the Company, and an order was made as in the preceding case.

Damages for Malicious Prosecution.

At the Lambeth County Court last Tuesday, Alfred Highmore, of Avondale Square, Old Kent Road, sued the South Metropolitan Gas Company to recover £50 damages for alleged false imprisonment and malicious prosecution. Mr. Hastings, who appeared for the plaintiff, said that on the latter's premises was a slot-meter, and it was the practice of the plaintiff, as also of other people, when they found they had not a coin of exact size, to cut a piece of metal, which was simply put into the meter for the purpose of working it. When the Company's official came, and it was found that the amount was short, the difference was paid. The plaintiff, however, was charged with stealing the money, and was committed for trial. But at the Quarter Sessions, he was discharged without any witnesses being called. Judgment was given for the defendants, with costs.

Claim against the Gaslight and Coke Company.

At the Woolwich County Court last Wednesday, his Honour Judge Willis had before him a case in which Arthur Robert Hodgkins sought to recover from the Gaslight and Coke Company compensation, under the Workmen's Compensation Act, for injuries sustained while in their service. Claimant was working on a hydraulic charger on the 16th of February, and had to stand on a stool. He stated that the stool slipped and he fell a distance of about a yard. Only one of his feet touched the platform on which the charger stood—the other remaining on the stool; but that leg was twisted, and he was unable to continue his duties. He went back and tried on more than one day to work, but finally had to leave off, and was not able to do anything. His Honour awarded applicant £12 18s. 9d. compensation.

Gas Explosion at Tranmere.—A house at Lower Tranmere was much damaged by a gas explosion last Sunday week, and Mrs. Hill, the tenant, received injuries which necessitated her removal to the hospital. On the evening of the accident, Mrs. Hill's son detected a strong smell of gas in the parlour. He went into the room, opened the window, struck a match, and immediately there was a violent explosion, which, it is conjectured, was caused by a defective pipe within the walls allowing of an escape of gas into the room.

MISCELLANEOUS NEWS.

GAS TESTING IN LONDON.

London County Council and the Gaslight and Coke Company.

At the Meeting of the London County Council to-day (Tuesday), the following report of the Public Control Committee will be presented.

Among the Acts passed during the current session of Parliament, affecting the work of the Council, is the Gaslight and Coke Company's Act, 1909, which received the Royal Assent on Aug. 16. The Act provides, *inter alia*, for the transfer to that Company of the undertaking of the West Ham Gas Company, and makes certain alterations as regards the standard quality of the gas to be supplied by the Company.

As from the date of the passing of the Act, the standard illuminating power of the gas was reduced from 16 to 14 candles—thus placing the Company in a uniform position in this respect with the other two Metropolitan Gas Companies. Provision is made for a consequential reduction in the standard price, &c., of gas, and for the Company to supply, gratis, burners suitable for the lower illuminating power in place of those already in use.

The Council did not oppose the lowering of the standard of illuminating power, but successfully directed its efforts to securing a standard of calorific power. The standard fixed is 125 calories net per cubic foot of gas, with an allowance of $12\frac{1}{2}$ calories (10 per cent.) on an average of each of three days, or of $18\frac{1}{2}$ calories on any one day. That is to say, the Company is now liable to forfeitures if the calorific power falls below 106 $\frac{1}{2}$ calories on any one day or below 112 $\frac{1}{2}$ calories on an average of three days. The Board of Trade is authorized to vary the standard on the expiration of three years, on appeal by either the Company or the Council.

In order to take advantage of the provisions of the Act without adding to the work of the Gas Examiners, we have arranged for the testings for calorific power, which up to the passing of the Act were taken for information only, to be continued, but for only one testing for illuminating power with the flat-flame burner to be made weekly on Sundays at each testing-place, instead of three testings daily—the daily testings for sulphur impurities being continued; and that a test for calorific value on Sundays shall be substituted for the usual illuminating power testings by means of the argand burner.

In view of the diminishing importance of illuminating power testings, and the general unification of the standard, we have given authority for the number of testing-places at which such testings shall be made on Sundays in the districts of the two Companies not working to a calorific standard, to be varied from time to time. We think that, by the arrangements above indicated, the interests of the consumers will be adequately safeguarded.

DANISH GAS COMPANY.

At the Ordinary General Meeting of this Company to be held on Thursday, the Directors will report that the net revenue for the year ended the 30th of June is £66,228; and that as the amount brought forward from the last account is £37,659, the total standing to the credit of the profit and loss account is £103,887. Compared with the previous year, there was practically no increase in the revenue; while the quantity of gas sold was greater by 3.67 per cent. The Directors say these figures may yet be considered satisfactory, because the price of gas was less in the past year by nearly 2d. per 1000 cubic feet, and wages and wear and tear cost more. The smaller percentage of increase in sales is mainly due to the new law as to the closing of shops.

After charging the debenture interest and the loss on exchange, and setting aside £13,000 to the reserve and redemption account, there remains £80,257 available for distribution. An interim dividend of 2 $\frac{1}{2}$ per cent. on the preference shares and 4 per cent. on the ordinary shares was paid on the 25th of March; and the Directors recommend that dividends should be declared of 2 $\frac{1}{2}$ per cent. on the preference shares and 5 per cent. on the ordinary shares. Further, that a bonus of 1 per cent. be paid on the ordinary shares in respect of the year. These dividends will amount together to £43,500, and will leave a balance of £36,757 to be carried forward.

During the year, there was charged to capital account £69,470, of which £35,852 represents expenditure in connection with new buildings, apparatus, mains, meters, &c., at the several stations of the Company, and £33,618 the further expenditure in connection with the new works which are being erected at Flensburg. At amount of £77,244 is written out of the capital account for the Randers works, &c.; these works having been taken over by the town, as from the 1st of April last, on terms which, under the special circumstances of the case, the Directors state are satisfactory to the Company.

Accompanying the Directors' report is that of the Engineer (Mr. A. W. Edwards). He states that the total consumption of gas in the twelve months ending the 30th of June was 1,139,122,000 cubic feet; being an increase of 40,355,000 cubic feet, or 3.67 per cent., compared with the previous year. This increase is below the average, and Mr. Edwards says it may be accounted for partly by depression in trade and industry in Denmark, and partly by the new law referred to in the report of the Directors. Dealing with the different stations, Mr. Edwards reports that the building of the new works at Flensburg is making satisfactory progress. The new condensing plant at Odense has been completed and is working well. The new gasholder at Aalborg has been erected and brought into use; and the relaying of the trunk main through the town has been completed. The new retort-house and ovens at Viborg are working well. New gasholders are being built at Assens and Elsinore. The working at the Strandvej and Frederiksberg stations is satisfactory. The first year's working of the new Tikjob district has been satisfactory—the consumption being more than had been estimated. The Company are in negotiation with the Afminderod-Gronholt Council regarding the supply of gas and water to their district from the mains in the Tikjob district. As to residuals, tar has been depressed in price, but the demand for coke is good.

NEW GAS SUPPLY FOR HAILSHAM.

Inauguration Ceremony.

The new gas supply for Hailsham was started on Monday of last week by the turning of a valve which allowed the gas to flow from the Eastbourne Gas Company's mains into those of the Hailsham Company, whose undertaking, as will be remembered, was recently absorbed by its larger neighbour. The laying of the trunk main from the Eastbourne works to connect up Hailsham has been quite an extensive work, representing nearly 10,000 yards of 12-inch pipes. By the desire of the East Sussex County Council, the main has been laid at a uniform depth of 2 ft. 6 in. below the surface of the roadway; this depth being considered necessary owing to the vibration caused by heavy traffic. The work has been done entirely by administration, under the direction of Mr. John Hammond (the Resident Engineer), assisted by his son (Mr. W. H. Hammond). The ceremony attending the turning on of the gas took place in the presence of the Directors and officials of both the Eastbourne and Hailsham Companies, and a number of residents. A timber framework erected near the point where the two systems of mains join bore several modern gas-lamps, below which appeared the inscription "May Cheap Gas further Hailsham's Prosperity."

Mr. J. J. WHITE (the Chairman of the Hailsham Gas Company) remarked that in 1853 a few people in Hailsham combined together in order to form a Company to light the streets, and generally to supply the town. They started by charging 8s. 4d. per 1000 cubic feet. But this was too dear for consumers; and in the following year it was reduced to 6s. 8d., at which figure it remained for 25 years. In 1880, it dropped to 5s. 10d.; and in 1895, it fell as low as 5s. But then came trouble in the coal world; and in 1900 they had to advance the price to 5s. 10d. In 1901, the Company managed to reduce the price to 5s. 5d.; and now, as a result of the amalgamation with the Eastbourne Company, the inhabitants of the town were to have their gas at the exceedingly low figure of 2s. 11d. As Chairman of the Hailsham Gas Company, he had been blamed for handing over the undertaking to the Eastbourne Company. Had the concern been retained in local hands, the consumers could never have hoped for the advantage they were about to enjoy; and the shareholders must always have been content with less than 10 per cent. for their money. They were to have cheap gas; and he hoped they would take full advantage of the concession by burning the gas freely both for illuminating and cooking purposes. He would now request Dr. Jeffery to turn on the gas from the new main.

Dr. G. A. JEFFERY, J.P. (the Chairman of the Eastbourne Gas Company) said he had never before been called upon to perform so novel a function as this; but his position was a very pleasurable one, since he had the privilege of opening a supply of gas from Eastbourne to Hailsham—a gas so cheap that everyone might use it, and affording a light so brilliant, so soft, and so reliable as to make it a pleasure to read or work by it; while it was second to none for cooking and heating purposes. But beyond all this, he believed they were cementing a friendship which already existed between the two towns.

By turning a lever, Dr. Jeffery then admitted the gas into the Hailsham pipes from the Eastbourne Company's new trunk main; and the overhead lamps became automatically illuminated. The operation evoked hearty applause, which was renewed when Dr. Jeffery formally announced that the new supply had now definitely commenced.

A party of nearly forty subsequently sat down to lunch at the George Hotel, on the invitation of the Directors of the Eastbourne Gas Company—Dr. JEFFERY presiding. A toast list was gone through, in the course of which testimony was borne to the friendly character of the negotiations that had taken place between the Companies, and to the liberal manner in which the Eastbourne Company had behaved.

Mr. WHITE, in proposing "The Chairman," said the Eastbourne undertaking had had the advantage of a continually increasing population. This assistance had, no doubt, tended to further its welfare, so that it had at length been able to reduce the price of gas to 2s. 6d. per 1000 cubic feet. Another advantage it had enjoyed was that of having a wise and capable Chairman, not for any short time, but for a great number of years. They all knew that, if a thing was to be successful, there must be continuity of purpose over an extended period. The Eastbourne Company had had this advantage in the person of the gentleman who was presiding over them that day. The Hailsham Company had had four or five different Chairmen; but the Eastbourne Company were more fortunate. They of the Hailsham Company desired through him (Mr. White) to ask Dr. Jeffery's acceptance of a memento of the day's proceedings. The inscription on the silver salver which he asked the Chairman to accept was as follows:—

The Eastbourne Gas Company,

With which is Incorporated the Hailsham Gas Company.

PRESENTED TO DR. G. A. JEFFERY, J.P., C.A.,

Chairman of the Company,

To Commemorate the Turning-on of the Gas Supply from Eastbourne to Hailsham.

Oct. 18, 1909.

He thought when the family of Dr. Jeffery, in the years to come, looked on the gift and reflected what their father had done, they would be proud of the long and active life devoted in so many ways to the public service.

Dr. JEFFERY, in responding, said he was taken quite by surprise at this especial mark of their kindness and goodwill. He thanked Mr. White particularly for his complimentary references. He valued the gift very highly, and he also greatly appreciated the cordiality with which his name had been received in connection with the toast. He should retain a grateful recollection of their kindness, and also pleasant memories of the day's proceedings.

Mr. J. S. GARRARD (the Secretary of the Eastbourne Gas Company), proposed "The Chairman of the Hailsham Gas Company," and Mr. F. R. HOLMAN also bore testimony to the excellent services rendered by Mr. White in bringing about the consummation which was being celebrated that day.

The toast was drunk with great heartiness.

GAS APPLIANCES AT THE BREWERS' EXHIBITION.

The collection of machinery, appliances, and produce which is annually on view at the Agricultural Hall, Islington, towards the close of October, under the title of the Brewers' Exhibition and Market, has of late years lost much of its old interest for readers of the "JOURNAL," and the thirty-first of the series, which closed last Friday, contained little to raise it above the level of its immediate predecessors.

Gas-stove makers who formerly exhibited have retired, and left the Richmond Gas Stove and Meter Company, Limited, in possession of the field; and a brilliant show they always make. This year it comprised an excellent collection of gas cookers and fires, gas-steam radiators, stoves, hot closets, carving-tables, &c. There were also at their stand several of the "Syphon" bar stoves made by Messrs. S. Clark and Co., of Canonbury, who, as is well known, make a speciality of these stoves, which are largely in use in public-houses, hotels, restaurants, &c., as they combine hot-water heater, muller, coffee-urn, and heating-stove. The entire stand was brilliantly illuminated by Messrs. J. & W. B. Smith, of Farringdon Road, who employed for the purpose their "Silva" inverted incandescent gas-lamps, which are excellent for inside shop lighting. The firm claim for each burner used in these lamps (varying from one to three) a lighting capacity of 125 candles with a consumption of about 4 cubic feet of gas per hour. Not far from this stand was that of the Eagle Range and Gas-Stove Company, Limited, who showed in operation a number of improved coal ranges. In the gallery, the Chipperfield Lamp Syndicate, Limited, had on view two of their high-power self-intensifying gas-lamps, which were fully described in the "JOURNAL" for Sept. 29, 1908.

Among the other exhibits, two connected with water supply may be briefly noticed. At the stand of Messrs. T. & E. Wannbacher, the Ruud instantaneous automatic water heater was seen in operation. The apparatus consists of an insulated cast-iron jacket containing a long copper heating-coil under which is an improved bunsen burner. The automatic mechanism consists of a water-valve of simple construction and an "internal" thermostat. The latter, which regulates the temperature of the water by controlling the flow of gas to the burners, is constructed in accordance with Ruud's patent. The opening of any hot-water tap which may be connected to the heater causes the water-valve on the latter to open a gas-valve, and the gas is lighted from a pilot flame. The water heats as rapidly as it is drawn, and flows at a good temperature as long as the tap is open. When this is closed, the gas is instantly shut off. The apparatus can be attached to any existing water supply.

Messrs. W. M. Still and Sons, Limited, showed a specimen of Jones and Still's patent automatic water-boiler, to facilitate the preparation of hot drinks, tea, &c., automatic gas-steam boilers for cooking, and an automatic gas circulating boiler for lavatories, baths, and wash-ups. These appliances are economical in operation, as the consumption of gas is small while it is in use, and it is automatically cut off when the water boils. Another feature is that only boiling water can be drawn from them.

LIGHTING DEVICES AT THE DUNDEE EXHIBITION.

Towards the close of the account given in the "JOURNAL" for the 12th inst. of the exhibition of gas appliances which was opened in Dundee the preceding Wednesday, it was mentioned that one of the stands on which some elegant lighting devices were shown was that of Messrs. Hands and Co., of London and Glasgow. Some of these may be more particularly noticed.

The above-named firm had on view on their stand a good range of hand-beaten art metal gas-fittings, finished in oxidized copper, which were very much admired by visitors; and we understand that considerable business in this class of goods was done at the exhibition. They also showed their latest form of vertical inverted burner, their special claim for which is that it has a perfectly cool head, and carries an absolute guarantee not to discolour any fitting upon which it is used. Some of these burners, which were described and illustrated in the "JOURNAL" a few months ago, were in use upon the fittings displayed; and it was pointed out by the firm's representatives that there was not the slightest discoloration upon them. The "Dreadnought" lamp, to which attention has already been called in our columns, is another patent of this firm which has been specially designed to meet gas companies' requirements. Every part is standardized, interchangeable, and readily accessible. It is a particularly compact lamp—the diameter of the body, which is of copper, being only 6½ inches; and it is made for various numbers of burners, ranging from one to five. It is British made throughout, and has a lighting efficiency of 125 candles per burner for a consumption of rather less than 4 cubic feet of gas per hour.

The "Norwich" system of gas lighting—another of the specialities of the firm—was also in use. It is claimed that there is nothing in the system to cause any trouble; and considering that all parts of the switch and valve are made of metal, an installation once put in should last for many years without requiring renewals or repairs. Another advantage is that no air-tubes or electric wires are required to be twisted round the fittings to be controlled. Messrs. Hands also showed a patent safety cock which it is impossible to turn on accidentally. These cocks should be of great service to members of the gas profession, both for gas ovens and fires, as they absolutely ensure consumers against accidents.

In the previous notice of the exhibition, reference was made to the lighting of the stand of Messrs. R. & A. Main, Limited, by Messrs. George Hands and Co. We may add that it was particularly artistic, as was also the lighting of the tea-room there. Both were greatly admired by Mr. Yuill, the Gas Engineer to the Dundee Corporation, as well as by a large number of members of the gas profession who visited the exhibition.

Belfast Gas Exhibition.—In the notice of the opening of this exhibition which appeared in the "JOURNAL" last week, the amount stated by the Chairman of the Gas Committee (Mr. J. A. Doran) as having been applied in reduction of the rates at the end of the past financial year should have been £24,000, not £2400 as given.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 234.

Issue	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Oct. 14	10	Alliance & Dublin 10 p.c.	17½-18*	-½	5 11 1	195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
298,955	10	"	7	Do. 7 p.c.	12½-13*	..	5 7 8	561,000	Stk.	"	10	Liverpool United A.	223-225	..	4 8 11
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	718,100	"	"	7	Do. B.	166-168	..	4 3 4
200,000	5	May 27	6½	Bombay, Ltd.	5½-6½	..	5 6 1	306,083	"	June 25	4	Do. Deb. Stk.	104-106	..	3 15 6
40,000	5	"	6½	Do. New, £4 paid.	48-48½	..	5 6 8	75,000	5	June 11	5	Malta & Mediterranean.	4½-5½	..	5 17 1
50,000	10	Aug. 26	15	Bourne-mouth Gas 10 p.c.	28-28½	..	5 5 3	560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	59-102	..	4 18 n
311,810	10	"	7	and Water 7 p.c.	16½-16¾	..	4 3 7	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
75,000	10	"	6	Brentford Consolidated	15½-15¾	..	3 16 2	541,920	20	May 27	3½	Monte Video, Ltd.	12½-13½	..	5 5 8
380,000	Stk.	Aug. 12	12½	Do. New	254-257	+1	4 17 3	1,775,892	Stk.	July 29	4½	Newcastle & G'tesh'd Con	106-108	..	4 3 4
300,000	"	"	9½	Do. 5 p.c. Pref.	190-192	..	4 19 0	518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	93-94	..	3 14 6
50,000	"	"	5	Do. 4 p.c. Deb.	120-122	..	4 2 0	55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13-13½	..	5 3 8
206,250	"	June 11	4	Brighton & Hove Orig.	100-102	..	3 18 5	300,000	Stk.	Apl. 29	8	Oriental, Ltd.	139-141	..	5 13 6
220,000	Stk.	Sep. 10	11	Do. A Ord. Stk.	208-213	..	5 3 3	60,000	5	Sep. 10	8	Ottoman, Ltd.	6½-6¾	..	6 5 6
246,320	"	"	8	British	150-152	..	5 5 3	31,800	53	Aug. 26	13	Portsea Island A.	137-139	..	4 19 0
460,000	20	Oct. 14	10	Bromley, A 5 p.c.	42-43*	..	4 13 0	60,000	50	"	13	Do. B.	129-131	..	4 19 3
109,000	Stk.	Aug. 26	6	Do. B 3½ p.c.	118-120	..	5 0 0	100,000	50	"	12	Do. C.	120-123	..	4 17 7
165,700	"	"	5½	Do. C 5 p.c.	88-90	..	5 0 0	114,800	50	"	10	Do. D and E.	101-103	..	4 17 1
82,278	"	"	4½	Do. 3½ p.c. Deb.	106-108	..	5 1 10	398,490	5	May 13	7	Primitiva Ord.	7-7½	..	4 16 7
55,000	"	June 25	3½	Do. 3 p.c. Deb.	88-90	..	3 17 9	796,980	5	July 29	5	Do. 5 p.c. Pref.	54-54½	..	4 10 11
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	13½-14*	..	5 0 0	488,900	100	June 1	4	Do. 4 p.c. Deb.	95-97	+1	4 2 6
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	96-98	..	4 1 8	1,000,000	10	Oct. 14	8	River Plate Ord.	16½-16¾	..	4 15 7
100,000	10	"	—	Cape Town & Dis., Ltd.	41-5	..	—	312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	96-98	..	4 1 8
100,000	10	"	—	Do. 4½ p.c. Pref.	5½-5¾	-½	—	250,000	10	Sep. 29	8	San Paulo, Ltd.	14½-14¾	..	5 8 6
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48½-49½	..	6 1 3	62,500	10	"	6	Do. 6 p.c. Pref.	11½-12½	..	4 18 0
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82-84	..	5 7 2	125,000	50	July 1	5	Do. 5 p.c. Deb.	51-52	..	4 16 2
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	106½-108½	..	4 12 2	135,000	Stk.	Sep. 10	10	Sheffield A.	230-232	..	4 6 2
1,493,280	Stk.	Aug. 26	5½	Commercial 4 p.c. Stk.	109-111	..	4 13 8	209,984	"	"	10	Do. B.	229-231	..	4 6 7
560,000	"	"	5	Do. 3½ p.c. do.	104-106	..	4 14 4	523,500	"	"	10	Do. C.	229-231	..	4 6 7
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	70,000	10	Oct. 14	10	South African.	12½-12¾	..	7 16 11
800,000	Stk.	"	5	Continental Union, Ltd.	97-99	+1	5 1 0	6,429,895	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	120-122	..	4 7 4
200,000	"	"	7	Do. 7 p.c. Pref.	138-140	..	5 0 0	1,895,445	"	July 14	3	Do. 3 p.c. Deb.	85-87	..	3 8 11
492,270	Stk.	"	5	Derby Con. Stk.	121-123	..	4 1 4	209,820	Stk.	Aug. 26	8	South Shields Con. Stk.	154-156	..	5 2 7
55,000	"	"	4	Do. Deb. Stk.	103-105	..	3 16 2	605,000	Stk.	Aug. 12	5½	S'th Suburb'n Ord. 5 p.c.	119-121	..	4 10 11
148,995	"	Oct. 2	5	East Hull 5 p.c. Ord.	97-99	..	5 1 0	60,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
486,090	10	July 14	12	European, Ltd.	24½-25	..	4 16 0	117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	122-124	..	4 0 8
354,060	10	"	11	Do. £7 10s. paid.	18½-19	..	4 14 9	502,310	Stk.	May 13	5	Southampton Ord.	111-113	..	4 8 6
15,141,545	Stk.	Aug. 12	4½	Gas 4 p.c. Ord.	105-106	-1	4 8 0	120,000	Stk.	Aug. 12	6½	Tottenham A 5 p.c.	133-135	..	5 1 9
2,600,000	"	"	3½	light 3½ p.c. Con. Pref.	88-90	..	3 17 9	453,940	"	"	5½	and B 3½ p.c.	111-113	..	4 15 3
3,799,735	"	"	4	Do. 4 p.c. Con. Deb.	104-105	+½	3 16 2	149,470	"	June 25	8	Edmonton 4 p.c. Deb.	100-102	..	3 13 5
4,193,975	"	June 11	3	Coke 5 p.c. Con. Deb.	85-87	..	3 8 11	182,380	10	June 11	8	Tuscan, Ltd.	9-9½	..	8 8 6
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	92-94	..	5 6 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
82,500	"	"	6½	Do. 117-119	117-119	..	5 9 3	236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	109-111	..	4 10 1
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	17½-17¾	..	4 12 10	255,616	Stk.	Aug. 26	6½	Wands B 3½ p.c.	139-141	..	4 14 0
131,070	Stk.	Sep. 10	6½	Ilford A and C	138-140	..	4 13 6	79,416	"	June 25	3	worth 3 p.c. Deb. Stk.	73-75	..	4 0 0
65,782	"	"	5	Do. B	102-104	..	4 10 11	895,772	"	Aug. 12	5½	West Ham 5 p.c. Ord.	124-126	..	4 5 4
65,500	"	June 25	4	Do. 4 p.c. Deb.	102-104	..	3 16 11	210,000	"	"	5	Do. 5 p.c. Pref.	127-129	..	3 17 6
4,940,000	Stk.	May 13	8	Imperial Continental	180-182	..	4 7 11	253,300	"	June 25	8	Do. 4 p.c. Deb. Stk.	112-114	..	3 10 2
1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	95-97	..	3 12 2								

Prices marked * are "Ex div."

IMPROVEMENTS AT SEAHAM HARBOUR GAS-WORKS.

The town of Seaham Harbour, which for many years was stagnant, has within the past few years undergone a rapid change, and the building trade has been very busy—whole streets of houses being rushed-up. To cope with the increasing demand for gas, the Gas Company last year put down four new luteless purifiers, 20 feet square, to replace four old ones 10 feet square, and also a station meter and a new exhauster, both for 20,000 cubic feet per hour. This year the Directors contracted with Messrs. Ashmore, Benson, Pease, and Co. to take out a single-lift gasholder, 80 ft. by 22 ft., with columns and girders, and replace it by a three-lift spiral-guided one. The holder was handed over to the firm in May, and was to be finished in September. The contract has been carried out, and the holder handed over to the Company exactly to time, and to the entire satisfaction of their Manager (Mr. J. Whyte), under whose supervision the work was done. This is the first spiral holder erected by the firm, and it reflects the greatest credit on all concerned with it. The three lifts are 75 ft., 77 ft. 6 in., 80 ft., and 22 ft. deep; and the holder will prove a great addition to the storage.

COST OF PRIVATE BILL LEGISLATION.

In accordance with notice of motion, Mr. Barrett moved, at the last meeting of the Heywood Town Council—"That the attention of the Government be directed to the present extravagant system under which the permission of Parliament is obtained before municipal authorities can proceed with local schemes by way of Parliamentary Bills; and this Council is of opinion that the machinery should be simplified so as to give satisfactory results at a considerably reduced expenditure; and that copies of the resolution be sent to the Right Hon. H. H. Asquith, M.P., Prime Minister, the Right Hon. John Burns, M.P., President of the Local Government Board, Sir Edward H. Holden, M.P., and the President and the Executive Committee of the Association of Municipal Corporations."

In support of his resolution, Mr. Barrett said it was a plea for increased local control over ratepayers' money. He quoted the cost of Parliamentary Bills which had been promoted by Heywood and neighbouring boroughs. A Bill promoted by Burnley in 1909 cost £6188; and by Oldham, in 1906, £5000. Bolton, in 1905, promoted a Bill which cost £9148; and the Rochdale Water Act, 1898, cost £9400; Bury, in 1901, promoted a Bill which cost £2297. There were several other Bills promoted by Bury, the most costly of which was one in 1885, which cost £6750. If they took their own experience, Heywood, in 1883, promoted a Parliamentary Bill which cost £3865. Since that time, the Heywood and Middleton Water Board had had various Acts passed at a total cost of £5456; and then Heywood had their Tram-

ways Provisional Order in 1908, which brought up the total for Heywood, along with the Heywood and Middleton Water Board, since the incorporation of the borough, to £10,052. When they added to this the cost of the Bill which had recently been promoted, they would get to a very magnificent sum. He thought it was an open secret that their Bill would cost no less than £5000. The time allowed for payment was five years; and to meet interest and sinking fund, they would need to have a rate of 2½d. in the pound for five years imposed on the ratepayers. He believed there was not a man on the Council who did not reluctantly vote in favour of the Bill; and it was only when they realized that they could not obtain the powers they required by any other means that they agreed to support it.

The resolution was carried with the addition of the name of the Hon. A. J. Balfour, M.P., to those to whom a copy should be forwarded.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Western District Junior Gas Association held their opening meeting in Glasgow to-night, under conditions which, when the result is looked at, ought to make everyone connected with the Association feel proud. The evening was marked by a rainstorm which would have been sufficient excuse for anyone staying at home; yet the attendance has not been exceeded in number since the early days of the Association's existence. This instance of revived interest in the organization is very welcome. It is to be hoped that the members will keep it up. It has all along been a feature of the Western District that the honorary members have given very generous aid in the work. They, as well as the ordinary members, were present in great force to-night, and took a large share in the proceedings. These consisted of an address by the new President—Mr. D. Currie, of Stirling—on the valuation and selection of gas coals. The address was a most thoughtful one, as the remarks in the discussion upon it show. The Western District are to be congratulated upon the vigour with which they have started the session. A good syllabus of events for the season has been drawn up; and expectation as to the winter's work is high.

The Falkirk Town Council on Monday discussed the subject of supplying free cookers. It came up in a recommendation by the Gas Committee, by a majority of two, that cookers be given out free, and that a Committee be appointed to arrange the whole matter. Mr. Sinclair, in the Council, said the question involved a principle which he could not admit at all. Every man who used gas could not use a cooker. They had £5000 of capital invested in cookers; and they had spent during the past year something like £700 in purchasing new ones. Taking the life of a cooker at ten years, this meant that they had to lay aside £500 a year to replace those in use; and, in addition, there were large interest and maintenance charges. This cost had to come from

OUR Patent "THERMO" Firefront

The Pioneer of Perfect Radiation.

OUR Patent "N.V."

The Pioneer of the Adjustable Gas-Fire Idea,

AND OF

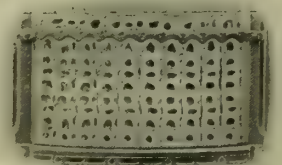
OUR Wide-Fire Principle

The First Wide Fire that has ever been a working success.

OUR INTERCHANGEABILITY SYSTEM

by which for many years past all the wearing parts of equal-size stoves have been mutually

INTERCHANGEABLE!



JOHN WRIGHT & CO.,
Essex Works,
BIRMINGHAM.

the revenue; and he did not think the gas undertaking was yet in a position to stand it. He moved that the subject be sent back to the Committee for further consideration. Mr. Graham was surprised to hear the arguments which had been used. The term might be "free" cookers; but the cookers were not free when the price for the gas they used was the same as for lighting. A year or two ago there was a preferential rate on cookers, which perhaps meant as much to the user as the rent of the cooker. He thought they were only giving a little preference to the users of cookers; and he mentioned that, with the view of increasing the output of gas, in Dundee, Arbroath, Paisley, and other towns, they had tried the experiment with great success. They wanted everybody to use cookers. Treasurer Wallace considered that they could not afford to give free cookers. They found that differential rates were a mistake. Their undertaking could not stand them. It was far better to see the people getting their value in gas, and the town getting a return for the capital invested in stoves. Bailie Russell, in support of the recommendation, said that many stoves were being returned by the users, because the people would not pay the same price for gas for cooking as they did for lighting. The Council gave a differential rate for gas used in engines; and why should they make it more expensive for people to get their food cooked? The greater the number of cookers out, the greater would be the demand for gas. Mr. Russell thought they should make an effort to supply gas as cheaply as in other towns before they tried this experiment. The cooker had been compared with the gas-engine; but there was no comparison whatever. With the gas-engine there was a steady consumption the whole day, whereas the cooker might only be used for an hour. Bailie Bogle, the Convener of the Gas Committee, said that the experience of all towns in which free cookers had been introduced was the reverse of what some of them imagined. In Manchester, since they were introduced the proportion of users had gone up from 1 in 11 to 1 in 4; and other places spoke in unqualified approval of the system. They must not think that users of free cookers could do what they liked with them. They had to sign a guarantee that they would use a certain quantity of gas per annum. He had not the slightest doubt that the system, if adopted, would pay handsomely. There was a movement in Glasgow just now to adopt the system. By a majority of one, the Council resolved to supply cookers free.

On Thursday, the Town Council of Falkirk met specially to consider the report of a Special Committee who had been appointed to investigate allegations which had been made against, and reflected upon, Councillor H. Russell. The Special Committee reported that they had had before them ex-Bailie Hamilton and Mr. Arthur Happer, and had interrogated them on the subject. They submitted findings to the effect: (1) That from March 15 to Oct. 10, 1895, Mr. Russell made numerous complaints regarding a defective supply of gas for his engine; that there was cause for complaint at the time, as the gas-works had only lately been taken over by the Council, and numerous connections were being made; that the meter appeared to have been sent to the makers for testing purposes; that, the meter makers having destroyed the

meter, the Council had to compromise with Mr. Russell by paying him twelve guineas, and that they claimed relief from the meter makers, who paid half. (2) That in December, 1896, and in February and March, 1897, Mr. Russell complained as to want of pressure; that between the 23rd and 25th of March, 1897, it was ascertained that an unauthorized connection to the Gas Commissioners' pipe had been in use by Mr. Russell; that after a meeting with the Town Clerk, Mr. Russell lodged £5 with the Town Clerk on the 26th of March; that on the 16th of April the Gas-Works Committee passed the following minute: "A report by the Manager was read, along with certificate by the Government Inspector, as to Mr. Henry Russell's meter, and, after deliberation, it was agreed not to prosecute Mr. Russell on the present occasion, seeing that he had lodged £5, which has been forfeited, on the understanding that any similar case will be prosecuted in future." (3) That from the Manager's report of April 16, 1897, it appeared that Mr. Russell's meter was tested on March 29 by the Chief Inspector of Meters, who reported that the meter was tested at 11-roths, which was a little less than was found at the inlet of his meter when working at its full capacity—that is to say, 120 cubic feet per hour; the pressure on the outlet of the meter was found to be 10-roths; the certificate shows that the meter was indicating 6 per cent. fast, on which account a rebate of £10 was afterwards allowed to Mr. Russell by the Gas Commissioners, in August, 1897. In the course of a discussion upon this report, it was stated that a technical error was made by Mr. Russell, but that the Special Committee were satisfied there was no fraudulent intent. The report was adopted.

A discussion upon the quality of the gas supplied in Dundee took place in the Gas Committee on Tuesday, having been initiated by Mr. Watson, who said that two persons had complained to him about the gas, and that he had himself noticed that it was very indifferent. Mr. J. Reid, the Convener, replied that it would be very unfair to the 90 per cent. who used the incandescent light to give a better gas at an additional cost. The gas that was made to-day was not suitable for the flat-flame burner. Mr. A. Yuill, the Manager, stated that ever since he had had to do with the manufacture of gas, this season of the year was always prolific of complaints. When they had 30-candle power gas, they had more complaints than during the past five years. On investigating complaints, he had found the cause was due to defective interior fittings. It would be in the interest of every consumer to adopt incandescent lighting. It was impossible to manufacture gas which would be suitable both for incandescent lighting and for the flat-flame burner. Mr. Yuill's explanation was considered satisfactory.

The gas exhibition in Dundee, which was closed on Wednesday evening, after having been open for a fortnight, was a great success from a commercial point of view. The attendances at the cookery lectures of Miss Dods were very large, particularly in the evenings, and led to a much more general appreciation, on the part of the public, of the possibilities and advantages of cooking by gas, with the consequence that orders flowed in freely for the hire of cookers.

The Directors and officials of the Cupar Gas Company, Limited, held their annual supper on Thursday evening. Hon. Sheriff-Substitute

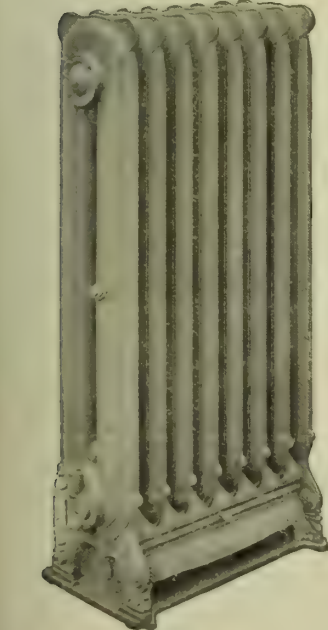
The Pioneer Radiator

For every situation where a flueless stove may be used.

FLUE Radiator

The Pioneer Radiator for every other situation.

OUR "ST. ANDREW."



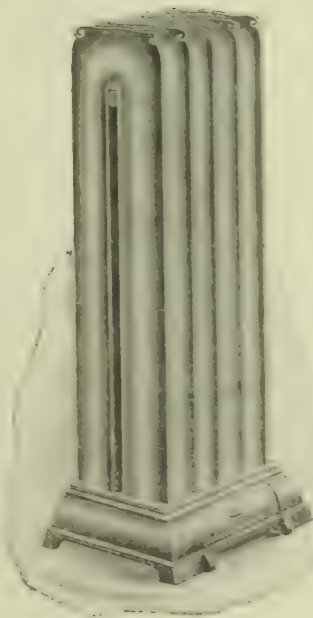
THE CHOICE!
OUR "St. Andrew"
and
Our "Official"

meet all requirements, no matter how varying the conditions. The "ST. ANDREW" will do most of it—the "OFFICIAL" will do the rest—and do it well, with the minimum cost for maintenance.

*The Radiators—Have Metal-to-Metal Joints,
Have no Internal Tubes,
Never need taking apart.*

**JOHN WRIGHT & CO.,
The Radiator Experts,
Essex Works, BIRMINGHAM.**

OUR "OFFICIAL."



Honeyman presided, and gave an interesting account, obtained from old records of the Company, of the progress of the works since they were started in 1831; the Chairman's remarks being supplemented by Mr. J. Macpherson, the Manager.

The Watching and Lighting Committee of the Edinburgh Town Council on Monday considered the offer of the Gas Commissioners to light the common stairs in the city by incandescent gas-burners, at the cost of 17s. 6d. per lamp per annum; the Gas Commissioners to instal the lamps and to undertake their upkeep and the extinguishing of them. The contract is to last for three years. On the motion of Mr. Wilson, it was agreed to recommend the Town Council to accept the offer.

About 11.15 on the evening of Saturday last, the whole of the electric lights in the central and northern parts of Aberdeen suddenly went out—both the public and the private lighting. In the course of ten minutes the light was restored. The cause of the mishap was that a dynamo which had just been switched on failed to take its load.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, Oct. 23.

This week's demand has continued fairly good; but, supplies always being ample to meet every requirement, prices have barely been maintained, and the nearest values to-day are £11 3s. 9d. per ton f.o.b. Hull, £11 5s. per ton f.o.b. Liverpool, and £11 6s. 3d. per ton f.o.b. Leith. For forward delivery, the position is unaltered. Makers continue to ask a premium of 2s. 6d. to 5s. per ton, according to time of shipment, which buyers refuse to pay; but a few second-hand transactions are reported for November-December at prompt prices, and at very little more money for January-June, 1910.

Nitrate of Soda.

The market remains without change at 9s. 3d. and 9s. 6d. per cwt. on spot, for ordinary and refined qualities respectively.

Tar Products.

LONDON, Oct. 25.

The markets for tar products have been quiet throughout the past week, but there is no actual alteration in price. In pitch, the market appears to be rather easier, and orders have been taken on the Continent at lower prices than has been the case for some time. Business has been done on the east coast at 26s. for delivery to the end of the year; and it is doubtful whether anything over this price can be obtained to-day for delivery to the end of June. London manufacturers are well sold; but it is doubtful whether the value of pitch in London is anything over 26s. to 26s. 6d., while it is worth about the same price on the west coast. Creosote is quiet, and some quantity is reported to have been sold in London at 2½d. per gallon; but this was

probably one of the outside makes, as the principal London makers do not report having sold any quantity. In the Midlands, makers are firm in their ideas, as they are fairly well sold. In the North, oil is quiet, and business is reported to have been done at 2d. Benzol, 90 per cent., is still very firm in London; but in the North prices are unchanged. Both in London and the North, 50-90 per cent. benzol is firm. Toluol is very good indeed, as is also solvent naphtha, of which article the London manufacturers in particular appear to be decidedly short. Heavy naphtha is quiet, and there is but little demand for it. Carbolic acid is unchanged, and the Continental manufacturers are offering low prices; but the figures put forward by the English makers show a slight improvement. Naphthalene is neglected; but salts are in good demand.

The average values during the week were: Tar, 13s. to 17s., *ex* works. Pitch, London, 26s. 6d. to 26s. 9d.; east coast, 26s. to 26s. 3d.; west coast, 25s. to 26s. f.a.s. Mersey ports, 26s. 6d. f.o.b. others. Benzol, 90 per cent., casks included, London, 6½d. to 6¾d.; North, 5¾d. to 6d.; 50-90 per cent., casks included, London, 7½d.; North, 6¾d. to 7d. Toluol, casks included, London, 9d. to 9½d.; North, 9d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 1s. to 1s. 1d.; North, 11¼d. to 11½d.; heavy naphtha, casks included, London, 10½d. to 11½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. Carbolic acid, 60 per cent., casks included, east coast, 10½d.; west coast, 10½d. Refined naphthalene, £4 10s. to £8 10s.; salts, 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article has been quiet the past week, and closes with a downward tendency. The Gas Companies quote £11 7s. 6d. for prompt, and £11 12s. 6d. for January-June. Outside makes can be secured upon Beckton terms at £11 to £11 2s. 6d. In Hull, business is reported at £11 2s. 6d., and in Liverpool at £11 3s. 9d. In Leith, manufacturers are asking £11 7s. 6d. for prompt, and £11 12s. 6d. for January-June, but cannot obtain these figures.

Effect of Inadequate Water-Pipes.—At the annual meeting of the North Warwickshire Water Company last Thursday, reference was made in the Directors' report to complaints received from consumers in the Company's new district of Knowle of the furring-up of the hot-water pipes owing to the hardness of the water. As no complaints came from any of the Company's other districts, the matter was investigated, and it was found that all the trouble arose from the pipes being too small. They had been provided for a supply of softer water than the Company's. The offending pipes at a consumer's house were taken out and replaced with larger ones, and a larger boiler was fitted; and examination after a three months' trial showed that there was no incrustation.

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COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade has shown some fluctuation of late; but on the whole the prices seem a little easier than they were a week or so ago. In the steam coal trade, best Northumbrians are slightly lower for early delivery—from 10s. 7d. to 10s. 9d. per ton f.o.b. being quoted. For second-class steams, from 9s. to 9s. 5d. is the price; and for steam smalls from 5s. to 6s. More coal is being sold forward over next year at higher prices than those current. In the gas coal trade, the home demand is naturally increasing with the lengthening nights; and the deliveries on the long contracts are now very heavy. Durham gas coals vary from about 10s. 3d. to 11s. per ton f.o.b. for the usual classes, according to quality; while for "Wear" specials, up to 11s. 9d. is quoted. Inquiries continue to be made for coal for next year's delivery; but some of the gas coal collieries, being well sold forward, do not care to quote, except at rates like those that are current—the doubtful effect of the Eight Hours Act having its influence on prices. Coke is firm; and gas coke is from 13s. to 13s. 6d. per ton f.o.b.—the increased output being well taken up generally.

Scotch Coal Trade.

Trade continues to be quiet. The current demand for shipment is slack; but contracts for delivery over next year, at substantial advances over present prices, are still being made. The prices now quoted are: Ell 9s. to 10s. 6d. per ton f.o.b. Glasgow, splint 10s. to 10s. 3d., and steam 9s. to 9s. 3d. The shipments for the week amounted to 326,484 tons—a decrease of 8871 tons upon the preceding week, and 10,314 tons upon the corresponding week of last year. For the year to date, the total shipments have been 12,144,250 tons—an increase of 571,795 tons upon the corresponding period.

Bideford Tradesmen and the Gas Company.—A letter from the Secretary of the Bideford Tradesmen's Association was read at the last meeting of the Town Council of the borough, with reference to the allegation that a large sum of money had been collected for gas over and above the legitimate charge. At the meeting of the Council in July, Mr. Squire, the Chairman of the Lighting Committee, stated that the amount overpaid was £7000, and cited in proof of it what had transpired before the Parliamentary Committee on the Gas Company's Provisional Order. The Secretary of the Tradesmen's Association now asked what action the Council were taking to get the money refunded. Mr. Squire said the subject was still under the consideration of the Committee. Until they heard from the Board of Trade, they could not say what the answer would be. A letter was read from the Secretary of the Gas Company (Mr. W. D. Joce) announcing that the Company would reduce the charge for lamps consuming 5 cubic feet of gas per hour from £2 18s. to £2 16s. 6d. per annum.

Sales of Shares.—Last Wednesday, Messrs. King and King offered for sale 2000 shares of £5 each, entitled to a dividend at the rate of 5 per cent. per annum, in the Portsmouth Water Company, at prices ranging from £6 5s. to £6 7s. 6d. each. The total amount realized was about £3000. At the Duke of York Hotel, Camberley, recently, Messrs. Sadler and Baker offered for sale 800 additional ordinary £10 shares in the Yorktown and Blackwater Gas Company; and they fetched from £14 10s. to £14 15s. each. The total amount realized was £11,722 10s., or an average of £14 13s. per share.

Carnarvon Water Supply.—The Special Sanitary Committee reported, at a meeting of the Carnarvon Town Council last Tuesday, upon the results of an investigation made by Mr. J. Parry, of Liverpool, into the water supply of the town, which a few months ago was in a very unsatisfactory condition, and caused the Council a considerable amount of trouble. After fixing meters, it was demonstrated that the shortage was caused by abnormal waste which was taking place owing to leakages in the town mains and to defective water fittings and pipes; and when these defects were in some degree remedied, the storage of water at the reservoir recommenced. Subsequently, the mains above the reservoir towards Nant Mill were cleansed for a length of 1540 yards. The Nant Mill main is now capable of delivering about 762,000 gallons a day; and the supply to the town has been reduced to something like 450,000 gallons a day. The improvement in both respects which has taken place will ensure an ample supply to the town for all purposes. The Committee remarked that the Council were greatly indebted to Mr. Parry for his valuable services, and also to the Borough Surveyor and Sanitary Inspector for the attention they had paid in carrying out the improvements suggested.

Whitchurch Council and the Gas Company.—At a special meeting of the Whitchurch Urban District Council, held to consider a communication from the Gas Company declining to negotiate for the sale of their undertaking on the basis of a scheme submitted to them, or to make any alternative proposals, Mr. Elson stated that there had been a redistribution of the Company's shares, and for each £10 share the holder received five £5 shares, the dividends on which had during the last year or two been 9 per cent., or within 1 per cent. of the maximum allowed. A year ago last April, the then Chairman of the Council remarked upon the fact that the Council, though the largest customers of the Company, were charged at precisely the same rate per 1000 cubic feet as the smallest customer; and he expressed his opinion that a reduction should be made. A reply was received to the effect that the high price of materials precluded a reduction. He (Mr. Elson) suggested that there were two courses open to the Council. One was to ascertain whether the Gas Company's Order could be repealed; and the other was to see whether an installation of electricity might not be brought about. He believed there would be companies willing to instal the light for public and private purposes at a cost to the consumer some 20 per cent. lower than the present price paid for gas; the Council to have the option of purchasing the concern in five or six years. It was resolved that the Lighting Committee should consider the latter proposal, and report to the Council.

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Hipperholme Gas Question.—The dispute between the Hipperholme Urban District Council and the Halifax Corporation is, for the time being at any rate, settled. Hipperholme, as an out-district of the Corporation of Halifax, is charged a higher price for gas than are consumers within the borough; and the right of the Corporation to do this was disputed by the Council. A cheque for what was considered a fair amount was tendered in the first place, and refused by Halifax; but, after legal proceedings were threatened by the Corporation, Hipperholme adopted a different attitude, and paid the full sum claimed.

Projected Gas Supply for South Wales Villages.—At a recent meeting of the St. Mellon's District Council, a letter was read from Mr. S. J. Ackland, asking if the Council would undertake not to oppose an application for a Provisional Order for the supply of gas to Machen and Bedwas if he made one; and also whether the Council would consent to take gas for these places. It was decided that they could not commit themselves. The places named are two villages, about two miles apart, between Caerphilly and Newport. Bedwas is in the area of the Rhymney and Aber Valleys Gas Company. It is not yet supplied with gas by that Company, but it is with water. Machen is outside their area.

Ceara Gas Company, Limited.—In the report which the Directors of this Company will present at the annual general meeting on Friday, they state that the result of the year's working is a net profit of £7493. This, added to the balance brought forward, gives a total of £12,153. Deducting the interim dividend paid in April (£1688), there remains £10,465 available for distribution. Out of this sum, the Directors have transferred £4000 to the reserve fund, making that account £16,000, and recommend the payment of a dividend for the six months ended the 30th of June of 5 per cent. on the preference shares (less income-tax) and of 5 per cent. on the ordinary shares (tax free); making together £2284. These payments, with the interim dividend paid, will make 10 per cent. on the preference shares and 8 per cent. on the ordinary shares for the year. The balance carried forward will be £4180.

Lighting of Ainsworth.—The inhabitants of Ainsworth having manifested a natural and laudable desire to have certain of the roads lighted, a public meeting has been held to consider the matter. In opening the proceedings, the Chairman (Mr. Henry Whitehead) said the Parish Council had not been idle in the matter; and they had been making inquiries from the Radcliffe Gas Company and the Lancashire Electric Power Company. They were in a peculiar position at Ainsworth. The gas supplied to the houses and shops of the village came from Bury; but the Bury people had no power to light the streets. The powers to light the roads were held by the Radcliffe Gas Company, who, however, had no mains up there. The terms on which the Electric Power Company were prepared to light two or three miles of road, on a ten years' contract, would mean an addition of about 7d. in the pound to the rates. In the course of the discussion, regret was expressed at the seeming impossibility of arranging for a gas supply for the public lamps; but as to the wisdom of going in for a lighting scheme of one form or another, all the speakers agreed.

Geltsdale Water Scheme.—At the last meeting of the Finance Committee of the Carlisle Town Council, the City Treasurer reported that the total cost of the Geltsdale water scheme was £287,642; being £34,110 in excess of the amount authorized to be borrowed. The Committee instructed the Town Clerk to make application to the Local Government Board for a Provisional Order authorizing the borrowing of the sum of £35,000 to cover the excess expenditure, together with an additional £5000 if required.

New Water Board for Stourbridge and District.—The first meeting of the newly-constituted Water Board for Stourbridge and the district was held at the Town Hall, Stourbridge, last Tuesday. The Board, which will acquire the undertaking of the Stourbridge Water Company, Limited, on the 1st of January next, is composed of representatives of the Stourbridge, Lye and Wollescote, and Amblecote Urban District Councils, and the Kingswinford Rural District Council. The Bromsgrove Rural District Council was formerly associated with the scheme, but retired from it by common consent of the promoters.

Crewkerne in Darkness.—A dispute between the Crewkerne District Council and the Gas Company, as to the sum to be paid for public lighting, has had the effect of leaving the town in darkness for over a month past. The difference between the two bodies is only about £25; but though the amount is small, it has caused a great deal of correspondence, which so far has led to no definite result. The Gas Company offered to do the lighting for £280; while the Council, who considered this amount excessive, offered £255. After a number of letters had passed, a deputation from the Council met representatives of the Gas Company; but it does not appear that the meeting had the effect of producing agreement. It is now said that the Council have offered a slightly larger sum than at first; but the result of this is not known. In the meantime, Crewkerne streets are in darkness, and the inhabitants suffer a good deal of inconvenience.

Greenwich Public Lighting.—At the last meeting of the Greenwich Borough Council, the Highways Committee reported that they had considered a communication from the South Metropolitan Gas Company, stating that, as a result of their experiments with a new inverted burner for street lighting, they were able to make a substantial reduction in the yearly charge, in consequence of the reduced cost of upkeep and the lower price of gas. The new inverted burner referred to gives a light of 120 candles, compared with 80 candles for the No. 4 upright burner. The present charge for lamps fitted with the latter burner is £3 2s. 10d.; and the Company offered to replace them with the inverted burner, and make the necessary alterations to the lantern, at a charge of 3s. per lamp, and also to reduce the annual charge to £2 19s. 6d. In view of the fact that increased light would thus be obtained at less cost, the Committee expressed the opinion that the offer of the Company, so far as the lamps fitted with No. 4 burners are concerned, be accepted; and they recommended that the Borough Engineer should make the necessary arrangements for having the whole of the No. 4 burner lamps in the borough refitted with inverted burners. This was agreed to.



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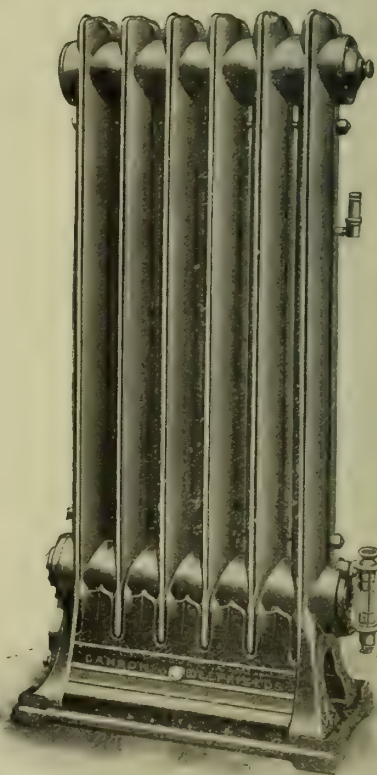
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Suicide by Gas.—Henry Beard, a West Bridgford tinsmith, was found a few days ago suffocated in his workshop. He was lying with an overcoat over his head; and a piece of piping was stretched from the gas-bracket, passed through the button-hole of his coat, tied there, and then the end placed close to his mouth. The Coroner's Jury returned a verdict of "Suicide while temporarily insane."

Limited Companies and the Franchise.—At the autumn general meeting of the Association of Municipal Corporations held in London last Friday, Mr. Abbott (Manchester) moved the following resolution: "That, in the opinion of this meeting, it is desirable that corporations and companies in occupation as owners or tenants of premises of a yearly value of not less than £10 shall be entitled to have one of their officers entered in the local government register of electors for the place in which the premises are situate, and such authorized officer may vote at any election (except a parliamentary election), and shall be qualified to be elected at such election as the owner or occupier of such premises; and that it be referred to the Council to take measures for giving effect to this resolution." Mr. Abbott, in support of his motion, said the City of London was one of the most amazing examples of the need for the proposed reform. It had a rateable value of £5,360,197, of which limited companies represented £3,428,089, or 63 per cent. The total amount raised by rates two years ago was £1,020,234, of which limited companies not represented on the register paid £1,164,122. These figures in themselves were, he said, sufficient justification for him to submit his resolution. The motion was carried.

Progress of the St. Mary Church Gas Undertaking.—Though the gas supply of the greater part of Torquay is in the hands of the Torquay Gas Company, the Corporation have control of that in the district of St. Mary Church. This part of the borough was formerly governed by a District Council; and the Corporation, in taking over their duties, acquired the gas-works as one of the Council's assets. Mr. Foster, the present Chairman of the Gas Committee, a few days ago at a ratepayers' meeting made a speech, in which he reviewed the progress of the undertaking since it came into the possession of the Corporation. During the last nine years, he said, the works had been completely remodelled, at a cost of many thousand pounds. The leakage had been reduced from 35 to 11 per cent., and the storage had been increased from 80,000 to 330,000 cubic feet—twice the maximum daily demand. The original outlay upon the works was £16,000, the whole of which sum would have been repaid by the end of the present year. Notwithstanding the large outlay during the nine years, they had accumulated a reserve fund of £2582. It was proposed, out of this sum, to pay for the installation of a patent gas producing apparatus, by which they expected to save 1000 tons of coal per annum. The price of gas had recently been reduced by 3d. per 1000 cubic feet; and it was believed that a further reduction would be effected next year. Though about £20,000 had been spent on the works during the past nine years, the whole of the capital would not exceed £19,000 at the end of the year. Were the works sold to a company, they would realize more than thrice this money.

Daylight Saving Bill.—Notwithstanding the fact that the Select Committee of the House of Commons reported against its adoption, it appears that the Daylight Saving Bill is not to be allowed to drop. Mr. Willett, the author of the proposal, is satisfied that with the great amount of support which has been promised by members of the House, he will have no difficulty in getting a similar Bill introduced next year. He has received intimation of the approval of the Bill from 120 Corporations and Town Councils (representing 15 million people), 35 Chambers of Commerce, 36 Trade Unions (representing 250,000 members), and, in addition, numerous business and other associations.

APPLICATIONS FOR LETTERS PATENT.

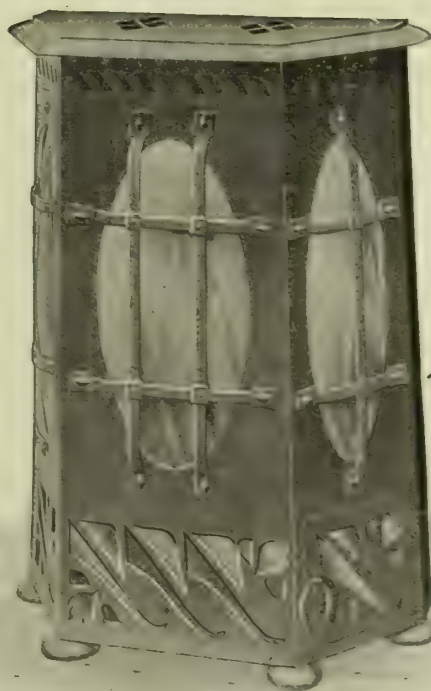
- 23,129.—WOOD, R. S., "Incandescent burners." Oct. 11.
 23,133.—HORSTMANN, G. O. H., E. H., A., & S. A., and EDGAR, W. T., "Pilot-lights for gas-burners." Oct. 11.
 23,195.—WAKEFIELD, C. C., "Acetylene generators." Oct. 11.
 23,200.—CAMPBELL, H. E., "Safety-attachments for gas-burners." Oct. 11.
 23,299.—PARKINSON and W. & B. COWAN, LIMITED, and CHESHIRE, W., "Torch-traps for street-lamps." Oct. 12.
 23,338.—DUENKEL, C. L., and VERGES, H. A., "Meters." Oct. 12.
 23,383.—SCOTT, W., "Meters." Oct. 13.
 23,409.—HARRISON, R., and MELMORE, W. M., "Compressing air or gas." Oct. 13.
 23,434.—VISSEUX, J., "Mantles." Oct. 13.
 23,476.—TUCKFIELD, C., and GARLAND, W. G. DE F., "Gas-engine." Oct. 14.
 23,482.—AIRD, K., "Gas-fires." Oct. 14.
 23,534.—SIEMENS, F. K., "Regenerative gas-furnaces." Oct. 14.
 23,545.—NEUE KRAMERLICHT G. M. B. H., "Regulators for burners." Oct. 14.
 23,551.—HIBBERD, C. E., "Gas-meters." Oct. 14.
 23,614.—MILLS, J., and PRICE, W. J. F., "Gas-engines." Oct. 15.
 23,622.—FEENY, V. I., "Gas-governors." Oct. 15.
 23,624.—WILLIAMS, P. E., "Treating coal and like gas for the removal of cyanogen." Oct. 15.
 23,633.—COOKE, J. J., "Incandescent burners." Oct. 15.
 23,665.—ARNOLD, H., "Incandescent lamps." Oct. 15.
 23,671.—MULLER, W., "Manufacture of coke and gas." Oct. 15.
 23,678.—BLAKEY, J. W. & A. G., "Lighting intensified gas-lamps." Oct. 16.
 23,727.—LINES, A. A., and HASSELL, W., "Attaching globes." Oct. 16.
 23,763.—OLIGNY, J. D., and the PEAT GAS AND COAL COMPANY, "Peat-gas producing process." Oct. 16.
 23,766.—HUGENDICK, W., "Continuous distillation of tar." Oct. 16.
 23,767.—OLIGNY, J. D., and the PEAT GAS AND COAL COMPANY, "Peat-gas plants." Oct. 16.

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Lewisham Public Lighting.—At the meeting of the Lewisham Borough Council last Wednesday, the Highways Committee reported that they had made a further application to the South Suburban Gas Company for a reduction in their charges for public lighting. A reply had been received from the Engineer of the Company (Mr. S. Y. Shoubridge) to the effect that his Board were anxious to meet the Council in the matter, and as there had been some saving in the cost of mantles, they were prepared to reduce their charges for the lamps as follows: Lamps with No. 2 burners, from £2 9s. 2d. to £2 7s. 8d.; lamps with No. 3 burners, from £2 16s. 11d. to £2 14s. 10d.; lamps with No. 4 burners, from £3 4s. 7d. to £3 1s. 11d.—all subject to 5 per cent. discount for cash monthly. These alterations will make a difference of £96 per annum, which, with the reduction made by the South Metropolitan Gas Company, reported in July last, makes a total saving to the Council of £205 19s. per annum.

Among the new Companies recently registered is that of Clark's Syphon Stove Company, Limited, with a capital of £3000, in £1 shares.

Mr. M'Rae, the Davis Gas-Stove Company's Advertising Manager at Luton, has been awarded a silver medal in connection with the "Best Press Advertisement Competition" at last week's Business Exhibition at Olympia. In the "Best Booklet Contest," also, his work was highly commended. On these results both Mr. M'Rae and the Davis Gas-Stove Company are to be congratulated.

Messrs. John Wright and Co. have been awarded a gold medal for their gas-heated steam radiator—The "St. Andrew"—by the Jury of the Imperial International Exhibition, 1909. They have also received a first diploma of merit for gas-steam radiators, open gas-fires, gas water-heaters, and gas-cookers from the promoters of the recent Smoke Abatement Exhibition at Sheffield.

In consequence of leakage from the gasholder tank at the Strabane Gas-Works, the Urban District Council have, on the recommendation of Mr. R. J. Skinner, the Engineer and Manager of the Londonderry Gas-Works, decided to requisition the services of a diver to ascertain what is wrong, and if possible repair the damage. It was stated that, in the event of the efforts of the diver proving fruitless, a new gasholder would have to be erected, or else the town would have to do without light while the present one was being repaired, which would occupy perhaps a month or two.

In the new season's gas-fire list (No. 246) which Messrs. Fletcher, Russell, and Co., Limited, are sending out, and in the supplement to it are shown several new and original designs. Attention may be particularly called to the "Madeira" and "Aden" fires and the "Ariel" radiators which were illustrated in the "JOURNAL" a few weeks ago. The firm make a special point of their Majolica and Chimatto enamel finishes for fires and heating-stoves. Accompanying the list, which contains a great variety of appliances, all effectively shown, is the new season's fire pamphlet, as well as an illustration and particulars of the automatic instantaneous water-heater.

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Patent Licence.

METER INDEX AND COMPUTING DEVICE. G. J. Cox,
Melbourne.

Stocks and Shares.

BARKING GAS COMPANY. Nov. 2.
HERTS AND ESSEX WATER COMPANY. Nov. 2.
REDHILL GAS COMPANY. Nov. 1.
SOUTHEND GAS COMPANY. Nov. 16.
TENDRING HUNDRED WATER COMPANY. Nov. 16.
WEST KENT GAS COMPANY. Nov. 2.

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Tenders by Nov. 1.

Exhausting Plant, &c.

CLEATOR MOOR GAS DEPARTMENT. Tenders by
Nov. 19.

Fire-Clay Goods.

LLANDUDNO GAS DEPARTMENT. Tenders by Oct. 30.

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Resists 4500° Fahr. Best for GAS-WORKS.
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FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

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Contractors for Complete CARBONIZING
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Pitch, Creosote, Brick and Fuel Oils, Solvent
Naphtha, Sulphate of Ammonia.

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Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
Carbolic Acid, Sulphate of Ammonia, &c.

SULPHURIC ACID for Sale, specially
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FOR REALLY RELIABLE
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For all Joints in connection with Oil-Gas Plant
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HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
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"GAZINE" (Registered in England and
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It is also used for the enrichment of Gas.
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SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges
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We guarantee promptness, with efficiency for Re-
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MR. W. B. MIMMACK, for many years
Secretary, Manager, and Accountant of the Crays
Gas Company (111 Millions), now in Amalgamation,
seeks APPOINTMENT in any or all of these Offices.
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JUNIOR DRAUGHTSMAN, accustomed to
Constructional Steel and Gas Plant work, for a Gas
Works in the County of Durham. Salary 30s. per Week
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Apply, by letter, stating Age and Experience, en-
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WANTED, a thoroughly Trained and
Experienced ENGINE-FITTER, who will act
as WORKING MECHANIC in Charge of Machinery.
Preference will be given to One who has a special
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House on the Works, Coals, Gas, and Rates Free.
Applications, in writing only, stating Training,
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1909.

WANTED, a Works Foreman for the
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Company to take Day and Night Duty on Alternate
Weeks.

He must have had a practical Experience of the
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the Plant in an up-to-date Works. A working know-
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Apply, in own hand-writing, stating Age, Experience,
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GASHOLDERS—Splendid, 45 feet dia-
meter, and New STEEL TANK fixed complete,
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Can be seen temporarily erected.
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Two PURIFIER COVERS, 7 ft. 6 in. by 5 ft. 6 in.,
in Good Condition; also Two Sets of SPENCER'S
HURDLE GRIDS for 7 ft. by 5 ft. Purifiers, nearly
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Address, GORDON WALKER, Manager and Secretary,
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THE Directors of the above Company
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70 Revolutions per Minute) GAS EXHAUSTER, with-
out Engine, but with Belt Pulley 3 feet diameter,
6 inches wide, also 12-inch diameter Screw Down Inlet
and Outlet Disc Valves.

Further Particulars may be obtained from the under-
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J. D. ASHWORTH, M.Inst.M.E.,
Engineer and General Manager.
Engineer and General Manager's Office,
Flathouse Gas-Works,
Portsmouth, Oct. 11, 1909.

FOR SALE—the following Second-Hand GAS PLANT—

One Bryan Donkin EXHAUSTER, combined on
One Bedplate with Horizontal Steam-Engine,
complete with Inlet and Outlet Valves. Capa-
city, 30,000 Cubic Feet of Gas per Hour.
One ANNUAL CONDENSER, with Four Vertical
Tubes 30 ft. high, Inner Tube 2 ft. 8 in. diameter,
Outer Tube 3 ft. 6 in. diameter, with Two 15-inch
diameter Disc Valves, and 4-inch Tar Run-Off
with Seal Pots.
One PIPE CONDENSER, 25 ft. high, with Twelve
12-inch diameter Pipes, Two 15-inch Disc Valves,
and 6-inch Tar Run-Off and Seal Pots.
One CAST-IRON TANK, 18 ft. 4 in. by 14 ft. by 5 ft.
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Two Livesey WASHERS, to pass 500,000 Cubic Feet
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Water Lute Covers, Connections, and Four-
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One COAL BREAKER and ELEVATOR capable
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PERSONS desirous of Tendering for the
Construction of ENTRANCE GATES, WEIGH
OFFICE, COAL-STORE, TAR-TANKS, APPARA-
TUS, BUILDINGS, ROADS, &c., in connection with
the above, are requested to send their names and
addresses to Messrs. Corbet Woodall and Son, Palace
Chambers, Bridge Street Westminster, S.W., not later
than Monday, the 1st day of November, 1909, together
with a deposit of £3 3s. (cheques only), for copies of
Specification, Bill of Quantities, and Form of Tender.
The deposit will be returned on receipt of a bona-fide
Tender.

The Drawings of the proposed Works can be inspected
at the Offices of the Surveyor to the Council, Outram
Street, Sutton-in-Ashfield.

The lowest or any Tender will not necessarily be
accepted.

JOHN D. FIDLER,
Clerk to the Council.

Council Offices,
Sutton-in-Ashfield.

CLEATOR MOOR URBAN DISTRICT COUNCIL.
TENDERS are invited by the above Council for the work of DUPLICATING the EXHAUSTING PLANT at their Gas-Works on a new site.

A copy of the Drawings and Specifications may be obtained from the undersigned on payment of £1 ls., which will be returned on receipt of a *bona-fide* Tender. Sealed Tenders, endorsed "Exhauster," and addressed to the undersigned, to be delivered, at the Public Offices, Cleator Moor, not later than Friday, the 19th day of November, 1909.

The Council do not bind themselves to accept the lowest or any Tender.

HENRY ROTHERY,
 Clerk to the Council.

Public Offices, Cleator Moor,
 Oct. 19, 1909.

THE Llandudno Urban District Council
 invite TENDERS for the Supply of RETORTS and other FIRE-CLAY GOODS, &c., delivered free at Llandudno.

Full Particulars may be obtained upon Application to the Gas Manager.

Sealed Tenders, endorsed "Retorts," to be sent in to the undersigned on or before Saturday, the 30th of October, 1909.

The Council do not bind themselves to accept the lowest or any Tender.

(Signed) ALFRED CONOLLY,
 Clerk to the Council.

Town Hall, Llandudno,
 Oct. 12, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HERTS AND ESSEX WATER-WORKS COMPANY.

NEW ISSUE OF 500 £10 ORDINARY SHARES
 AND
 £1000 FOUR PER CENT. MORTGAGE DEBENTURES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 2, at Two o'clock, in Lots. Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BARKING GAS COMPANY.

NEW ISSUE OF 600 £10 SIX PER CENT. PREFERENCE SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 2, at Two o'clock, in Lots. Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

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25 £10 FULLY-PAID ORIGINAL SHARES.

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By order of the Directors of the
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NEW ISSUE OF £21,500 NEW ORDINARY "B" STOCK

AND
 £3500 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 16, at Two o'clock, in Lots. Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
TENDRING HUNDRED WATER-WORKS COMPANY.

applying Harwich, Parkeston, Dovercourt, Walton-on-Naze, Frinton-on-Sea, and adjacent places.)

NEW ISSUE OF 400 £10 "B" SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 16, at Two o'clock, in Lots. Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

REDHILL GAS COMPANY.

SALE OF ORDINARY "B" STOCK.

NOTICE is Hereby Given, that it is the intention of the said Company to SELL BY TENDER £3500 of ORDINARY "B" STOCK of and in the Redhill Gas Company. The last day for the reception of Tenders will be Monday, the 1st of November, 1909, at Twelve o'clock at noon.

Forms of Tender, with Particulars of Sale and Conditions of Tender attached, can be had upon Application at the Company's Office, Brighton Road, Redhill.

By order of the Directors,
 HORACE LONG,
 Secretary.

Redhill, Surrey,
 Sept. 30, 1909.

TO INDEX MAKERS AND OTHERS.

THE Advertiser is desirous of treating with Index Makers, or with others interested, for the Assignment of such Rights as he may Possess to obtain British and other Patent Rights under International Convention Rules, for the INDEX and COMPUTING DEVICE COMBINATION, described in connection with consumers' accounts, &c., in last week's issue of the "JOURNAL," preferably on a Royalty basis. Advertiser considers the Device referred to would be a useful novelty, attractive and popular, and that, if retailed at a reasonable price, would command handsome Sales among Gas Consumers generally. A copy of a Patent Specification and Drawings, as deposited in the Australian Commonwealth Patent Office, Melbourne (as the basis of Subsequent applications elsewhere), can be inspected at 50, Devonshire Road, Chiswick, W.

Address, G. J. Cox, Balwyn, Melbourne, AUSTRALIA.

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Sperm Value 87.85 lbs. per Ton.

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Gas Engineers' Agents and Contractors for
METERS, FIRE-CLAY GOODS, OXIDE OF IRON AND
ALL OTHER GAS APPARATUS.
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Makers: JOHN E. WILLIAMS & CO., *Lower Moss Lane,* MANCHESTER, S. W.



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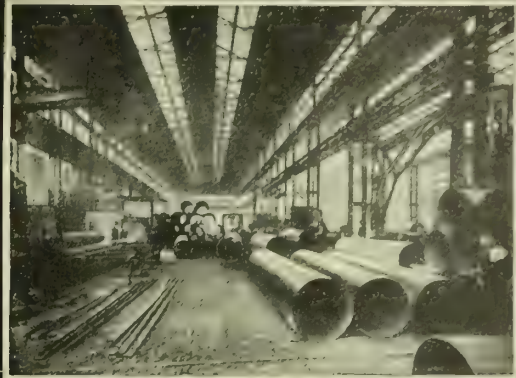
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CONTRACTORS
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THE CHIEF GASWORKS
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FOR
MANUFACTURED FROM
OUR
CAREFULLY SELECTED
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WELL SEASONED STOCK
OF
OLD MINE FIRE CLAY.
RETORTS

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LIMITED
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RETORTS.**
DIBDALE WORKS,

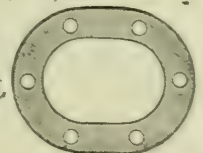
DUDLEY.

Telegraphic Address:
MACHINE, LOWER GORNAL."

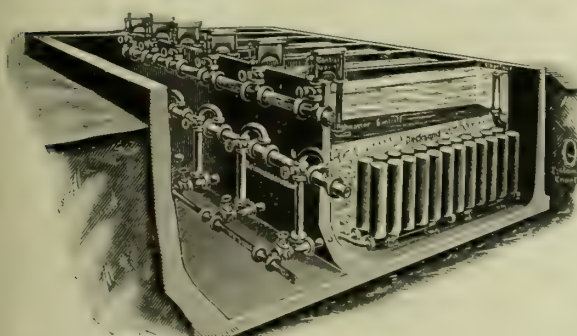
B. GIBBONS, JR., LD.
Retorts and other Fire-Clay
Goods carefully packed for export
FOREIGN AND HOME COPIES OF ILLUSTRATED
CATALOGUES ON APPLICATION.

**SPECIAL BRICKS
& BLOCKS** of every
description for **GENE-
RATOR and REGENERATOR
FURNACES.**

Large Stocks of Bricks of all sizes,
Burs, Boiler Seating Blocks and Covers,
Plain and Rebated Tiles, &c., &c.



"ABC" Code and UNICODE used for Telegrams and Cablegrams.



WATER FOR DRINKING AND
INDUSTRIAL PURPOSES
AS CLEAR AS CRYSTAL

Supplied from turbid rivers and ferruginous underground water to isolated
buildings, by means of the

PATENT AGGA COMPOUND FILTER.

Lowest expenses for attendance and working.

AKTIEN-GESELLSCHAFT FÜR GROSSFILTERATION U. APPARATEBAU,
WORMS-ON-RHINE.

The Inverted Burner has met with great success, but it has by no means

KILLED the UPRIGHT.

THE

LUCAS LIGHT'S LONG LIFE

is proof of this.

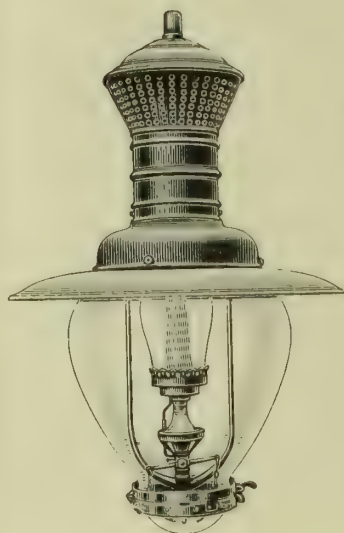
The Lucas Light was the first and original self-intensive high-power lamp, and its steady sale to-day proves its value.

200, 400, and 700-candle power from a single mantle, with gas at its usual pressure, and with the lowest consumption on record.

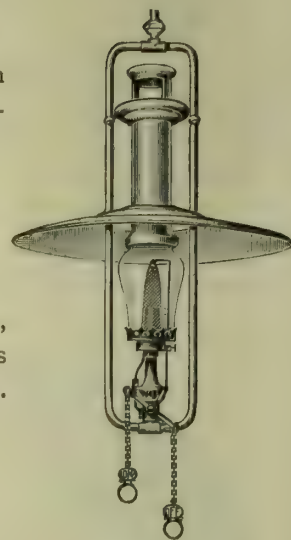
No high pressure required.

SIMPLE. BRILLIANT. RELIABLE.

The "Lucas" is the best lamp for Public Halls, Factories, Workshops, Streets, Railway Stations, &c., and the prices compare favourably with those of any similar type of lamp.



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INDOOR.

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Aug. Klönne
Dortmund 5. (GERMANY).

Chamber-Furnaces

HORIZONTAL, VERTICAL, INCLINED

FOR GAS AND COKE

SO FAR 97 CHAMBERS BUILT AND
BUILDING FOR A DAILY PRODUCTION

4 322 500 Cfeet.

IN POINT OF EFFICIENCY, COST OF
PRODUCTION AND RESULTS

BEST FURNACES IN THE WORLD.

2000 WORKMEN.

ENQUIRIES AT ONCE ATTENDED TO.

CAST-IRON PIPES FOR GAS, WATER, & STEAM,
also VALVES of all descriptions.
R. LAIDLAW & SON, LTD., ALLIANCE FOUNDRY, 147, MILTON STREET, GLASGOW,
And LAMBHILL FOUNDRY, GLASGOW.
OFFICE: 147, MILTON STREET, GLASGOW.

THE WIGAN COAL & IRON CO., LIM^{TD.}

Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

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Telegraphic Address: "WIGAN, BIRMINGHAM."

Telephone: No. 200.

LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

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GRAETZIN LIGHT

Important Improvements.



BURNERS.

1. 20-Candle Power more light without increase in the consumption of gas.
2. Patent Gas Adjuster; cannot get out of order.
3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. Accurate Regulation of the Air Supply.
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

From Lamps with more than one burner, the burners can be removed from the outside, without taking the lamps to pieces.

ASHMORE, BENSON, PEASE & CO., LTD., **STOCKTON-ON-TEES.**

Telegrams:
"GASHOLDER."

MANUFACTURERS AND ERECTORS OF

**Gasholders, Purifiers, Condensers,
Washers, Steel Mains, Roofs,
AND ALL OTHER GAS-WORKS PLANT.**

The Name of

MOBBERLEY & PERRY, STOURBRIDGE,
LIMITED,
on Gas Retorts and Fire-Clay Goods
is a
GUARANTEE OF BEST STOURBRIDGE QUALITY.

GEO. R. LOVE'S INCLINES AT 45 DEGREES.

CARBONIZATION MADE EASY.

A Few Recommendations for this System:—

Simplicity of Design.

No Machinery to get out of order.

Carbonizing charges 40 per cent. less than with Horizontals. No skilled Stokers necessary.

Yield of Gas per ton guaranteed about 1000 cubic feet more than under present conditions, of guaranteed candle power.

Heats under absolute control throughout the whole length of the Retorts.

Saleable value of Coke greatly increased.

25 per cent. greater yield of Ammonia.

More liquid Tar.

Stopped Pipes unknown.

Naphthalene always in solution. 45 per cent. less ground space required.

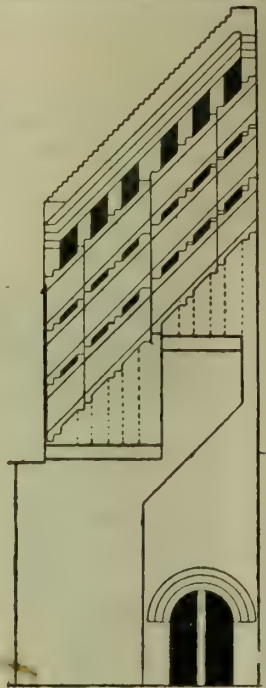
Constructional cost per Ton carbonized considerably less than with Horizontal or Ordinary Inclined Retorts.

Several Installations in course of construction or completed.

FULLEST ENQUIRIES INVITED.

Sole Agents:

WINSTANLEY & CO., **MURDOCH WORKS,**
KING'S NORTON.



BARRY, HENRY, & CO.,

— LIMITED. —

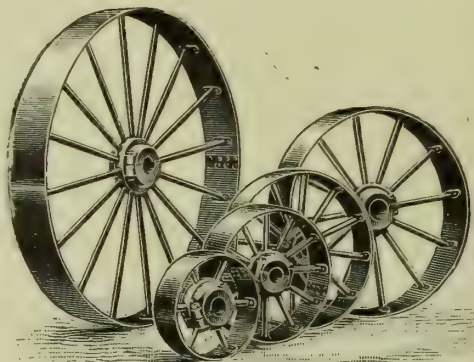
Specialities:

TRANSMISSION

OF

POWER.

Rope & Belt Pulleys,
Spur & Bevel Wheels,
Shafting & Couplings,
Pedestals & Fixings.



WORKS

ABERDEEN,
SCOTLAND.

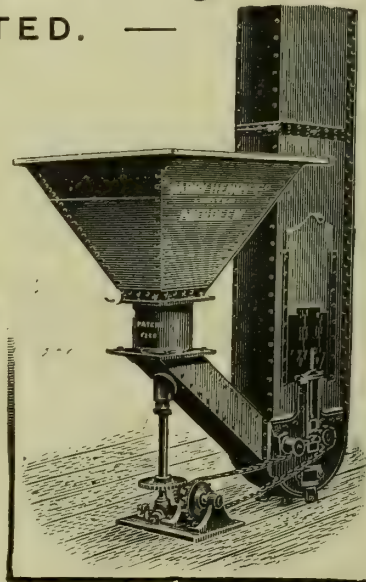
Specialities:

TRANSMISSION

OF

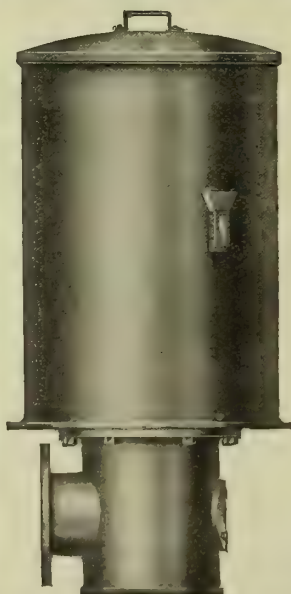
MATERIALS.

Conveyors,
Elevators,
Grinding Machinery,
Motors.



AND

64, MARK LANE,
LONDON, E.C.



RETORT HOUSE GOVERNORS.

THESE Governors are made to prevent fluctuation in the Pressure of Exhaust in the Hydraulic Main by controlling the Gas entering the Governor, notwithstanding the constant varying quantity of Gas coming from the Retorts. This enables the Seal of the Dip Pipes to be reduced to a minimum with perfect safety, and an increase in the make of Gas per Ton of Coal is thereby assured.

There is absolutely no possibility of any sticking, due to deposits of Tar or Pitch, with this Governor, as the Cone is quite free to pass through the Seat. The Regulation by means of a long Parabolic Cone is recognized as the most exact method that can be employed. A great improvement, first introduced by Messrs. JAMES MILNE & SON, LIMITED, is the simple arrangement by which a smaller Cone and Seat can be easily fitted, thus ensuring delicate adjustment during a period of small makes.

PRICES AND SIZES ON APPLICATION.

JAMES MILNE & SON, LIMITED,

EDINBURGH. LONDON. GLASGOW. LEEDS.

Rheinische Chamotte-und Dinas-Werke, Cologne on Rhine.

Construction of Entire Gas-Works & Coke Oven Plants, Retort Furnaces,

Furnaces for Chamber Settings New Coke Ovens
(Patent), (Patent),

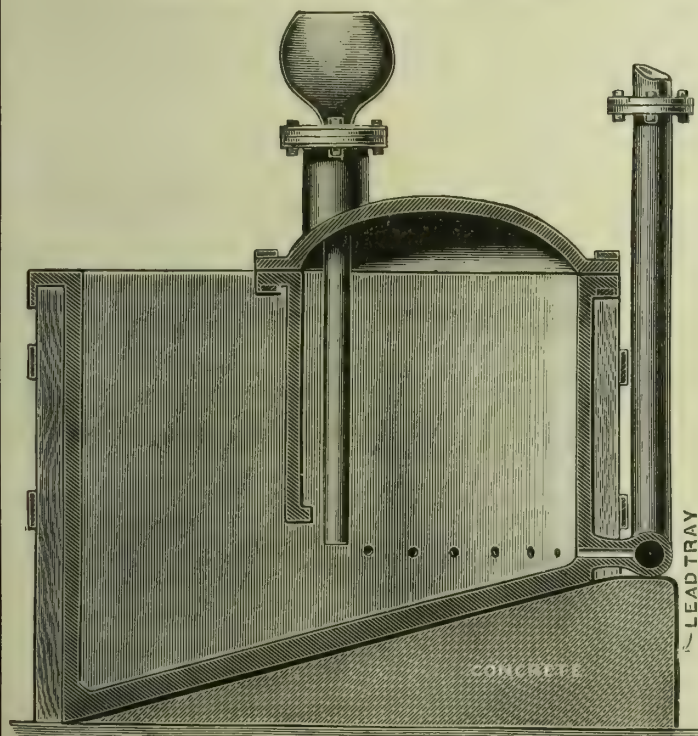
With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia Works, and Cyanogen Extraction Plants.

BIGGS, WALL & CO.

Telegrams: "RAGOUT LONDON."

Telephone: 273, CENTRAL.

MAKERS OF **SULPHATE OF AMMONIA PLANT.**



Section showing Williams and Fenner's Patent Outside Cracker Pipe as fitted to our Solid Lead Plate Saturator.

Sole Proprietors of Williams' and Fenner's Patent Saturator with Outside Cracker Pipe, for which we claim the following

ADVANTAGES:—

1. Equal distribution of Steam and Ammonia.
2. Perfect agitation and boiling of the Acid Liquor.
3. No possibility of local Alkalinity,
4. Consequently no formation of Blue Salt.
5. Sulphate is easily forced to point of discharge.
6. No incrustation.
7. No renewals of Cracker Pipe.
8. Capacity of output greatly increased.

IT CAN BE APPLIED TO ANY EXISTING SATURATOR.

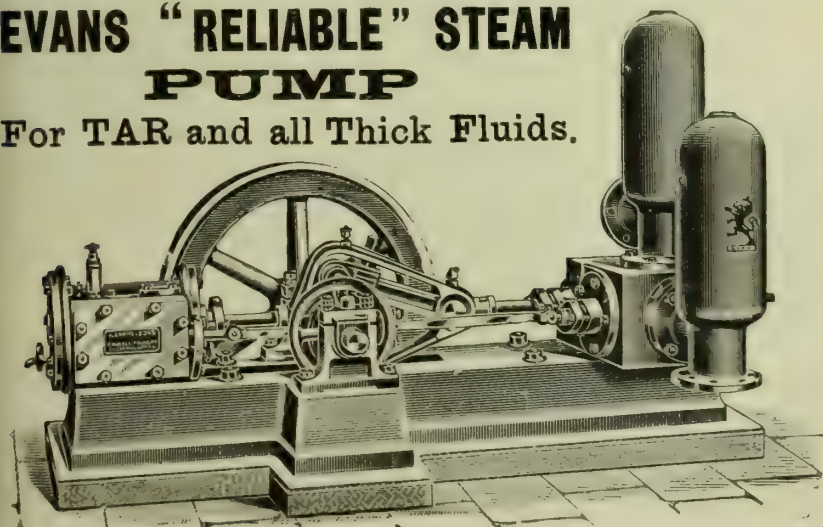
LICENCES TO MAKE MAY BE OBTAINED;
FOR FULL PARTICULARS APPLY TO

BIGGS, WALL & CO.

13, Cross Street, Finsbury Pavement,
LONDON, E.C.

EVANS "RELIABLE" STEAM PUMP

For TAR and all Thick Fluids.



FIRST AWARDS EVERYWHERE.

Write for No. 8 Catalogue.

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JOSEPH EVANS & SONS,
(WOLVERHAMPTON) LTD.,
CULWELL WORKS,
WOLVERHAMPTON.

MAIN LAYING.

Paper by PERCY GRIFFITH, M.Inst.C.E., and BRUCE MCGREGOR GRAY, Assoc.M.Inst.C.E., before the Association of Water Engineers.

A. The Authors used *Flanged Pipes* for the Rising Main up the Steep side of the Barff, and their experience proved that this was not an advantage, as the *rigidity of the Joints* involved considerable difficulty in regard to the depth of the Trench, and a good deal of Cutting to make the final Connections at each end of the Pipe-Line.

B. In the case of the Delivery Main, the Joints were *Ordinary Socket Joints*, but made with Lead only. The only difficulty met with here was the necessity for pouring the Lead in at a suitable temperature to prevent it melting the Solid Lead Fillet, and running through into the Pipe.

C. In some of the Smaller Branch Connections, Lead Wool was used, and proved highly successful.

Particulars from

THE LEAD WOOL CO., LTD., SNODLAND, KENT.

EVERITT'S Patent TAR-FOG EXTRACTOR AND NAPHTHALENE REMOVER.

SOLE MAKERS:

ROBERT DEMPSTER & SONS,

ROSE MOUNT IRON-WORKS, LTD.,

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"COALEXLD."

The growing popularity of the Manufacture of Coalexld is **proved** by the absence of Stocks of Coke, and the **increased** number of Gas-Works now making it.

**COALEXLD LIMITED,
LANCASTER.**

ARROL-FOULIS Stoking Machinery HYDRAULIC COKE PUSHERS

(HUNTER and BARNETT'S PATENT).

**WILL DISCHARGE A RETORT IN ONE OPERATION
LARGE NUMBERS IN USE.**

Full Particulars may be obtained from the Sole Makers,
**SIR WILLIAM ARROL & CO., Limited,
GLASGOW.**

[See Illustrated Advertisement, Oct. 19, p. 164.]

R. LAIDLAW & SON (EDINBURGH), LTD. GAS METER MAKERS.

DRY METERS
IN
TIN AND IRON CASES.

WET METERS
IN
TIN AND IRON CASES
WITH ORDINARY AND
COMPENSATING DRUMS.

All Materials used in the Manufacture of these Meters are of the best quality, and the Workmanship of the Highest Standard.

SIMON SQUARE WORKS,
EDINBURGH.
6, LITTLE BUSH LANE,
LONDON, E.C.



Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof— For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

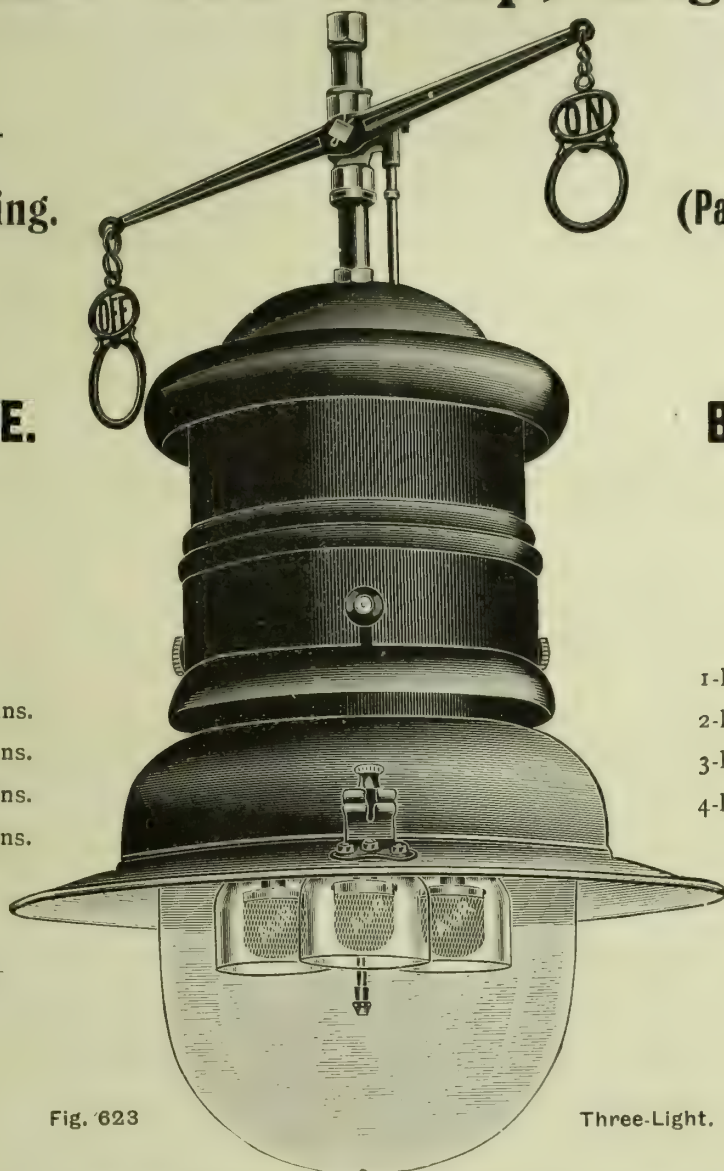
BRITISH MADE.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	.	.	.	1 ft. 1 in.
2-light	.	.	.	1 ft. 5 ins.
3-light	.	.	.	1 ft. 5 ins.
4-light	.	.	.	1 ft. 8 ins.



ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	<i>Gas per hour.</i>	<i>C. P.</i>	<i>Steel.</i>	<i>Copper Case.</i>		<i>Gas per hour.</i>	<i>C. P.</i>	<i>Steel.</i>	<i>Copper Case.</i>
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52 6	6/- extra.
2-light	8 feet	260	47 6	6/- extra.	4-light	16 feet	550	72 6	9/- extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3 6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

		<i>1-Light.</i>	<i>2-Light.</i>	<i>3-Light.</i>	<i>4-Light.</i>			<i>1-Light.</i>	<i>2-Light.</i>	<i>3-Light.</i>	<i>4-Light.</i>	
Clear Glass Globes, each		2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2/9	3/6	
" " " In Case lots		19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6		Not made
" " " per dozen.												
Case contains . . .		80	18	18	12	Welsbach Mantles, each		6d.	subject as usual.			

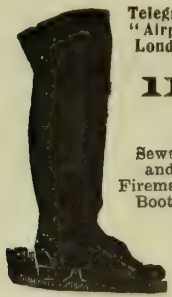
The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price **4½d.** each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD..

Welsbach House, 344-354, Gray's Inn Road, London, W.C.

Telegrams and Cables: "WELSBACH LONDON."

Telephone 2410 NORTH.



Telegrams:
"Airproof.
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THOMAS BUGDEN & CO.,

India-Rubber and Airproof Manufacturers and General Contractors.

116-118, GOSWELL ROAD, LONDON, E.C.

Largest Manufacturers of Gas
Main Bags.

Telephone:
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Sewer
and
Fireman's
Boots.



Gas Bags for repairing Mains.
All Seams Stitched and Taped.

Patentees of the DENMAR BAG,

Impervious to Main Liquor and
Climatic Influences.

Oilskin Clothing, Diving and Wading Dresses,
Sewer Boots, Tar Hose, Stokers' Mitts,
Bellows, &c.



Gas Bags for repairing
Mains. All Seams
Stitched and Taped.



Contractors' and Mine
Jackets.

<h2>HANNA, DONALD & WILSON, PAISLEY,</h2> <h3>ENGINEERS & CONTRACTORS.</h3>					
<p>LARGE CAST IRON OR STEEL OIL, LIQUOR OR WATER TANK.</p>	<p>CONDENSERS VARIOUS TYPES.</p>	<p>GAS AND WATER VALVES.</p>	<p>ROOFING STRUCTURAL WK M.S. & C.I. PURIFIERS.</p>	<p>GAS EXHAUSTER & GAS ENGINE COMBINED.</p>	<p>ROTARY GAS EXHAUSTER.</p>
<p>ADMIRALTY LIST. WAR OFFICE LIST. COLONIAL AGENTS. ETC.</p>					
<p>GAS EXHAUSTER AND C.I. OR S.C.I. TANKS.</p>					

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN, CAR HOUSE, & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

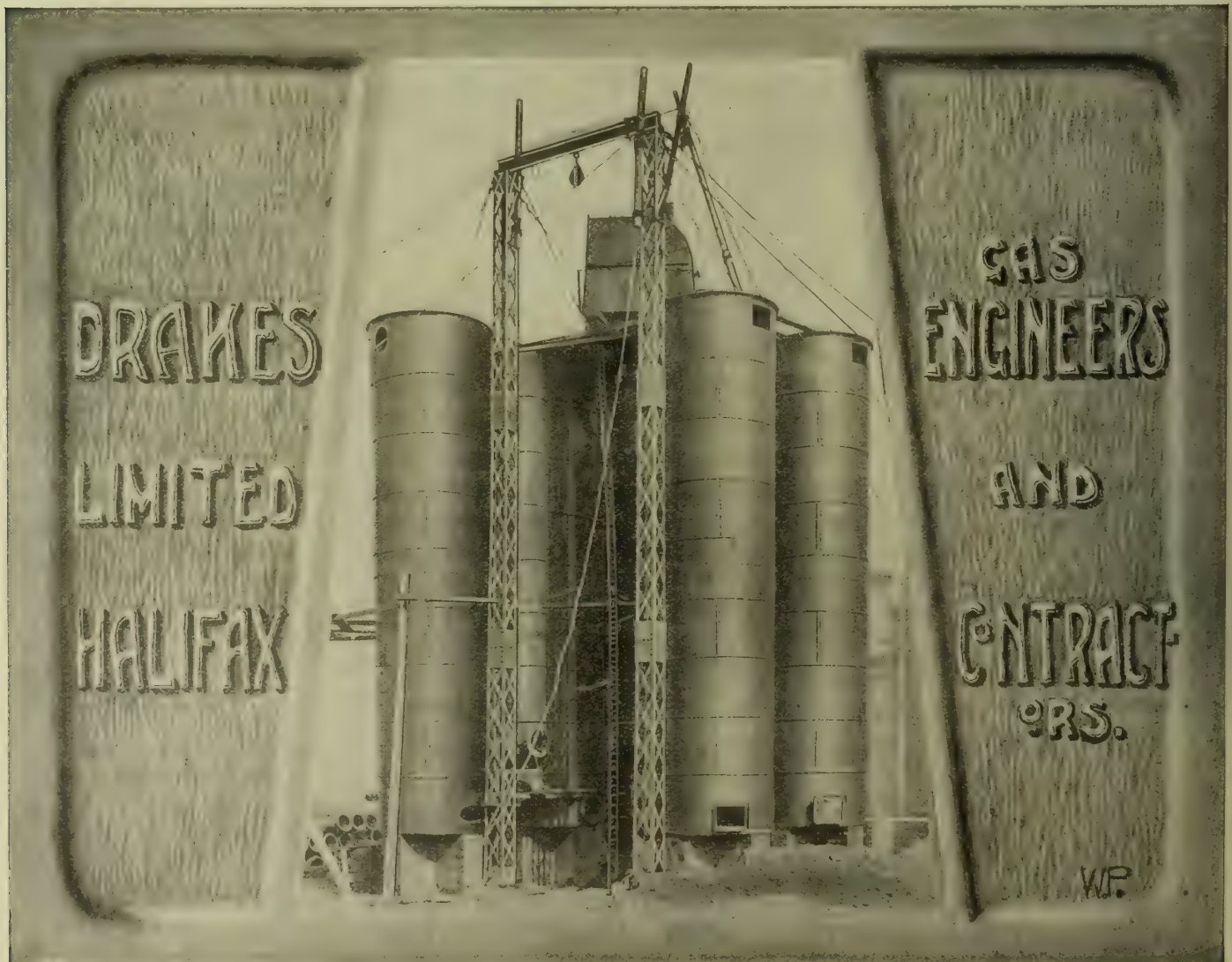
ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820'20.

VERY FREE FROM IMPURITIES.

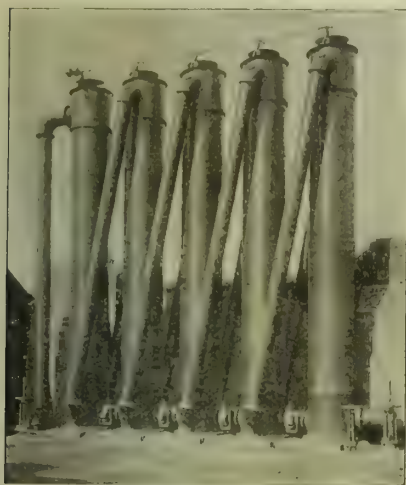
TELEGRAMS: "ATLAS SHEFFIELD."



DRAKES
LIMITED
HALIFAX

GAS
ENGINEERS
AND
CONTRACT
ORS.

W.F.



GASHOLDERS.
WITH GUIDE FRAMING OR COLUMNLESS.
LUTED PURIFIERS LUTELESS

WATER **Condensers** **AIR**

**GAS PLANT OF EVERY DESCRIPTION
 DESIGNED AND ERECTED.**

C. & W. WALKER, LTD., MIDLAND IRON WORKS,
 DONNINGTON, SALOP.
 110, CANNON STREET, LONDON, E.C.

SAML. CUTLER & SONS, MILLWALL, LONDON,
 And at 39, VICTORIA STREET, WESTMINSTER, S.W.

CARBURETTED WATER-GAS PLANT.

MAXIMUM EFFICIENCY GUARANTEED.

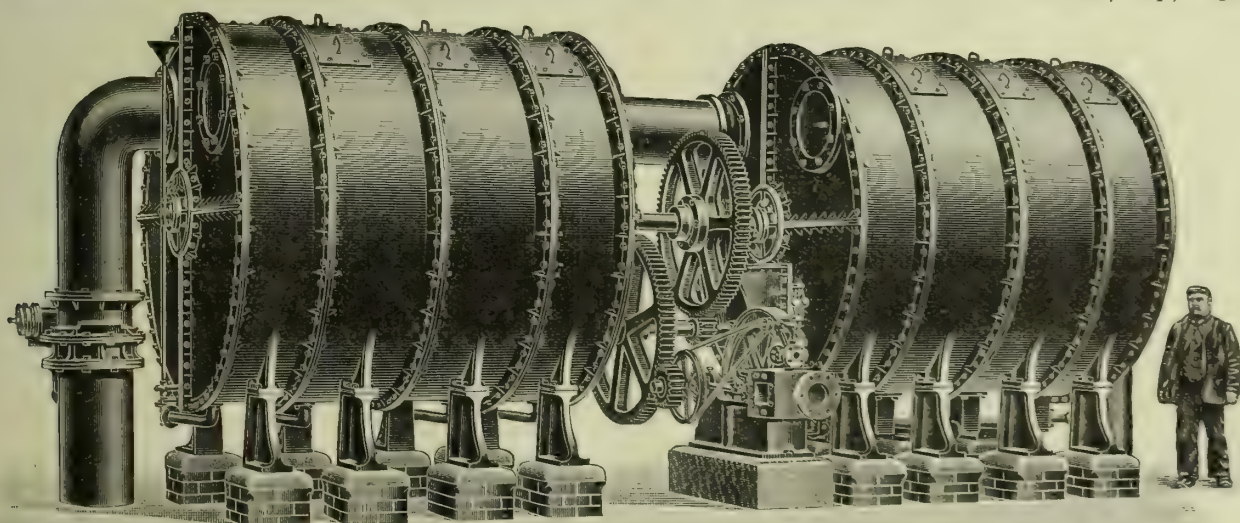
Inspection of Working Plants Invited.

No. 227.

ROTARY WASHER SCRUBBER.

Capacity 2,500,000 cubic feet per day,

For Gas-Works, KINGSTON-ON-THAMES. H. W. Packham, Esq., Engineer.

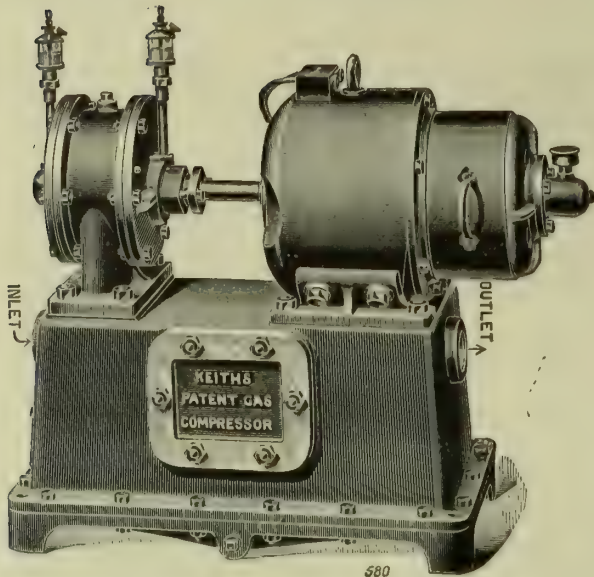


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R. & J. DEMPSTER, Ltd.,
 London Office :
 165, GRESHAM HOUSE, OLD BROAD ST., E.C. **MANCHESTER.**

The KEITH LIGHT.

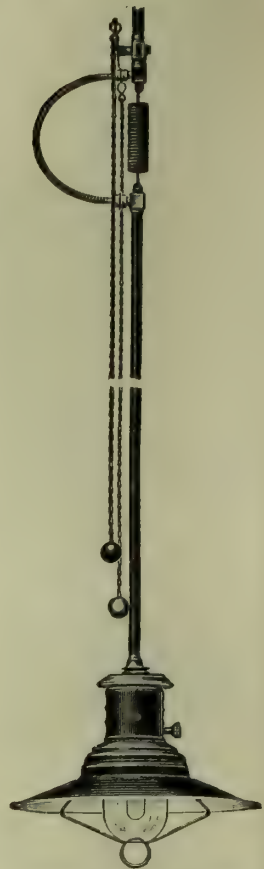
5500 Installations in use.



Electrically-driven Rotary Compressor.

**60-CANDLE POWER
PER FOOT.**

Sizes from **100** c.p.
to **1500** c.p.



100 to 300 c.p. Fitting.

JAMES KEITH & BLACKMAN Co., Ltd.

27, FARRINGDON AVENUE, LONDON, E.C.

WE ARE OLD

makers of Gas-Works Plant, having been in business over Seventy Years,

BUT ALIVE

to modern developments and requirements,

AND

if you are requiring Retort Mountings, Condensers, Rotary Washers, Tar Extractors, Purifiers, or Valves, please send for our

UP-TO-DATE

particulars of Clapham's "Eclipse" Specialities, which were awarded "Diploma of Honour" at the Franco-British Exhibition.

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Wellington, Nelson, and Market St Works,

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F. HERBERT STEVENSON, Edgbaston House, Broad Street, Birmingham.
JOHN. D. GIBSON, 2, Causeyside Street, Paisley.

THE JOURNAL OF GAS LIGHTING

WATER SUPPLY & SANITARY IMPROVEMENT

Vol. CVIII. No. 2425.] LONDON, NOVEMBER 2, 1909. [61ST YEAR. PRICE 6d.

PARKER & LESTER,
— ESTABLISHED 1830. —
MANUFACTURERS AND CONTRACTORS.
ORMSIDE STREET, LONDON, S.E.

THE ONLY MAKERS OF
PATENT ANTIMONY PAINT & PARKER'S IMPERIAL BLACK VARNISH,
OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

SAFETY GAS-MAIN STOPPER,
FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS.



GAS-LEAK INDICATORS,
With all Latest Improvements.
SHORT'S IMPROVED
AND ANSELL CLOCK FORM.
For Ground Use, Flush Boxes, &c.
For Purifier Blow-off Valves.

Highly Sensitive. Long Range.
For Hard Usage.


GAS AND WATER PIPES
1½ to 12 in. BORE.



THOMAS ALLAN & SONS, LIMITED
Bonlea Foundry,
THORNABY-ON-TEES.
Formerly Springbank Iron-Works, Glasgow
ESTABLISHED 1848.
Also Manufacturers of
Sanitary and Rain-Water Pipes, Hot-Water Pipes, Stable Fittings, and General Castings.
Telegrams: "BONLEA, THORNABY-ON-TEES."

THE HOUSE FOR MANTLES. THE HOUSE FOR MANTLES. THE HOUSE FOR MANTLES.

Indoor Lamp.



NO NOISE. NO SMOKE. NO SMELL.

The Airopstat Burner

"DEGEA"

The only Burner with Automatic Air Regulation by the Airopstat Arrangement.

Try our Lamps and you will never use any other.

1. The Airopstat Automatic Air Regulation, works Automatically when Burning.
2. The Burner gets sufficient Air by this arrangement.
3. Low Pressure (½ in.) sufficient.
4. Gas Regulator without Spring or Wire.
5. Dust Trap.
6. Inner Protection.
7. Ceramic Nozzle.
8. Takes the Ordinary Glasses.

PLEASE ASK YOUR FACTOR FOR PARTICULARS.


JULIUS NORDEN,
Manufacturers of Incandescent Mantles, Ltd.,
44, Farringdon Street, LONDON, E.C.
OR THROUGH

Faudels, Ltd. (S. & F. Dept), LONDON, E.C.
MANCHESTER: Baxendale & Co., Saml. Gratrix, Junr., & Bros., Lewtas Lamp Works.
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Read the Articles in the "JOURNAL OF GAS LIGHTING," Sept. 21, page 753, and Oct. 12, page 106, and also the "GAS WORLD," Oct. 2, page 402.

Outdoor Lamp.



Only One Bye-pass. Outside Ignition. Dust Trap. Midnight Burner.

THE HOUSE FOR MANTLES. THE HOUSE FOR MANTLES. THE HOUSE FOR MANTLES.



Complete Telfer Track with Screens showing Coke Storage Heap and Telfer travelling round Curve.

"TELPHERAGE"

Conveying Plants for Handling Hot Coke, Coal, &c. Coke Handled in Bulk and without Breakage.

Specially suitable for Handling Hot Coke discharged by the Mechanical Discharger.

STRACHAN & HENSHAW, LTD.,
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Telephone: 5662 LONDON WALL.

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ILLUMINATING GAS (Permanently Fixed) FROM
COKE TAR AND BENZOL, OF ANY DESIRED POWER.
CAN BE MIXED WITH COAL GAS UP TO 75% OF THE MIXTURE.

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HYTHE.

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ST. MARY-CHURCH, TORQUAY.

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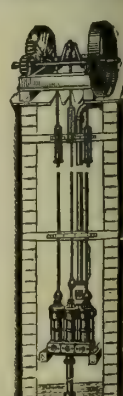
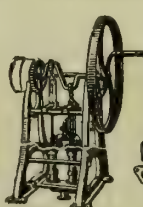
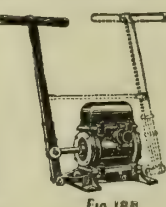
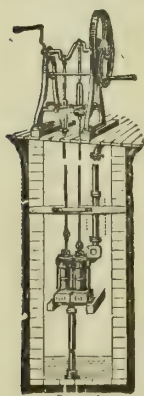
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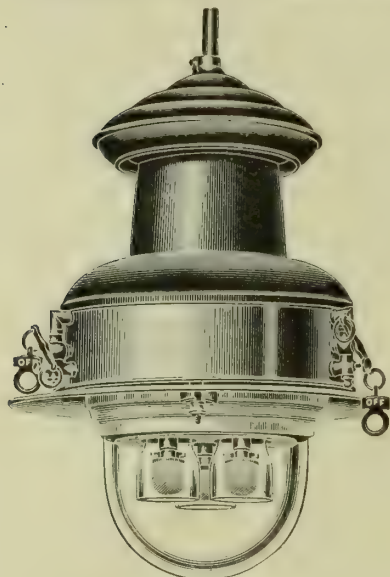
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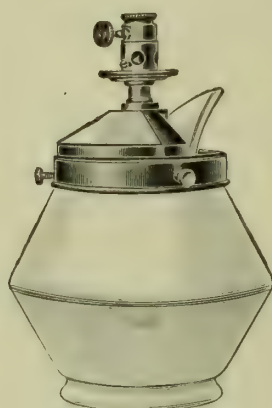
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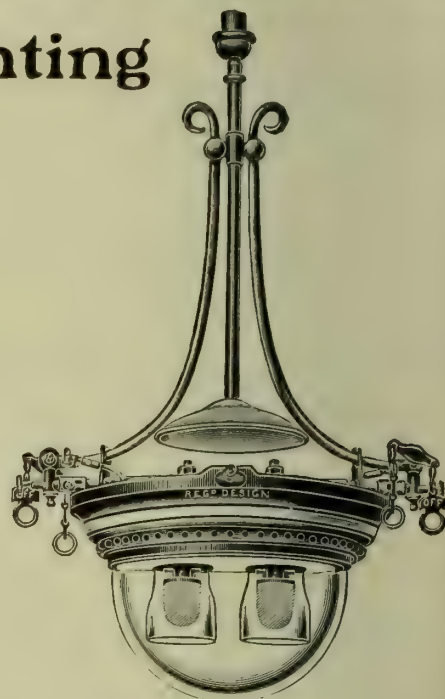
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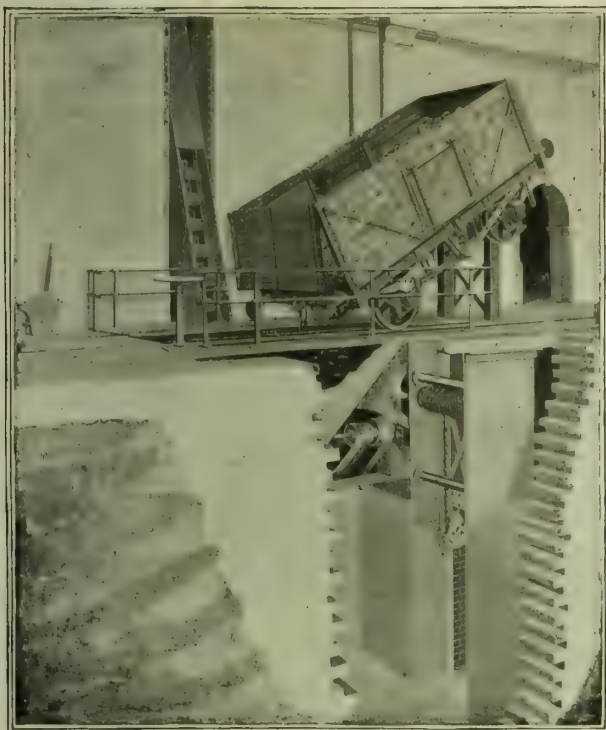
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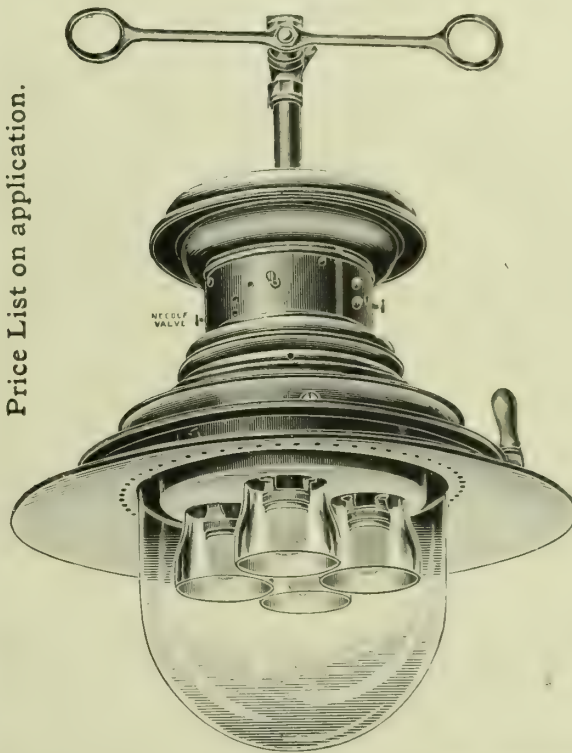
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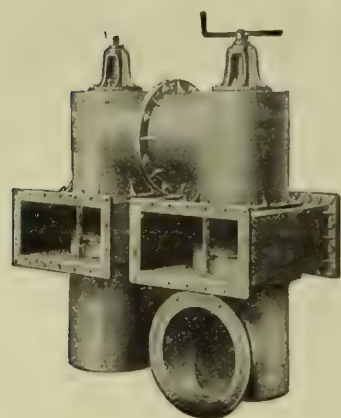
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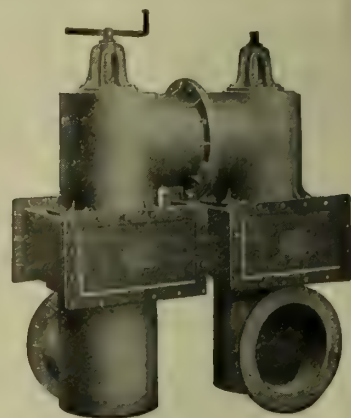
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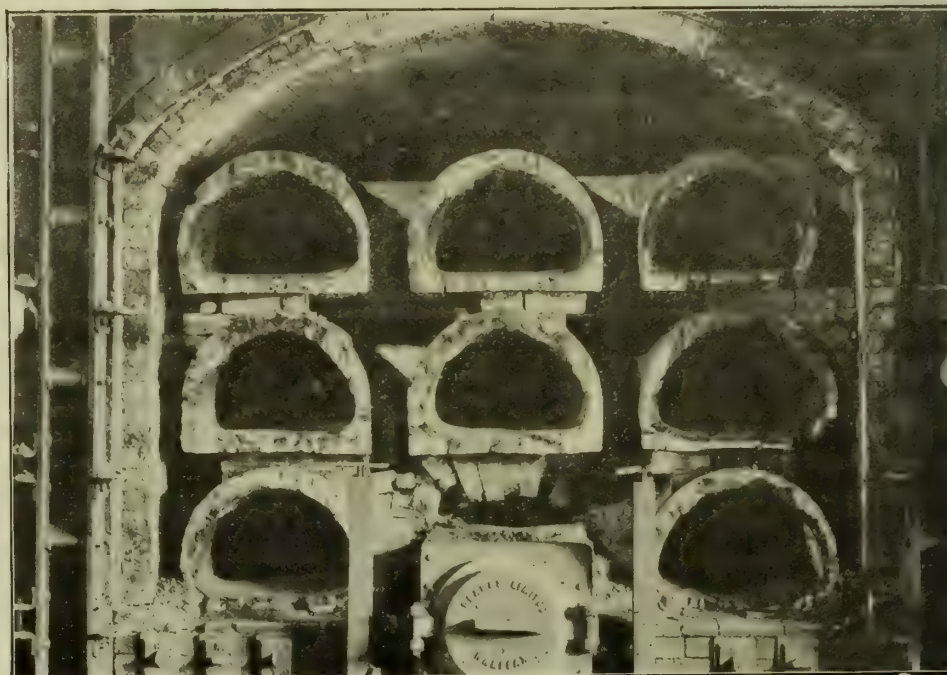


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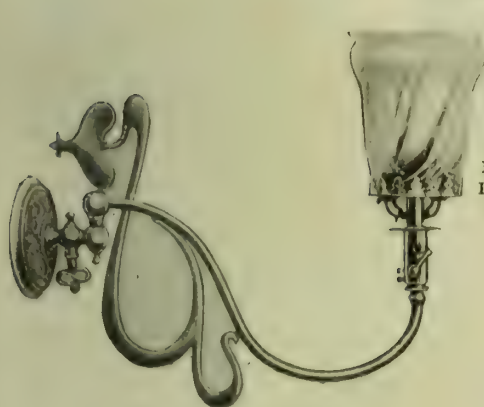
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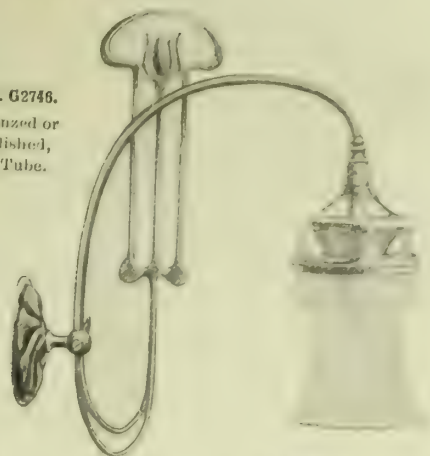
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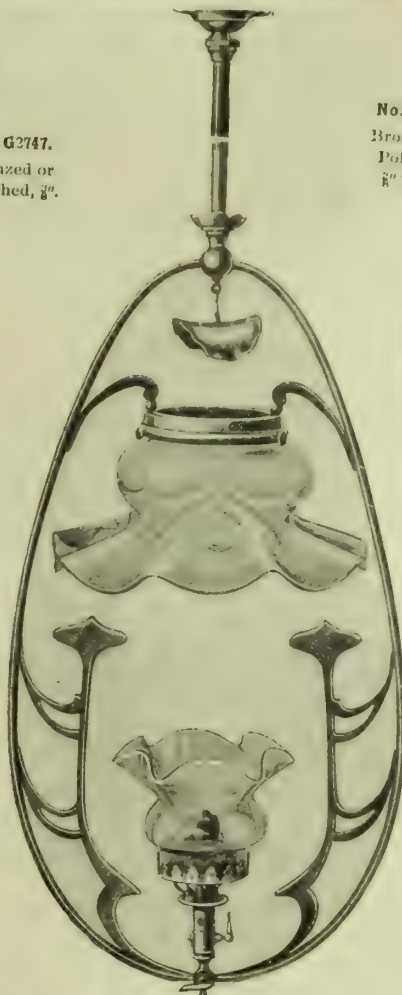


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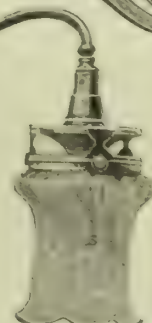
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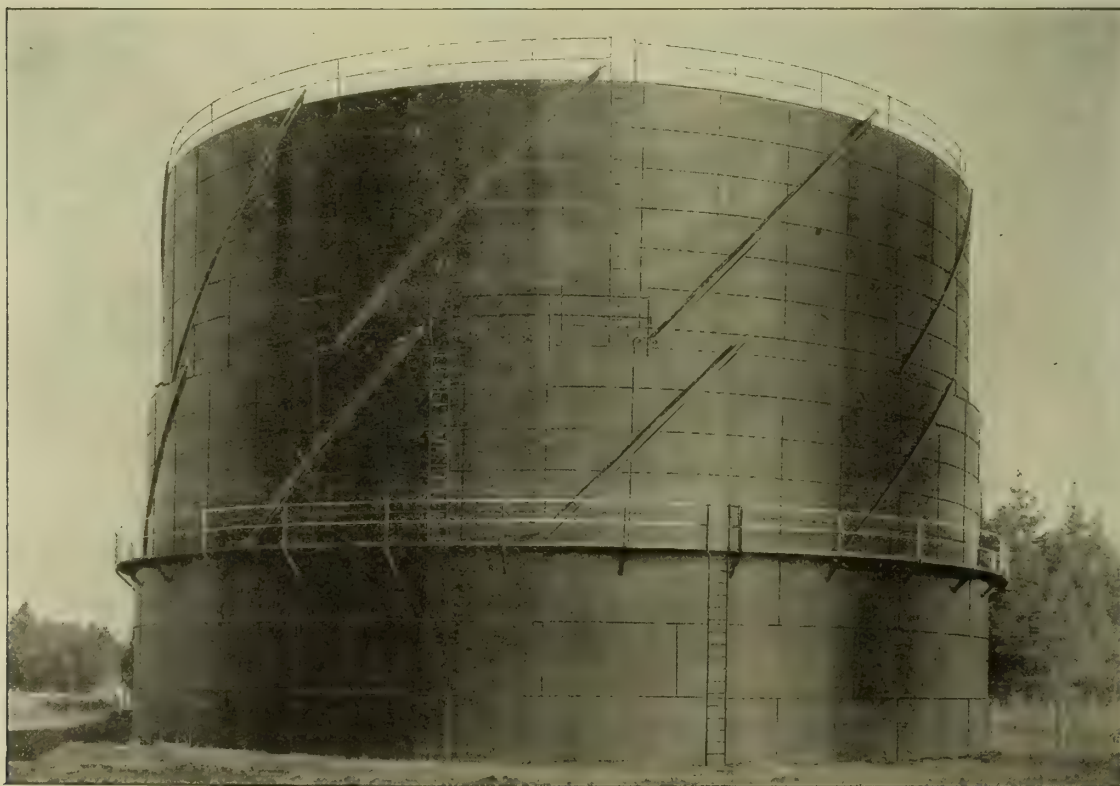
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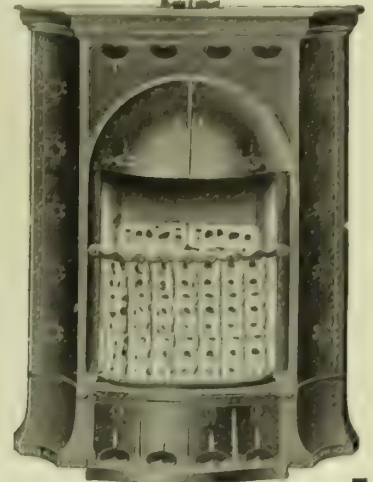
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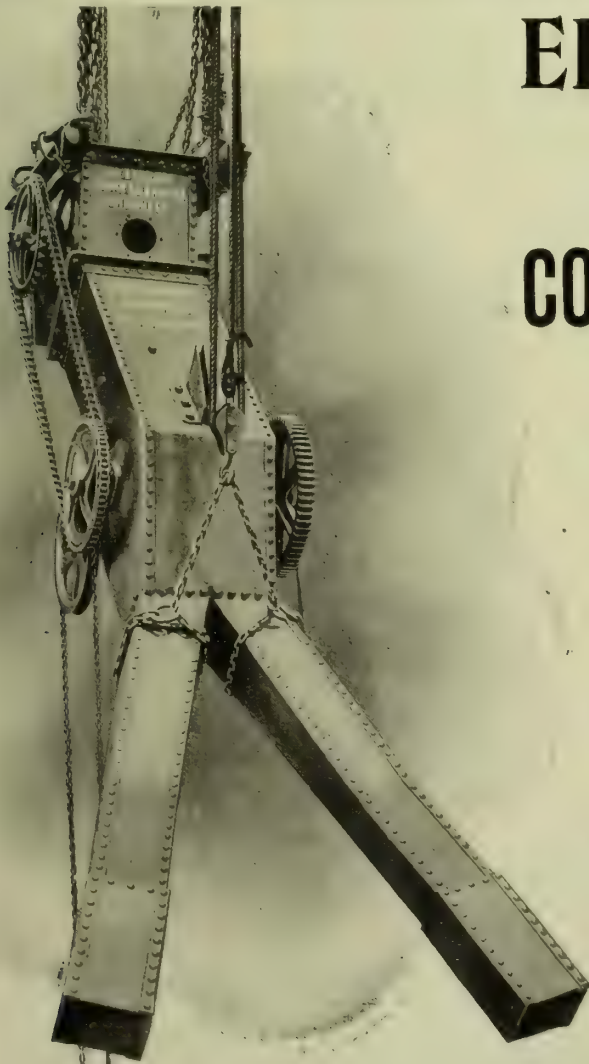
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A. The Authors used *Flanged Pipes* for the Rising Main up the Steep side of the Barff, and their experience proved that this was not an advantage, as the rigidity of the Joints involved considerable difficulty in regard to the depth of the Trench, and a good deal of Cutting to make the final Connections at each end of the Pipe-Line.

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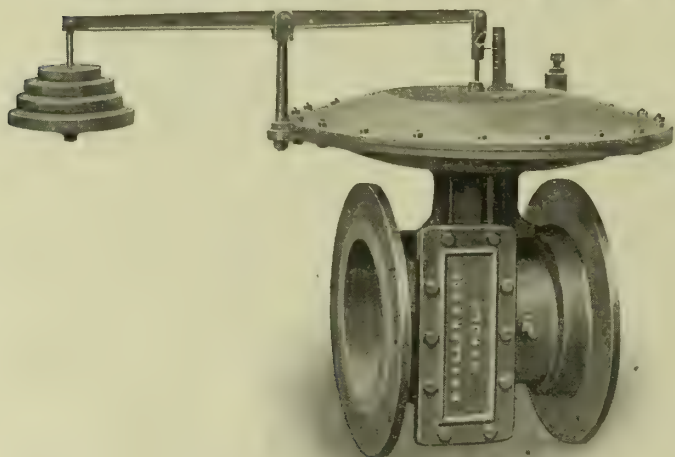
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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING.

OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CVIII., No. 2425.—TUESDAY, NOVEMBER 2, 1909.

EDITORIAL NOTES—GAS, &c.

The Organization of the Gas Industry.

"Is Better Organization Needed in the Gas Industry?" was the title of an editorial article that appeared in the "JOURNAL" for July 20 last. Privately, many answers in the affirmative have come to us; but the answer especially desired is that which has now been given by the, *pro tempore*, responsible head of, and therefore the most influential man in, the professional gas organizations of the country. When speaking at the meeting of the Midland Association (*ante*, p. 252), the President of the Institution of Gas Engineers, Mr. James W. Helps—who by-the-by has been devotedly assiduous in his attentions to the affiliated District Associations—confessed that he was not at all satisfied with the present organization of the gas industry. If anyone in the professional ranks is capable of forming fair judgment on this matter, that one is Mr. Helps; for no man has had more intimate connection with the inner workings of professional organization in the industry than he, no one has better acquaintance with the difficulties of which public display is not made that compass about the organized bodies, and no one has better knowledge as to the limitations from which all such organizations—and particularly the Institution—suffer. Therefore to have the confession of dissatisfaction from the President is the first step towards reform; the second is to produce a widespread desire to bring about reform. If we correctly construe the remarks of Mr. Helps, anxiety in the matter is already existent among members of the Council; and, what is more, there is adumbrated in the President's mind a fully representative organization for the industry. The President's observations on the point appear to herald what may be a change fraught with so much importance to the industry that it may be of advantage to give them the prominence of reproduction here:

He might mention that one great thing they were anxious to do was to organize the industry in such a way as to have a representative body which could take up such questions as they had been discussing that day, and not have them left to be dealt with by outside organizations on their behalf. He confessed that he was not at all satisfied with the present organization of the industry; and he hoped during his term of office to be able to make a suggestion which, if taken up, would increase the usefulness of the Institution.

In our opinion, in no way could Mr. Helps signalize his year of office better than by making a suggestion, and working to effect its consummation, having for its purpose the amending of that which is palpably defective. We need not again to-day traverse the ground of argument to be found in the article in our issue for July 20. But this we do say, that the enlargement from professional to industrial usefulness of the Institution can only be effected by an extension of its constitution. As a professional or technical body, the Institution is (within, true, somewhat sharply defined limits) an effective body; as a representative industrial organization, it is an ineffective body, and has no present title to be regarded as representative industrially. There is no getting away from this. As pointed out in our former article, the modern history of the industry supplies incontrovertible evidence of this being so.

It may be said that it is not long since the old Institute and Institution were in the melting-pot, and a united organization ensued; and it may be asked why this extension was not thought of then? The question is a very fair one; the answer is not at all difficult. At that time, the industry was not so strongly possessed as it is to-day with the importance of the closer and deliberately wrought union of science with the every-day work of the industry, such as has eventuated, after great effort, in the concrete association between the industry and the University of Leeds; then the competition between the gas and electricity industries had not reached

the stages of severity that now obtain, not so much through the increased efficiency of electricity as through undue municipal preference and support; the residuals markets were not then threatened so acutely as they are now by the by-products of the recovery coke-ovens (see *ante*, p. 97); further, the notable changes that have been, and are still, occurring in the industry had not advanced to their present stages. Events affecting the industry have indeed been moving very rapidly; and technical or professional organization alone does not suffice for the needs of to-day. In dealing with all matters other than those of technical inception and moment, the Institution are handicapped in effective movement solely through constitutional limitations; and even in the technical work, there is a somewhat rigid bounding through financial considerations. As suggested before in these columns, this all points to a new section in connection with the Institution being essential to the work of the times—a section in which the administrators of the gas supply industry can be organized, and in conjunction with which, without touching the technical work of the Institution, periodical conference on administrative and commercial matters could be arranged. Only bring about, on common ground, the direct union of Chairmen and members of Boards and Gas Committees with the general work and the requirements of the industry, and the confining chains to the competence and ability of the Institution will be greatly lengthened, to the advantage of the whole industry. We are not aware of the lines of the suggestion the President will make in due season; but, whatever may be done in the result, if it produces an effective expansion (estimated industrially) of the scope in value and vitality of the Institution, it will be a worthy memorial to his presidential year.

Protective Work.

THE Gas Companies' Protection Association is one of those bodies whose activities are usually carried on in such a manner that, if the curtain were not lifted once a year, the organization would be largely lost to view, except to those constituting the membership. The report that the Committee presented at the annual meeting on Thursday, and the amplifying speech of the Chairman (Mr. H. E. Jones), indicated a pretty large range of subjects that have occupied during the year the attention of the Committee and the Secretary (Mr. F. E. Cooper)—the latter more especially on legal points. The Association serves as a kind of agency for the members, a source of information, and, through it, a sharp look-out is maintained for all matters that affect in any way the interests of gas companies. There is also through it collective participation in appeal and protest. But it cannot be expected that success will always ensue from its operations. If it did, here would be a body to be greatly feared.

The Association did its part in warning the Government as to what would be the effects of the Coal Mines Eight Hours Bill. Neither the Association nor any of the other protesting bodies and industries fathomed in anticipation the full depths of mischief that the Act would produce. But the Home Secretary, receiving protests willingly and urbanely, displayed the same characteristics, when the door was closed upon his visitors, in setting the protests on one side as being of no account. One suggestion may be interjected here; it is that eyes should for a period be kept carefully on Northumberland and Durham. In the matter of the universal application of the test-burner, too, the work that the Association did in conjunction with the Institution has so far proved abortive, and has resulted in a promotion (as seen elsewhere) of less pretension, but of great value. Officially, the Board of Trade have shown apathy in the matter; but unofficially it is understood that they cannot move in it. We take it that in the address of Mr. Jones at the meeting, he was intentionally throwing light upon the position when he said: "It was clear they had called upon the Board to do a little more than they could do, without at the same time bringing in a further measure for the rectification of the

"Gas-Works Clauses Acts, which probably might not have suited the members." We do not like the last few words. They appear to suggest that there is something to fear. If rectification of the Gas-Works Clauses Acts is desirable (and most of us admit that for many reasons it is), then the desirability should be allowed to stand before anything else. There are these constant hints as to some cryptic evil accompanying amendment, and yet no one is in a position to shadow out, much less put into material shape, what these evils will be. Find out whether they are evils or otherwise, or purely imaginary; and when the knowledge is available, then we shall know whether rectification or the *status quo* is the better. At any rate, no amendment of the General Acts would be effected without the fullest inquiry. But we do submit that the gas industry ought not to be handicapped in the matter of its legislative facilities without gaining some more exact knowledge than exists as to where the industry actually stands in regard to what is expected of it, and what, if anything, would be the price of amendment.

It is clear, from the report of the Committee of the Association, and from the remarks of the Chairman, that a certain paper that was read before the Midland Association a week before the meeting under notice does not represent the views that have general currency in the gas industry on the subject of the disallowance of depreciation in assessing for income-tax. A principle such as is proposed is a serious matter; and it cannot be permitted to become established without putting to trial its title to validity. The advice of the Committee of the Association is resistance to the Inland Revenue intentions until the larger companies have had opportunities of testing the question to a definite conclusion. Meantime, the Committee of the Association will keep a watchful eye on the question. It would, however, have given backbone to the smaller companies in their resistance to this new species of financial oppression if there had been some suggestion of united action. Another piece of work that, with proper assistance, will develop, is the attack the Committee of the Association contemplate making on unfair rate-aided electrical competition, and the loose charges made for electricity, especially by municipal authorities conducting such competition. The Committee want the active support of gas companies in furnishing them with as much evidence as possible on the subject, so that a strong case may be formulated.

Joint Bill for the New Test-Burner.

STRONGLY supported by influential Companies, the first step has been taken in the promotion of a Joint Bill for the adoption, by Companies who enrol themselves as participants, of the "Metropolitan" No. 2 burner as the standard instrument for testing the illuminating quality of their gas. The conference convened for Thursday last by the Gas Companies' Protection Association, under whose auspices the Bill is being promoted, was attended by a larger number of representatives of Gas Companies than there has been at meetings of the Association for some time past; and this is significant of the interest and importance generally attaching to the movement. As the Chairman of the Association (Mr. H. E. Jones) pithily put it, this is "a common cause," and a cause that is common must necessarily attract general attention. We have been at the parting of the ways now for some time in the matter of gas supply. The uses of gas have expanded and multiplied, and the old essential quality is not the essential quality to-day. Everything possible that is effective in assisting the industry, even in respect of the proper valuation of the gas supplied, must be done for the sake of progress in the right direction. Some of the burners named as standards in Acts of Parliament are monstrosities for the purpose; and the hypothesis has become extinct that the for many years ordinary burner, which was the best one known prior to the advent of the "Metropolitan" No. 2, is suitable for gas other than of the illuminating quality for which it was specially constructed. To obtain uniformity of standard, the present process of individual application to Parliament or to the Board of Trade is a tedious one. The Government, however, are much too occupied to give attention to any general legislation on the subject; and indeed unofficially (as mentioned elsewhere) it is learned that the Board of Trade are not prepared to move in the matter at present. Therefore the mode of procedure proposed by the Gas Companies' Protection Association is the next best that can be devised to bring about more rapidly the uniformity that all but a slender minority believe to be advisable.

Now, then, is the time for gas companies who have not yet obtained the right to have their gas tested by the burner that has been so widely scientifically approved, and consistently accepted by Parliament and the Board of Trade—by the parliamentary authorities to the extent of specifying it in the model clauses—to join hands with those who have already signified their intention of being included in the Joint Bill. But those companies—whether members of the Association or not—who intend to co-operate should communicate their willingness at once to the Secretary of the Association (Mr. F. E. Cooper), at the offices at No. 5, Victoria Street, S.W. Early intimation is of the greatest importance. The terms on which there is to be this joint application are reasonable. The original proposal of an initial fixed contribution of £50, has been reduced to 20 guineas, with a *pro rata* (according to volume of gas sales) responsibility for the balance of the expenses later. United action of the kind works out cheaply for the individual companies who have no other immediate necessity for approaching Parliament; and the terms and the opportunity should more especially appeal to the smaller gas undertakings. A Committee of strong constitution—including the Chairman of the Association, the President of the Institution of Gas Engineers (Mr. James W. Helps), though not in that official capacity, and Mr. Charles Carpenter, the inventor of the "Metropolitan" No. 2 burner—has been appointed to see the measure through; and the Committee, as at present composed, have power to co-opt anyone else whose services, in their judgment, may be of any special value.

Everything looks favourable for success; and really we cannot see grounds for anticipating anything else. The confidence of the promoters is seen in the very act of initiating the movement. What Parliament has done, *without exception*, during the years that have elapsed since the introduction of the new test-burner, in every individual case that has come before them—company or municipal authority—they, assuredly, will not refuse to do because a number of companies collectively ask them to do likewise. The precedent is too abundant to allow of any refusal. There will be general endorsement of the Chairman's advice that the local authorities in the districts supplied by the Companies joining in this promotion, should be informed at once of the intention to do so, and that full explanation as to purposes and advantages should be given them. The point especially should be impressed as to the complete and consistent ratification by Parliament of the adoption of the new standard burner in the case of both municipal and company gas supply; and, moreover, mention should be made of the fact that there are instances where, the old test-burner having been proposed in Bills in recent sessions, the parliamentary authorities have, during the progress of such Bills, made the test clause comply with the new model one, and so, in this way, have done something towards bringing about the uniformity of standard burner and conditions that is desired by the industry. Opposition, in our opinion, under the circumstances, will be futile. The success of the joint Bills in connection with the sulphur clauses should also serve as an inducement to participation in the present movement. But let us again emphasize this, that it is imperative there should be immediate decision and communication with the Secretary of the Association. Procrastination will put companies on the wrong side of the pale of this favourable opportunity. Those who determine to avail themselves of the opportunity will find themselves in good company. Up to last Friday, seventeen Companies had entered for participation in the promotion; and these Companies represent an annual gas production of about 15,000 million cubic feet. Others, too, are on the point of determination. Those who fear that some onerous exactions will be made, entertain a view that is not shared by us. Should any undue imposition threaten in any case, there can be immediate withdrawal.

Some Unique Experience, and Reconstruction Work in Melbourne.

THE article Mr. P. C. Holmes Hunt, the Chief Engineer of the Metropolitan Gas Company of Melbourne, contributes to our columns this week is particularly interesting from two aspects—the one is the almost romantic, at any rate, unique experience that the figures in the introduction supply; and the other is the absolutely up-to-date carbonizing equipment at the South Melbourne works that Mr. Hunt has been instrumental in installing. The descriptive story that he puts before his colleagues in this country seems, through

the line to line character of new plant there and here, to do much to bridge the space between him and them. But first as to the figures in the two opening paragraphs. They bear a tale of rapid declension and recoupment in the business of a gas undertaking that is, we opine, without parallel in the history of the world's gas industry. Here is an undertaking that in 1891 was doing a business in gas to the amount of 2,136,631,000 cubic feet, and six years later (owing to the momentous trade and financial crisis through which the country passed) that magnificent business had crumbled away, by upwards of 45 per cent., to 1,167,900,000 cubic feet. The Company's return to more prosperous conditions has accompanied the turn in the tide of the country's affairs. The recuperative power of the concern is best seen when it is mentioned that the loss of 968,731,000 cubic feet per annum which the foregoing figures show, had been reduced to 375,840,000 cubic feet by 1908. At the present rate of increase, it is expected that the old position will be completely restored in a very few years. It is a remarkable experience; and the strength of the Company must have been great to have withstood such a tremendous shock.

Meanwhile, a considerable part of the plant was standing idle; and during those years was degenerating and, through the advances in carbonizing practices and plant, losing cast in point of economical ability, as judged by the modern standards. The position was one that added greatly to the ordinary responsibilities of the Engineer; but upon this head Mr. Hunt is modestly silent. It is easy to picture the undescribed position. Directors and Engineer, however, have adopted a spirited policy in putting themselves, with a reflux of business, in possession of economical gas producing plant. Its character, apart from the descriptive article, there is no call to specially mention here. For horizontal working in every particular—in structural features and ancillary devices—it is up to line with the best plant and practice in this country. Mr. Hunt has adopted De Brouwer projector charging and pusher discharging; and the economical considerations that weighed in his choice are stated. Single ascensions have been adopted; and in twelve months' working there have been only three stopped pipes. But tar towers and Cowan's governors are employed. The material-handling plant is of a kind that has the recommendation of considerable experience. A novel feature is the Engineer's own design of travelling platform and coke-shoot, which is a convenience in several ways and a saver of labour. We will not detract from the interest of the communication by further specifying the plant. But in considering the question of capital costs, readers will bear in mind the distance much of the plant had to be shipped, the higher wages for labour in Australia than in England, and the extensive character of the plant that the capital cost includes.

The Company and their Engineer are to be warmly congratulated upon their enterprise; and what they have done shows that, in these large works so far from the Mother Country, it is intended that practices shall follow, with the exercise of discrimination, close upon the heels of advance in countries where the opportunities for progress are greater. Much other reconstruction and extension work looms ahead. Already Mr. Hunt is asking himself, Shall the next system be horizontal retorts for heavier charges, or vertical retorts, or carbonizing chambers? In this respect, thought at the far ends of the earth synchronizes with that at home.

St. Helens Verticals under Inspection.

It was extremely good of the President of the Manchester District Institution (Mr. J. W. Morrison) to forego the pleasure of receiving the members at Sheffield (though his Company would not relinquish their privilege of entertaining them) on Saturday, in order that they might have the earliest possible opportunity of inspecting the exemplification at St. Helens of the system of continuous carbonization in vertical retorts that has been developed in their very midst by the concerted work of Mr. Samuel Glover and Mr. John West. The names impart a home interest to the system; and the numerous gathering of engineers who inspected the installation, by the courtesy of the Chairman (Mr. James Crooks) and members of the St. Helens Corporation Gas Committee, were fully satisfied that their colleagues have produced a practical system, that it fully answers claims, and that it has come to stay to take an important place among other successful advances in gas manufacturing operation. Carbonization is not only a burning question,

but it is an incandescent one at the present time; and every gas engineer feels himself bound to keep himself as fully *au courant* as possible in all matters affecting it. Thus it was noticeable that most of the members—through the published descriptive articles, with the records of tests that have been made by independent workers with different coals, and through the exceedingly informative and creditably prepared *brochure* that the patentees had distributed among them—were well-primed before their visit with what they were going to inspect in actual operation and with the working performances.

The objects aimed at, and successfully embodied by joint labour in the setting, and the attendant successes in every respect, were also succinctly stated by Mr. Samuel Glover in a paper that he read at the business meeting held during the visit. The objects and successes make a substantial list. Among the capital ones are: Continuous charging and discharging, simplification of the process of carbonization, reduction of mechanical operation, increased output of gas per retort and make per ton, control of the rate of carbonization, control of the heating of the setting, fuel economy, improved heat efficiency, recovery of heat from the spent coke, improved labour conditions, saving in costs, enhanced quality of coke, increased yield of ammonia, avoidance of stopped pipes, reduction of naphthalene, and saving in ground space for a given production. There are some other advantages of minor importance; but this list gives such material benefit that the others can be here ignored. On looking at the list, it is obvious that in considering the relation of vertical retort working to the older systems, it is a mistake to limit oneself to the make of gas only. The collateral advantages are also material, and valuable. In fact, the vertical retort system appears to have produced an unbethought-of alliance of manufacturing economies.

Supplementing the comprehensive tests by Dr. Colman and Mr. J. E. Blundell already published, Mr. Glover gives in his paper the results of a thirty days' test with the local washed nuts and fine slack that are purchased for their cheapness (cheapness as adjudged by the final financial result) and availability. It was a pity that the season did not permit of a corresponding simultaneous test in the horizontal retorts; but the average increase with the verticals of 1200 cubic feet per ton in make of which Mr. Glover speaks is a substantial gain that alone is worth attention. Multiplying it by the annual coal tonnage of the works, the financial advantage in gas revenue and saving in working expenditure would be considerable. Looking into the working costs quoted in the second table in the paper, the fact that they refer to a setting of only eight retorts will not be overlooked. There will be a considerable depression in the costs per ton and per 1000 cubic feet, when additional settings are at work, as is seen by the calculations in the third and fourth tables. Points that, from outward observation, particularly struck the visitors on Saturday last were the simplicity of the charging arrangements, the confining of mechanical operation to the discharging of the retorts, and the extraordinary reduction of the temperature of the coke before being finally removed from the setting, by the extraction of the heat by the secondary air.

Gas-Works and Railway Charges.

THE appeal of the Corporation of Birmingham to the Court of Railway and Canal Commissioners (constituted of Mr. Justice Lawrence, the Hon. A. E. Gathorne-Hardy, and Sir James Woodhouse) for relief in respect of a number of matters affecting the traffic to and from their gas-works has ended in a judgment that, on the main issue, is adverse to the Corporation; but in the total result, through concessions and admissions as to excess charges that the investigation has been the means of producing, has fully justified the Corporation in the action they took at the instance of the Gas Committee and the Chief of the Department (Mr. G. Hampton Barber). The judgment does not reveal, in their entirety, what those gains are; but it is sufficiently clear that, in the aggregate, they will amount to a substantial sum. For instance—taking one point only—it was proved to the satisfaction of the Railway Companies that they had been charging more in respect of outgoing coke than they were entitled to; and, as Sir Alfred Cripps pointed out during the protracted proceedings in March last, the Corporation, in respect of those charges that had been illegally made, would be entitled to an account for six years past. So that there are some gains that are retrospective, as well as present

and future. More information as to excess charges can be readily extracted from the judgments—particularly that of Sir James Woodhouse.

Inasmuch, however, as the investigation referred to three large Railway Companies, to four gas-works, and to an incoming traffic of 650,000 tons of material a year, and an outgoing traffic of 120,000 tons, it is patent that the matters under review make a somewhat complicated whole, and that very little in the way of general principles can be gleaned from the proceedings or judgments that will be commonly applicable. In connection with works' sidings, and the questions of accommodation and terminal charges, the conditions are so varied between works, that—unless there is clear evidence of excessive or illegal charge, or without mutual agreement—there is much perplexity, and no simple rules can apply. And, naturally, where there is no competition, there are railway companies who do not look with any benevolent eye upon traders who have sidings, and who are dependent upon them, though far be it from us to suggest that they deliberately overstep the bounds of legal charge. This Birmingham case, however, shows that what is legal is subject to a good deal of individual adjustment, depending upon the position of the sidings, the accommodation afforded for free entry and removal, and the relative service rendered by the parties. It was on questions of this sort in connection with Saltley and Nechells—these stations constituting the main centres of dispute—on which the Corporation failed. They claimed private siding allowances or rebates on the ground that they rendered certain services to the Railway Companies at these works; while the Companies submitted that, on the contrary, they had not always free access to the Corporation sidings, and that, for the practical working of Saltley and Nechells, considerable use had to be made of the Railway Companies' sidings—"service reservoirs" Mr. Justice Lawrence aptly termed them—for accommodation, for regulating the traffic, and for sorting outgoing trucks. The Court held that the Railway Companies did render a service not incident to conveyance, and which was due to position, area, and configuration of the works, and the large volume of traffic in and out. Though there was failure on this point, the Corporation, it will be seen, had clear ground for dissatisfaction on others; and they acted wisely, while these matters were being investigated, to have the whole position overhauled and clearly defined and regulated, to put an end to continual dispute.

In view of the position in point of magnitude of the Birmingham works, the fact that three Railway Companies were concerned in the dispute, and the eminence of learned Counsel engaged in the appeal, the evidence was published at considerable length in the second volume of the "JOURNAL" this year, in the belief that it will be suggestive to other administrators of gas-works which have private sidings in investigating the rates and charges levied in respect of their incoming and outgoing traffic, and the questions of consideration for special services rendered either by the gas undertaking or the railway company.

How to Increase Wages.

So much has been heard of late with regard to Socialistic doctrines as a cure for all the ills that Labour suffers from, that there seems to be some ground for fearing that other suggested remedies than those which fall within this particular category may be lost sight of by a large proportion of the working classes. Perhaps there is in reality no justification for any fear of this kind; it is a matter that time must be left to reveal. Meanwhile, it is pleasant to see that, for those who will heed, there is no lack of other suggestions for benefiting Labour. As a means of improving the relations between employer and employed, profit-sharing is now well-tried, and has been found highly successful; but what about increasing the employment the profits resulting from which might be shared? Would it not be worth while for workers generally to make up their minds to try the method of adding to employment and wages by adopting the course suggested by Mr. Robert Stubbs, when presiding over the seventeenth annual congress last week of the National Free Labour Association? His view is that there is only one way to increase wages as a whole—to avoid strikes and legislative attacks on employers, and so tempt larger masses of capital into industrial enterprises. This is a proposal for the carrying out of which no elaborate programme of social reform is needed, and the

simplicity of which is its recommendation. That the Trades Unions might, in times gone by, have done much more in this direction than they saw fit to do, admits of no dispute by students of industrial history; but there has lately been a good deal of evidence that the leaders of these organizations are prepared to discuss questions between employers and their men in a much more reasonable manner than heretofore. Here is what Mr. Stubbs had to say to militant Trade Unionism: "Trade Unionism destroyed initiative and fostered hate. It separated the employer from the employed, and placed an injunction upon progress. It perpetuated distrust and organized enmity, and created a system of suspicion. Trade Unionism did not strive to get the work done; its intent was to make it last. Twenty years ago Trade Unionism, unrestrained and militant, was rapidly controlling our national industries. But a change had now come over public feeling." Dissatisfaction with Trade Unionism apparently led to the formation of the National Free Labour Association, who now claim to represent nearly three-quarters of a million of free labour wage-earners. With so much success behind them as this, it is not surprising that the delegates should have passed a resolution declaring that the time has arrived when employers of labour and non-Union workers should enter into closer relations for mutual support and assistance "in order to counteract the aggressive action of militant Trade Unionism."

The Ticehurst Muddle.

The further the shareholders of the Ticehurst Gas Company go in the investigation of their affairs, the deeper they get into the mire, and the clearer it becomes that they are the victims of a well-organized befooling scheme. They met last Tuesday, but went away from the meeting sadder, if not wiser, men. A firm of Auditors (Messrs. Archer and Capes) who had audited the Company's books reported that they could not find receipts or invoices, that no distinction was made between capital and revenue, that no proper record had been made of receipts for residuals, that account collections had been carried out in the most haphazard way—in short, reading their report, it would appear that it was nobody's business to properly conduct the affairs of the Company, but that it was everybody's business in a position of trust to so confuse everything that the shareholders could not possibly find out their exact position. Mr. George Capes is, or has been, associated with a number of companies which have not commended themselves to us as good investments. It is understood that he is connected with the firm of Auditors who reported upon this Ticehurst chaos. The Chairman of the meeting was Mr. W. B. Martin and a colleague is Dr. White, both names with common association with Eaton schemes—the former, for example, with the Amman Valley and Laindon Companies. No meeting of the Ticehurst Company has been held (until this one) since 1904, and no accounts have been issued; and yet Mr. Martin, as coolly as possible, stated that it is doubtful whether the Directors have material at their disposal to comply with the requests of Mr. C. S. Glover and his fellow shareholders for information. Mr. Martin and Dr. White cannot be allowed to shake off their responsibility in the easy manner the former seemed disposed to do at the meeting; and the shareholders were wise in refusing to at present accept their resignations. There are explanations and acts of commission and omission to be accounted for in a manner somewhat different from that which was considered good enough for the shareholders at this meeting. Eaton seems rather clever at leaving his old associates, at the proper time, to face the music; and they face it badly. But an absolute callousness appears to be a common characteristic. It was denied by the Chairman that £67,000 had been spent on the works; but he confessed to £34,750 having been the amount of two contracts, while another shareholder mentioned that £58,000 was referred to in the statement as having been spent upon work carried out. There is no getting at the truth. The total value placed on the work carried out (at the water-works and the Ticehurst and Wadhurst gas-works) by an engineer consulted by Mr. Glover is £15,552. So where has the sum gone to that represents the difference between value and expenditure? The meeting does not seem to have thrown much new light upon the position, beyond confirming the story of the absolute muddle in which the Company's affairs are, and the indifference and neglect of those in whom the shareholders were, by the artifices of Eaton and his confederates, induced to put their trust.

A New Promotion.

As we expected would be the case when the Bungay, Harleston, and Eye Water Bill was before Parliament this session, seeing that the name of a well-known professional promoter—Preston—was connected with the measure, a Company is being floated and a prospectus has been issued. These promoters do not lose time in turning into money the powers given them by Parliament. Parliament gives them property that they sell to the public—at a price; and therefore Parliament fills the useful, if undignified, position of being a pawn in the professional promoting game. The Unopposed Bills Committee of the House of Commons (see "JOURNAL," June 15, p. 715) were dissatisfied with the evidence adduced as to Bungay and Harleston, though looking more favourably upon Eye. There was also, in their opinion, a deficiency of evidence regarding the sources of supply. The deficiency is continued in the present prospectus, the most eloquent parts of which are the omissions on vital points. It is mentioned, for instance, that contracts have been entered into for the construction of the works; but it is not stated who are the contractors. If we were asked to make a guess, the reply would be the Finance and Construction Corporation. Perhaps the Engineer (Mr. Gerrard H. Perryn, Assoc.M.Inst.C.E.) will give us the information, as we are not likely to get it from Mr. Preston or any of the Directors. The Directors are Charles Wheeler, George Capes, and Frederick Miller. The name of Capes has appeared in connection with the Bude Gas, Brockenhurst Gas, South Lincolnshire Water, and Mid-Oxfordshire Gas Companies. The name of Charles Wheeler has been associated with the Mid-Oxfordshire and North Sussex Companies. The Mid-Oxfordshire Company's Bill was ejected from St. Stephen's (not St. Stephen's Chambers) on financial grounds—a Committee on inquiry being dissatisfied with the proposals. The matter stands fully recorded in the "JOURNAL" columns. With regard to this little Bungay matter with its big capital, it is described as a "sound home investment." That is a matter of opinion; and our opinion is of a somewhat contrary nature to that suggested by the prospectus. The total authorized share capital of the Company is £25,000, of which the Directors want to get £18,000 in hand in the next two months. The authorized debenture capital is £8300, of which the Directors are asking the public for £6000. Here is a little Company whose works do not appear to have been started yet; and already the Directors are requesting the public to part with £24,000! It will take time to construct the works; and then, in order to pay 6 per cent. upon the ordinary shares and 5 per cent. on the debentures, assuming the promoters succeed in getting the present issues landed on the public, a clear profit of £1380 per annum will be necessary. The chances of getting this are remote. The customary bait of 6 per cent. interest on the ordinary shares is offered. The "contractors" are going to pay this. It would be interesting to see a copy of the contract; but those who desire to do so must go to the Bungay offices. Why could it not have been on view at a more convenient address—say, at Tokenhouse Buildings or St. Stephen's Chambers?

Gas Turbines.

Some six years ago Mr. E. Kilburn Scott, Assoc. M.Inst.C.E., predicted that "the gas turbine will make its appearance." It was a bold assertion then; but it is less so now. His confidence is unabated. The progress made in large power gas-engine construction has been tremendous; but between such engines and the high-speed gas-turbine, there is a field over which investigators are roaming in a sort of haphazard way, in the hope of hitting upon the correct lines for the creation of an efficient gas-turbine. Experiments are being made; but Mr. Kilburn Scott thinks they require co-ordination, and that this must be done before any settled progress can possibly be effected. His suggestion, we gather from an article in a contemporary, is that the engineering trade should combine, and have the matter thoroughly investigated by gas experts. He suggests that the Royal Society and the Institutions of Civil, Mechanical, Electrical, and Mining Engineers should form a Gas-Turbine Committee, start a fund for the purpose of investigation, and commence research at an early date. The gas-engineering profession is strongly represented in the membership of the Institution of Civil Engineers, but why does Mr. Scott omit mention of the Institution of Gas Engineers? Has he never heard of this body, whose history runs back to 1863?

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 349.)

THE Stock Exchange had a much better time on the whole last week, but not without some little perturbation. The tightness of money and the question how the settlement was going to be got through, oppressed minds; and when the way ahead was seen to be clear, there was evident relief. The opening day was fairly cheerful; the air having been to a great extent cleared by the liquidations of the previous week. Consols advanced $\frac{1}{4}$. Railways were rather better, and there was a recovery in the speculative lines. This tone lasted into Tuesday, and a hopeful feeling in reference to the settlement confirmed it. But this gave way before the close, and a good bit of selling supervened. Wednesday was thoroughly depressed. Money was dearer; the weather abominable; and things in general uncheering. There was no great fall in prices, but markets sulked. Thursday brightened up considerably as the settlement proceeded smoothly, except for two small failures not of devastating importance. Business was not large, but prices everywhere mended. Friday was quite a cheerful day, except in the Consols Market, and most of the rest improved; while the speculative lines were very gay. This condition of affairs continued on Saturday—a pleasant prelude to the closing of the Exchange until Tuesday morning. In the Money Market, there was a strong demand which enforced higher rates for short loans, and discount terms stiffened steadily. Business in the Gas Market was much quieter than the week before. Things were languid and listless, hardly a change in quotations taking place all through the week. In Gaslight and Coke issues, the ordinary was comparatively little dealt in, and the tendency continued weak. The best figure attained was 105 $\frac{3}{4}$ on Tuesday, from which point it went weaker, and 104 was touched on Saturday—a fall of 1. The secured issues were quiet and unchanged. The maximum marked 88 and 88 $\frac{1}{2}$, the preference from 104 to 104 $\frac{3}{4}$, and the debenture 85 $\frac{1}{2}$ and 86 $\frac{1}{2}$. South Metropolitan was steady, realizing from 120 to 121. Commercial were not dealt in at all. In the Suburban and Provincial group, Alliance and Dublin new was done at 121 $\frac{1}{2}$ and 12 $\frac{3}{4}$, Brighton and Hove original at 211 $\frac{1}{2}$, British at from 42 $\frac{3}{8}$ to 43, Ilford "A" at 138, South Suburban at 119 $\frac{1}{2}$ and 120 $\frac{1}{2}$, Tottenham "B" at 112 $\frac{1}{2}$, West Ham at 124 $\frac{1}{4}$, and ditto preference at 128. On the local Exchange, Sheffield "B" and "C" were advanced to the level of the "A" stock. The Continental companies were very quiet, and were unchanged. Imperial changed hands a few times at from 180 $\frac{1}{2}$ to 181 $\frac{1}{2}$, ditto debenture was done at from 95 to 95 $\frac{1}{2}$, and Union at 97 $\frac{5}{8}$ and 98 $\frac{1}{2}$. Among the undertakings of the remoter world, Buenos Ayres realized 13 $\frac{1}{4}$ and 13 $\frac{1}{2}$, Cape Town preference 5 $\frac{3}{8}$ and 5 $\frac{1}{2}$, ditto debenture 83, Melbourne 5 per cent. 100 $\frac{1}{2}$ and 101 $\frac{1}{4}$, Primitiva 7 $\frac{1}{4}$ *cum div.* and from 7 to 7 $\frac{1}{2}$ *ex div.*, and River Plate from 16 $\frac{1}{4}$ to 16 $\frac{1}{2}$.

ELECTRICITY SUPPLY MEMORANDA.

Revival of the Public Lighting Question—Defence of Ratepayers by the Local Government Board—Questions of Relative Interest—ness and Prices—A Local Misconception—A Comparatively Small Sum—Purchasing a "Remunerative" Undertaking—Postulation.

IT will have been remarked, from references in the "Memoranda" recently, that in various towns there has been a fresh outburst of attention to the question of side street lighting by metallic filament lamps. But this increased attention is concentrated in places where the municipal authorities are the suppliers of electric current. The fact speaks volumes. The questions of efficiency, of improved lighting at lower capital and running costs by adopting the advances of another system, and of reliability, do not enter into account. They are matters—economic and otherwise—that are contemptuously set on one side under the new law of the ascendancy in local government of municipal trading. The two sole arguments are that the private lighting peaks having had their points considerably levelled by the metallic filament lamp, street lighting by the same means should be established to reinstate those peaks; and that no matter whether to achieve this the capital expenditure be heavy, no matter whether the annual costs be more, no matter whether the central station supplies current to these street lamps at an unprofitable price, no matter whether the efficiency and reliability are less than the newest systems of incandescent gas lighting, the lamps are held to constitute a good advertisement. That is the position to be faced; and it is only by the Local Government Board and the ratepayers doing their best to preserve the independence of local government from the influences of municipal trading, that the unreasonable, preferential treatment of the municipal electricity undertaking at any cost will be even partially prevented. There are local authorities who dispute all right on the part of the Local Government Board to interfere in their choice of an illuminant—a choice dictated by the one consideration of municipal ownership. Nothing stronger than this is wanted to point the utter incompatibility of such ownership with the proper direction of local affairs. The Board have for years been trying to preserve a distinction between the two; and, as stated recently, fresh instances of this have been provided by Finchley, Yarmouth, and Gravesend, with the customary crop of resentment.

At each one of these places, the electricity undertaking is a

municipal possession; but the gas undertakings are not. The latter have the double interest of being exceptionally large rate-payers and competitors of rate-supported electric undertakings. But for them to utter a word of protest brings down a perfect avalanche of abuse, just as does a suggestion in the interests of a district upon the Local Government Board. The district papers are encouraged by the local governing interests to discount the suggestion of the Board by questioning the competence of that body, while in doing so they lay themselves open to the obvious retort that their knowledge of the matter must be particularly microscopic in contrast, through extensive experience, with that of the Board. And as to the position of the gas companies, their protests can be best emphasized by analogy. Suppose a municipal authority started a local newspaper of its own; and it was within its power to preserve all reports of the proceedings at meetings of the Council, all other local government intelligence, and all local government advertisements for its own venture, using, too, its influence through the members to obtain the same preferential treatment for the municipal newspaper from the other local bodies—such as the Board of Guardians, school authorities, and so on. Heavens! what a row there would be in the ordinary local press. The principles of municipal trading would be torn into shreds, and scattered by the torrent of censure from the outraged journalists. There would be a sudden stoppage of the servile talk in the local papers (as at Yarmouth now) regarding the great confidence of the ratepayers in their local representatives, and the ratepayers would be described as a “wooden-headed” lot for permitting their independence to be so absolutely alienated by the local Council. That term “wooden-headed,” it may be said in passing, is not ours; it is suggested by a Yarmouth paper as being our estimate of the intellectual capacity of the ratepayers. Far from our thoughts was and is such an estimate. The indifference of ratepayers is not so much due to wooden-headedness as to a want of understanding of the entire position. It is because of this that the Local Government Board are duty-bound to do what they can to protect the ratepayers. At Finchley, Mr. Councillor Royston has this matter of public lighting in hand; and very fairly he says he “quite recognizes that it is the Local Government Board’s duty to check extravagance of public bodies.” There is indebtedness to him for this recognition; the value of which would have been increased had he after “extravagance” inserted the words “and mismanagement through preference.” But it should be said that Mr. Royston’s protest was against the delay of the Local Government Board in granting consent to a public lighting loan. Upon which it may be remarked that they are now waiting for information as to comparative costs that the Council are not disposed to give them.

It will have been gathered from the foregoing that the Yarmouth “Independent” and “Mercury” have had a turn at our comments on their unreasoned attack on the attitude of the Local Government Board in respect of the scheme for converting Yarmouth street-lamps to electricity; and they resent deeply our questioning of the superiority of their competence over that of the Board to judge of this matter. Those who sneer should not be offended if they are sneered at. We are not in the least annoyed at being called “interested,” at being told that it is our business to run down electric light, nor at the suggestion that we are none too scrupulous, or at being misrepresented as having referred to the “Independent,” as a “little squib of a local newspaper.” We have a duty to perform; and it will be performed. Scorn is showered upon our interestedness; but totally ignored is the interestedness displayed by municipal championship in the local press, without giving due heed to the other side of the case. In taking counsel (as from observations made in our contemporaries we rather suspect has been done) with their municipal friends, the door of the Gas Company’s Engineer has been deliberately passed by our local critics. However, our comments were published on Oct. 12; and it was not until Oct. 23 that replies were published; so that it may be assumed that the notes under review represent the best assisted judgment of our friends. In the result, we ought perhaps to feel ourselves totally eclipsed, but do not. As we read, it is borne upon us how in ignorance some people can be absolutely confident tools; and the confidence of our Yarmouth journalistic *confrères* only brings into stronger relief the ignorance with which they write on this particular question. The writer in the “Independent” abuses the title of his paper by being one-sided; the writer in the “Mercury” justifies the title of his paper by his vapid views on the subject in hand.

We are really pleased to see that the many cheap gibes at the Local Government Board have been toned down; but the defence of the Corporation’s scheme is, if anything, now more curious than ever. It is not considered extravagant by the note writers in our local contemporaries that £10,000 to £12,000 should be expended in converting gas-lamps to electricity to swell the volume of business for (not necessarily the profits of) the electricity station, not when all expenses direct and incidental are paid—at a cost below that at which modern gas lighting can be done, yet producing a light less efficient than the newest of gas-burners in illuminating and diffusive powers under the worst of atmospherical conditions, and a light the reliability of which falls far short of the character of safety possessed by gas lighting. Once get that £10,000 to £12,000 spent, and the ratepayers will be in this matter irretrievably in the hands of the municipal electricity department, no matter what happens. We have asked for the report of the local officials on the subject of this wholesale conversion, in order that

it may be studied with the view to praise or adverse criticism. The report has not come to hand, though the officials in question ought to have been pleased to crush us by immediately forwarding it. Instead of this, one of the papers simply quotes certain annual costs without giving any descriptive information regarding the lamps, in order to enable judgment as to what those prices represent in the way of quality, and whether the lamps are the best for the purpose. Even the figures given are contradictory in the two papers. In the “Mercury” the annual cost of each electric lamp is stated as £3 3s., and of gas as £3 6s. 8d.; while in the “Independent,” it is mentioned that the Yarmouth Gas Company offered to reduce their price to £2 19s. 6d. Candle powers are not given; but 3s. 6d. multiplied by the number of gas-lamps in Yarmouth is worth saving.

The writer in the “Independent” comes a cropper between his want of technical knowledge and his enthusiastic championship of the Corporation Electricity Department. He says that “when nearly two years ago the Corporation were in communication with the Gas Companies for the purpose of comparing the prices of gas and electricity, the Southtown Gas Company explained that it was wishful to retain the Corporation custom, not so much on account of the actual profit derived from the lamps as from the fact that the extra quantity of gas used caused a reduction in the cost of the whole production.” “Just so,” he triumphantly adds, “it is in our own electricity works.” To the layman, the contention appears correct. There is, however, no comparison between gas and electricity in this respect. Gas is produced regularly throughout the twenty-four hours, and stored ready for use as wanted; gasholders providing the balance for all variations in demand. Electricity has to be produced as required. What is the result of this in considering this public lighting question? The public lighting falls on the peak of the private lighting load; and, in many places, it is only because of the effect upon the peak of the metallic filament lamp, that there is all this hub-bub about getting hold of the public lighting. The whole idea is to re-establish or increase the volume of the output of lighting units. But to do this by the means proposed, during the private lighting hours, does not necessarily imply that the addition of this particular load, spread over all the other units, will be an economic advantage to the central station. On the contrary, any disinterested electrical expert will aver that the units that form the topmost part of the day’s peak are more expensive to produce than those that form the solid foundation. And let us point this out to the writer in the “Independent”—that, while these public lighting units, which come upon the foundation provided by the private lighting business, are relatively more expensive to produce than the private lighting units, the price paid for them is less, and must be less or the public lighting account would ascend to such mighty figures that there would be a great deal more grievance than there is now over its rise in numerous places since the advent of electric lighting. The increase goes on by littles; and it is only by periodical comparison that the truth is found. But these expensive units being sold for public lighting at less cost than is charged to the private consumers, someone has to make up the difference. The public lighting merely bulks-up the number of units sold and the revenue received. This gives the fictitious appearance of growth of prosperity, that has no reality in profits; so that from the economic aspect, there is a good deal of fallacy about it.

There is some mention in one of the papers of the fact that the Norwich Corporation are proposing an extensive scheme of side street lighting by metallic filament lamps. But this does not give any support to our Yarmouth friends, or alter in any way our contentions. Norwich also owns the electricity undertaking; and there perhaps, as at Yarmouth, electrical pride and municipal ownership take precedence in the considerations that affect the question. The writer in the Yarmouth “Mercury” takes exception to our statement that the proposed increased adoption of electricity for public lighting is for no other purpose than for imparting a better showing from the volumetric point of view to the accounts of the department. With chastened spirit, we read: “The [‘JOURNAL’] writer is in absolute ignorance of the facts of the case so far as Yarmouth is concerned, or he would not have so libelled the Corporation. For instance, out of a total income last year of £20,385, only £2931 was received for public lighting. To suggest that this comparatively small sum could make a great difference to the accounts is sheer stupidity on the writer’s part.” Many thanks! We regard with positive admiration a newspaper writer who can look upon the one-seventh part of the electricity undertaking’s income as a comparatively small sum. What to a man of such affluence may appear to be sheer stupidity may not appear so to others less fortunately circumstanced. We wonder whether our friend has calculated out, on behalf of the private electricity consumers, the number of units the £2931 represents in relation to the number represented by the revenue obtained from the private consumers. If he has, perhaps he will find the private electricity consumers as well as the Gas Company have cause of complaint. But with regard to the £2931 (we are not off-hand aware whether it includes receipts from public buildings), it merely indicates what the Corporation have done, and not what they are proposing to do, which is the present bone of contention.

There is one other point in the “Mercury” regarding the electricity undertaking. The writer alludes with pride to what he regards as “facts.” A large sum, he naively says, is being set aside as sinking fund—in other words, a highly remunerative and

successful undertaking is being purchased by the town without the cost of a single penny to the ratepayers—and the rates have been relieved to the tune of £4200. Let us deal with this in the reverse order. The relief of the rates by a total sum of £4200 is not a matter for boast after fourteen years' trading. For information only, we should like to know whether, during this period, the ratepayers have been relieved of any sums in support of the concern, and, if so, to what extent? As to the undertaking being highly remunerative and successful, our records as to Yarmouth inform us that the deficit was £14 in 1907-8, and the surplus last financial year was £194, during which year the increased income from private consumers amounted to £41. We like the innocence that suggests that the sinking fund is purchasing a remunerative and successful undertaking. Electrical plant has a comparatively short life. We do not remember ever having noticed that the Yarmouth undertaking has been in a position to accumulate reserve and depreciation funds. If not, there must be re-borrowings for replacement. Under such circumstances, when will the ratepayers conclude the purchasing of this "remunerative and successful undertaking?" We do not approve of perpetual hire-purchase systems. Certain it is that the present generation of Yarmouth ratepayers will never come into the glorious possession foretold by the "Mercury" writer. And, mark this, the extension of the public lighting, through the low-priced units coming on top of the private lighting load, will not improve the ultimate financial position of the Electricity Department, although the accounts show an increased business.

A few words more. The "Independent" writer suggests that the report on public lighting of the deputation of the City of London Corporation is valueless, because they did not take an expert with them on their travels. In all the towns visited, they had the advantage of seeing and hearing the lighting experts—gas and electricity—of the municipal authorities; and they returned home fully persuaded, from what they saw and gathered from investigation, that the inverted gas-burner is the ideal illuminant for street lighting purposes. The writer of the "Independent" has not heard of the success of the inverted gas-lamps in competition with electric metallic filament lamps at Beckenham and elsewhere; and that, from the points of view of effectiveness and cost, the public were decidedly favourable to the former, though electricity supply in Beckenham is owned by the District Council. We ask him to state his grounds for saying that "perhaps the 'JOURNAL' will wake some day to the knowledge of the circumstances that the recent development of the metallic filament lamp has done much to make electricity the ideal public street illumination, and a formidable competitor with gas as regards both effectiveness and cost." That is barren talk.

Manchester Electrical Exhibition, 1908.

A financial statement regarding this exhibition has been issued. The total receipts amounted to £19,393, of which exhibitors contributed £10,061, less a rebate since made from profits of £1989. The donations of corporations amounted to £1133; gate money and tickets realized £4750. Among sundry matters it is seen that "commission" on refreshments amounted to the nice little sum of £1033. The cost of the buildings was £4031, and incidental expenses £908. A sum of £1216 was spent on advertising. The electrical decorations cost £1116—fittings, wiring, and current. Gas was not altogether excluded from the building, as we see that £188 was expended on gas, water, and mains. The profit of £6317 was utilized in rebates, benevolence, &c.

Manchester and District Junior Gas Association.—The annual lecture to the members of the Association will be delivered in the Manchester University next Saturday afternoon, by Professor Harold B. Dixon, M.A., F.R.S.; his subject being "The Chemistry of Flame." The Council of the Association extend a hearty invitation to members of the Manchester District Institution of Gas Engineers to avail themselves of the opportunity of hearing Professor Dixon on the important subject that he has chosen. Arrangements have been made for an inspection of the gas-meter testing-station and the London Road fire-station of the Manchester Corporation.

Earth Currents and Water-Mains.—In the "Zeitschrift für Electrochemie" for Sept. 15, Herren F. Haber, F. Bergius, and P. Krassa discuss the question of the attack of water-mains by wandering currents from tramways and the like. According to an abstract translation of the article in the "Chemical Trade Journal," they conclude that alternating currents with a periodicity of from 15 to 50 may be regarded as safe—that is to say, that neighbouring water-mains will not suffer damage. The proposal to reverse the direction of the current in direct circuits, at intervals of one, two, or four hours, is shown to be valueless, as no reduction in the rate at which iron is attacked is found to attend this procedure. In particular cases in the neighbourhood of Karlsruhe, they find that the amount of damage done by earth currents exceeds by many times the normal chemical corrosion by the ground water. The skin of cast-iron pipes, while intact, affords considerable protection against both chemical and electrolytic attack, but is liable to break down locally when powerful local corrosion follows.

OBITUARY.

RICHARD LAYBOURNE.

WHEN referring, in the "JOURNAL" for the 12th ult., to the distribution of awards in connection with the garden allotments of the Newport (Mon.) Gas Company, it was mentioned that the venerable Chairman, Mr. R. Laybourne, was unable to be present on account of illness. We regret to record that this terminated fatally on the 25th ult. Until a few months ago, he had taken an active part in the concerns with which he was connected; and he presided at the half-yearly meeting of the Company in August last. But he began to feel the infirmities of advanced age (he was in his 85th year); and he gradually grew weaker until his death. Mr. Laybourne was the second son of the late Mr. Jacob Laybourne, of Nafferton Lodge, East Yorkshire. He selected the career of an engineer, and served his apprenticeship at the Hareshaw Iron-Works, Northumberland. In 1847, he was engaged at Messrs. E. B. Wilson and Co.'s Railway Foundry, Leeds; working first in the shops and subsequently as chief draughtsman. In the latter capacity he visited Hanover to inspect the railways; and he designed engines for the Hanoverian Government. In 1852, he was appointed Assistant Locomotive Engineer to the London and North-Western Railway at Wolverton; and two years later he settled in Monmouthshire as Locomotive and Carriage and Wagon Superintendent for the Monmouthshire Railway Company. Having served the Company for fourteen years, he was appointed General Manager of the Rhymney Iron Company, and designed and erected Bessemer steel-works and plant capable of producing 1000 tons per week. In 1878, he took an active part in the management of the Isca Foundry and Engineering Company at Newport; the management of these works being now in the hands of his sons. In addition to the Newport Gas Company, he was Chairman of the Tirpentwys Colliery Company, and the Weston-super-Mare (Old) Pier Company. He was a Justice of the Peace and Deputy Lieutenant of Monmouthshire, and was High Sheriff in 1894. He was a Director of the Newport and Monmouthshire Hospital, and Past Master of the Isca Lodge of Freemasons. He was a member of the Institution of Civil Engineers, having been admitted in 1868, and a Past-President of the South Wales Institute of Engineers. He leaves two sons and two daughters.

The "Journal für Gasbeleuchtung" reports that Herr WILHELM KLEINFELDT, the Manager of the Reutlingen Gas and Water Works, in Württemberg, died on the 20th ult. at the early age of 43. Deceased had drawn up plans for a new gas-works for the town of Reutlingen, which had been approved, and the construction of the works is already in hand.

The recent death is announced of Mr. JOHN W. BROOKE, of Mistley, the Secretary and Manager of the Manningtree Gas Company, Limited. Deceased had been unwell for some time, and had undergone an operation. Another was, however, called for; and, unfortunately, to this he succumbed. He was highly esteemed; and at his interment in Mistley Churchyard every mark of respect was shown.

STANDARD RATES OF WAGES.

SOME idea of the wide variation in the remuneration given in different parts of the country for the same class of work, may be gathered from a statistical report of the Labour Department of the Board of Trade which sets forth the standard rates of wages and hours of labour that were in vogue in connection with a number of trades on Oct. 1 last.

The place of honour in the report is occupied by the building trades, the information in regard to which has been supplied by the Employers' Associations and the Trades Unions concerned, so that the figures may be accepted as reliable. The next portion of the report has reference to the engineering and shipbuilding trades, which comprises the following seven sections: Engineers, sea-going engineers, brass moulders and finishers, ironfounders and pattern makers, boiler-makers and iron and steel ship-builders; shipwrights, shipjoiners, ship plumbers, and ship painters; and electrical workers. The statistics given in the first section—engineers—are compiled from information furnished by the Amalgamated Society of Engineers, so that there should be no reason to question their accuracy. In the London district, the rate of pay per week for turners, fitters, and brass finishers is given as 40s.; and that for smiths, as from 40s. to 49s. Millwrights earn 42s. 6d., pattern makers 44s. 6d., and copper smiths 40s. The weekly hours of labour are stated as 54 and 48. In the marine shops at Cardiff, Newport, and Swansea, there is a uniform rate of 41s. per week of 53 hours, though there are a good many other cases in which the wages are stated as being round about 28s. per week of 54 hours. At Cardiff, a marine electrical engineer earns the uniform rate already referred to, 41s.; while general electrical engineers obtain 40s. in London, Erith, and Montrose, and at Keighley no more than 29s. a week.

The "other trades" included in the report embrace the following: Letterpress printers—compositors; lithographic printers, bookbinders, and machine-rulers; cabinetmakers, &c., French polishers, and upholsterers; gas stokers; bakers; boot and shoe

operatives; farriers; police constables; seamen; and agricultural labourers. In this section, the only item that we need trouble about is the standard rates of wages and hours of labour per shift recognized on Oct. 1 last for stokers in gas-works in the principal towns of Great Britain—based on information furnished by the employers and the National Union of Gas Workers and General Labourers. The figures given relate to 51 towns, in addition to the London district; and they include five places in Scotland, but none in Ireland. In all but five of the towns, the eight-hour shift is worked; the whole of the London district being with the majority in this respect. The exceptions are Wakefield, York, Tunbridge Wells, and Exeter, where there are twelve-hour shifts; and Lancaster, where nine-hour ones are in vogue. The general rate of payment for weekday work is between 5s. and 5s. 6d. per shift, though several towns fall below the smaller of these amounts. In Sheffield, 5s. 9d. is paid; and so it is in Birmingham, to stokers employed in working drawing and charging machines. For North Shields, too, the rates are given as 5s. 5d. and 5s. 8½d., plus 5 per cent. The London district figures are as follows: East, 6s.; south-east, 6s.; south-west, 5s. 9d.; Beckton, 5s. 9d.; West Ham, 6s.; Southall, 5s. 10d.; and Brentford, 5s. 10d. It is stated that double time for Sunday work is paid in all parts of the London district but the south-east, where time-and-a-half is the rule, as it also is in most of the other towns. In a dozen cases, four of which are in Scotland, the rate of payment is the same for Sunday as for weekday work.

ITALIAN GAS WORKERS' MEMORIAL.

IN the "JOURNAL" for the 19th ult. (p. 175), we referred to the present relations between the gas workers of the Union des Gaz Company in Italy and the Directors of the French Company with the interests of which the English Continental Union Gas Company, Limited, are so closely concerned. From the Italian newspapers, it is learned that the fresh demands of the men in the Company's Italian Gas-Works have been formulated, and presented to the Company in the form of a general memorial. On the 19th ult., this memorial was left in the hands of the Company's Manager for Italy (Signor Grüss); the men's deputation consisting of three representatives of Milan, two of Alessandria, two of Modena, and two of Genoa.

The memorial occupies four pages of typewritten matter, and deals with a variety of questions to the number of sixteen. Among them are the following: The abolition of piece-work and sub-contractors; the publication of a new edition of the *Organico* (or agreement between the Company and the men), embodying all modifications down to date; the compilation of regulations dealing with dismissals; the question of pensions; a demand for 24 non-working days in the year for those who do not benefit by the weekly day's rest under the recent law; pay according to the higher category for those who temporarily fill higher positions; the qualification for old-age pensions to be reduced from 60 to 50 years of age for furnace or acid workers; a seniority gratuity of lire 5 per month after 21 years' service; a reduction of hours of work from ten hours to nine for all classes from November to February; and a general increase of 10 per cent. in wages.

A definite reply to these various demands was promised by the end of the month; and the men's representatives desired to discuss them—not with Signor Grüss, but directly with representatives of the London and Paris offices of the Company. They wish to show that with reasonable reforms, and with closer regard to contracts, the enormous capital of the Company could be made more profitable, and gas improved to the great advantage of the consumers. The ex-Secretary of the Federation of Gas-Workers (Signor Speroni), in an interview with "Il Secolo," says: "We will show the possibility of making economies to the great advantage of the Union des Gaz and its customers."

With reference to the recent shortage of gas due to a few hours' cessation of work, the following figures as to storage accommodation are given:

Works.	Cubic Metres.
Nine gasholders at San Celso	85,300
Three " Porta Nuova	6,000
Three " Porta Venezia	27,000
One gasholder at Porta Magenta station	25,000
Storage at Bovisa	80,000
Total	223,300

[or, say, a total gasholder capacity of 7,886,000 cubic feet.]

"If," says Signor Speroni, "the average daily consumption, which in November, 1908, was 230,000 cubic metres, distributed to about 119,000 consumers, may be estimated to be increased this year by 8000 consumers, there will be required 250,000 cubic metres" [say, 8,829,000 cubic feet].

The Milan newspaper "Corriere della Sera" also devotes space to an interview with Professor Antonio Laderchi, the Secretary of the Federation of workers attached to the Italian works of the Union des Gaz Company. He appears to justify the present agitation on the ground that the previous agreement in 1907 left many matters outstanding, which are now due for settlement. As to the proposal of co-partnership, he says: "But co-partnership in what? Not indeed in profits, because in that case—given the

return due to capital, the recompense due to labour, the part due to amortization—the residue ought to be divided between capital and labour on the basis of profit and reserve. Now, it is not said what return is reserved for capital, nor is any investigation of the balance-sheet afforded, nor are bye-products included. . . . In fact, the Company does not say, 'Share in my profits;' but it says 'Save, and I will share in your savings.'" The Italian paper, perhaps wisely, does not enter upon the merits of the questions involved. It adopts a non-committal attitude, but supports the view that the direct intervention of the Directors of the Union des Gaz might be beneficial in the interests of all parties, and not least those of the citizens in the towns concerned.

THE "FIAT LUX" LIGHT CONTROLLER.

AN addition to the various appliances now on the market for lighting and extinguishing gas-lamps from a distance is coming prominently forward under the name of "Fiat Lux." It is not altogether unknown to London gas men, as it was brought under their notice at the *conversazione* of the London and Southern District Junior Gas Association in the spring of 1907, and was briefly noticed in our columns at the time. It did not, however, then bear the name which has since been given to it. The inventors of the appliance, which is of the diaphragm type, were reluctant to push it until the initial difficulties had been successfully overcome, and it had emerged from the experimental stage. But as soon as it had done this, steps were taken to have it brought into use on a working scale in connection with public lighting; and we learn that so rapid has been its adoption, that whole districts and towns in some of the principal countries on the Continent have it in operation, to the entire satisfaction of managers of gas-works, technical engineers, and others. This statement is borne out by testimonials contained in a small pamphlet from which several of the foregoing particulars have been obtained.

The advantages claimed for "Fiat Lux" are many; one of the most important being the great saving it effects by enabling the lighting and extinguishing of the street-lamps to be controlled from the gas-works or any other centre that may be desired, and by conserving the life of the incandescent mantle. It is claimed for the appliance that it can light or extinguish some 50,000 lamps instantaneously—an important feature in the event of sudden darkness or fog. The "Fiat Lux" can be fitted to existing street-lamps; there are no springs, mercury, or delicate parts to get out of order; and no special plant is required for its use, as it is operated merely by pressure from the gas-works. The appliance has been patented; and the owners of the patent have entrusted Messrs. Willis, Stewart, and Co., of New Broad Street, with its introduction into England, and have appointed them their sole representatives for Great Britain and Ireland.

The Committee appointed by the Royal Scottish Society of Arts to award prizes for communications read or reported on during session 1908-09, have awarded Keith prizes of the value of £5 to Mr. W. Shearer, for his paper on "An Improved Apparatus for Producing Petrol Gas for Lighting and Heating Purposes," and to Mr. W. Key, for a paper on "Notes on the Centenary Air-Gas Turbine Generator."

In the remarks of Mr. A. Smith, of Tradeston, on the President's Address at the meeting of the Scottish Junior Gas Association (Western District) on Oct. 23, as given in the "JOURNAL" last week, he is reported as saying that the coal-testing plant at Tradeston was capable of dealing with "a thousandth part of a ton." He writes to say that his statement was that "the plant at all the Glasgow gas-works was the same—capable of dealing with a hundredth part of a ton—viz., 22½ lbs."

We have received from M. Enrique Hauser, Professor at the Madrid School of Mines, a pamphlet containing his first address to that school on fire-damp and the apparatus he has devised for its detection. This formed the subject of a paper submitted to the International Congress of Applied Chemistry that opened in London in May last; and it has been reproduced in the "Bulletin et Comptes Rendus Mensuels de la Société de l'Industrie Minérale," St. Etienne, France, for September.

Mr. Alexander Mitchell, the Secretary, and until quite recently the Engineer and Manager, of the Bury St. Edmund's Gas Company, has accepted an invitation to fill the office of Mayor for the ensuing year. Mr. Mitchell took up his abode in the town nearly thirty years ago; but he did not become a member of the Corporation till about eight years since. He has rendered good service on some of the most important Committees, including that having charge of the electric lighting, and also the Finance and Education Committees.

The resignation is announced of Mr. James Parkinson, the Town Clerk of Brighouse. Mr. Parkinson has been associated with public life in the district for over thirty years. He was appointed in 1878 Gas Manager at Brighouse and also Clerk to the Local Board. He remained in these positions until 1893, when he was made Town Clerk and Gas Engineer. Recently he was relieved from the position of Gas Engineer; and since then, as our readers will be aware, there has been an investigation (*ante*, p. 197) into affairs connected with the Gas Department.

GAS PRACTICE IN AUSTRALIA.

RECONSTRUCTION AT THE MELBOURNE GAS-WORKS.

By P. C. HOLMES HUNT.

IT may be fairly assumed that there does not exist a gas undertaking which has experienced such a great fluctuation in its business as has the Metropolitan Gas Company of Melbourne. Following the incorporation of the Company in 1878 by the amalgamation of the three old Companies, the output of gas in Melbourne had a steady increase for a few years, and then a rapid increase (at the rate of over 11 per cent. compound) up to the year 1890. During that year things in Melbourne reached their height; and the bursting of the "boom" in Victoria in the following year, accompanied by the failure of the banks, is doubtless recollected by many of your readers. Following that, depression set in, and the gas consumption fell rapidly and regularly—reaching the low-water mark in 1897, in which year the gas manufactured was only 1,167,900,000 cubic feet as compared with 2,136,631,000 cubic feet in 1891—a reduction of rather more than 45 per cent. What this means to a gas undertaking, will be readily realized by gas engineers, for capital had to be spent in providing plant to produce the output in 1891—a very large proportion of which was lying idle for many succeeding years.

In 1900, the turn of the tide came, and slight increases were again experienced until some four years ago, when owing to largely increased prosperity in Victoria, the introduction of slot meters, and other factors, a much bigger increase in consumption was experienced; and in 1908 the gas made was 1,760,791,000 cubic feet. The output is still, therefore, considerably below what it was 17 years ago, though, according to the present increase, a few years should see that of 1891 equalled. But, as already stated, a considerable increase in consumption has been experienced during the past few years, necessitating heavy expenditure on the reconstruction of old and obsolete plant in order to produce gas more economically by up-to-date methods. Consequently, when the writer assumed charge in the middle of 1906, he found himself face to face with having to reconstruct the benches in two retort-houses—one at the West Melbourne, and the other at the South Melbourne works. At the former, the main arches were in an advanced state; and the special work involved was the decision as to the type of machinery to be adopted. After a great deal of consideration, the De Brouwer projector and the Jenkins-De Brouwer pusher, which was then in considerable favour at Home, were selected; and a De Brouwer hot-coke conveyor was also installed. A description of this plant appeared some time ago in the "JOURNAL."



Photo. No. 1.—Panoramic View showing a Portion of the Retort-House with Roof raised, the Coke Conveyor, and the New Sulphate House.

Reconstruction at the South Melbourne Works.

At the same time as the West Melbourne work was proceeding, the design for the reconstruction of the South Melbourne retort-house was taken in hand. As the latter was on somewhat similar lines to the installation recently put in at Derby by Mr. J. Ferguson Bell—whose most interesting paper at the recent meeting of the Institution of Gas Engineers has lately reached us—probably some description of the plant erected in Melbourne in 1907-8 may be of interest to engineers in the Old Country.

The retort-house at South Melbourne is 460 feet long by 120 feet broad, originally built with retort-benches down the centre and coal-stores on either side. In the northern half were two sections, each comprising ten direct-fired settings containing oval retorts, hand charged; and in the southern portion, twenty beds of seven direct-fired \square retorts. The latter are operated by means of Arrol-Foulis machinery. Attention was directed to the reconstruction of the northern half of the house.

POSITION OF COAL-STORES AND RETORT-SETTING ADOPTED.

It was determined first to place the new bench out of the centre of the house, in order to avoid having coal-stores on both sides (the concentration of coaling operations offering a much improved arrangement); and to facilitate the removal of coke into the yard—arguments brought forth, of course, as the result of the introduction of the new type of projector-chargers and the successful initiation of pushing the coke instead of pulling it out of the retorts. Moreover, the single store could be arranged to accommodate more coal than the two separate ones—an important point where it is necessary to carry such large stocks of coal as in Melbourne. Conveniently situated in the coal-store are two coal-elevators, with crushers; the latter, together with all driving gear, being housed in roomy cellars placed centrally under the store and approached by subways entered outside the retort-house. Close consideration was given to the type of setting to be adopted; settings of eights, in which the retorts are set in four tiers, being decided upon. There were several reasons which led the writer to adopt this. First, the setting offers a large combustion chamber, and the retorts can be more evenly and easily heated. This appealed strongly to the author, because it suggested a very convenient way of arranging the retort-house work.

In speaking in the discussion on carbonization at the meeting of the Victorian Gas Managers Association held in Ballarat in November last, the writer said: "To that end (eight-hour charges) the new plant just put in at South Melbourne was deliberately

designed; and so far as they had gone, they were quite satisfied with the results obtained from it." This remark expresses the fundamental idea underlying the general design. He was desirous of adopting an arrangement which he conceived would facilitate such a system of work, and which appeared to offer more advantages than the ordinary setting of eight. Moreover, it was found that twenty such beds with chimneys could be erected on the area to be dealt with. The installation therefore comprises this number set in one bench, with an extra wide pier between the tenth and eleventh settings. The retorts are \square -shape, 21 in. by 15½ in. by 20 ft. long; this section being necessarily used as the retorts were already on hand, otherwise the writer would have preferred a larger section.

ASCENSION PIPES, MOUTHPIECES, AND TAR ARRANGEMENTS.

The writer had no difficulty in deciding to adopt only one ascension pipe. Such a course effected a saving in capital outlay of over £1000. Moreover, one cannot see why a horizontal retort should not work satisfactorily with a single ascension pipe when an inclined retort does, despite the fact that in the latter case the pipe is fixed at its lower end. Single ascension pipes were therefore determined upon; and these (7 inches in diameter) were placed on the charging side of the bench as being the more convenient. On the discharging side, only short mouthpieces are provided; and thus it is arranged that the ascension pipes are attended to on the same side as the machines are manipulated and the coal handled. On the opposite side of the bench, the only work required is the opening and closing of the lids, the feeding of the producers, and, of course, the clinking of the furnaces; a conveyor being installed in order to carry away the coke.

The ascension pipes lead into the hydraulic mains in the ordinary manner; but the latter are of special trough-shaped section to facilitate the removal of tar. For convenience in running off the liquor and tar, the hydraulic mains are arranged in four sections; the mains from five beds working into their own tar-tower. There are thus four tar-towers provided; one being fixed at the ends of the bench, and the two centre ones in front of the wide pier referred to above. The general arrangement will be better understood perhaps from photograph No. 2. A 24-inch foul main collects the gas from the hydraulic mains; and two of "Cowan's" retort-house governors are installed for regulating the exhaust. The arrangement of pipes and mains has proved quite satisfactory; for although the plant has been at work now

for over twelve months, only three stopped pipes have been experienced. We may, in fact, truly say that stopped pipes in this retort-house are practically unknown.

MACHINERY SELECTED.

The stoking machinery selected was again the De Brouwer projector and the Jenkins-De Brouwer pusher. The charging-machine carries in its own hopper 5 tons of coal; this being filled from two centrally situated overhead hoppers as required. The hot-coke conveyor is also of the De Brouwer type, the longitudinal conveyor running in front of the retort-benches and emptying into a cross conveyor in which the coke is quenched before being deposited in the yard. Photograph No. 3 shows the general arrangement on the discharging side.

OTHER FEATURES.

In addition to the single ascension pipes—and probably this is one of if not the largest installation of horizontal retorts so fitted—the bench contains one or two other features of special interest. It has been pointed out that the general reconstruction allowed for the provision of a coal-store on one side of the bench. As will be gathered from the photographs, the retort-house and coal-stores are covered by the same roof; lattice girders supporting it, and spanning the house. In moving the bench off the centre of the house, it was, of course, necessary to erect a division wall, in order to separate the coal-store from the retort-house proper. After some consideration, it was finally decided to build this of

reinforced concrete and also the stage floor carrying the stoking machines; this type of structure coming out somewhat cheaper than a brick wall and steel floor. Photograph No. 5 shows the method of construction of the wall, embodying a system of counterforts joining into a base-plate running the whole length of the store. The charging stage was not carried close up to the buckstays, so as to guard against any effects of expansion; the space between the edge of the concrete floor and the bench being filled in with steel plates. The floor is finished with a granolithic surface; and it has proved to be most satisfactory in working, easily kept clean, and an easy operating floor for those continuously engaged upon it.

On the discharge side something in the form of a novelty has been introduced, but which has proved a very satisfactory innovation. It consists of a machine embodying the combination of a travelling platform and coke-shoot, and is propelled by an electric motor supplied with current from overhead wires in the usual way. The coke-shoot is specially designed to catch the coke from the top tier of retorts and deflect it into the furnaces—an operation easily carried out and conveniently directed by a man standing on the platform at its rear. The shoot is fitted with a movable bottom plate; so that when the coke is not required for the furnace the plate is withdrawn, and allows the coke to run into the conveyor—thus preventing it falling on, and spreading over, the stage floor. The platform serves the double purpose of allowing convenient inspection of the top tier of



Photo. No. 2.—Interior of the Retort-House—View of the Charging Side.

retorts, and also makes it handy for the men to close the lids of the top retorts after discharging; while the work of directing the coke into the producers is made much easier. The machine works most satisfactorily, and not only simplifies and assists the work of the men, but has also proved a genuine labour saver. Photographs Nos. 6, 7, and 8 fully illustrate the apparatus, and show it in action.

POWER AND POWER-HOUSE.

It was determined to use electricity for all purposes, and to concentrate the power in the exhauster-house some distance away from the retort-house; the arrangement being one to which electricity readily lends itself. Electricity was, of course, necessary for the De Brouwer machines and the travelling platform; but, in addition, a motor was provided for driving the coke-conveyors and conveniently placed on the stage floor (as shown in Photograph No. 3), and motors were also provided for driving the coal crushers and elevators.

The electric generating plant is all in duplicate; each set comprising a 100 B.H.P. Crossley gas-engine coupled direct to a British Westinghouse dynamo of the direct-current type, capable of developing 65 kw. at 220 volts. To accommodate this plant, a new power-house, 69 feet long by 55 feet wide, was provided. This was erected over the old exhauster-house; the latter being cleared away when the former house was on the point of completion—the

finished house containing room for a third generating plant when necessary, and also for an additional set of exhausters. As will be seen from Photograph No. 9, the switchboard is fixed opposite the dynamos; and the arrangement is such that, on one side of the power-house, the whole of the electrical work is placed, and on the opposite side the exhausters, gauges, and everything connected with the gas manufacture proper. Fixed over the switchboard is a specially-designed indicator under control only of the retort-house foreman, who rings the order "switch in" when power is required for each draw, and likewise signals "done with" when the draw is finished.

The electricity is conveyed by two main cables to a distributing board fixed at the end of the stage floor in the retort-house, and in which are placed switches to the various machines; the whole being under the control of the shift foreman. The general arrangement has proved all that could be wished; and the adoption of electricity for all power requirements has thus fully justified itself. Whatever the opponents of the adoption of electricity in gas-works may say in defence of their attitude, they cannot get away from the fact that it is peculiarly adapted for gas-works purposes, and is especially convenient and not expensive. With the exception of minor difficulties inseparable at the starting of new plant, we have had no trouble at all with the installation since it was started; and the secret of continuing so appears to be the maintenance of constant and careful supervision.



Photo. No. 3.—General View of the Discharging Side, showing the Combined Travelling Platform and Coke Shoot.

ERECTION.

It may be mentioned here that the whole of the brick and constructional work, including the general fitting up and erection of the machines and coke-conveyors, was carried out by our own staff and workmen; the buckstays, cross girders, and stage-floors being erected by local firms. Having settled on the design, mouthpieces, ascension pipes, and other essentials were ordered from Home early in 1907, and the actual work of reconstruction commenced in July of that year; the desire being to get completed in time to assist in manufacturing the winter output in 1908. The roof of the house was raised 7 feet—a tedious job, as it all had to be taken down and re-erected. But despite disabilities it was successfully accomplished. The foundation for

the bench consisted of a concrete raft 12 inches thick, reinforced with expanded metal, on top of which were built brick piers as footings to the piers of the main arches and the main flue walls. The intervening spaces were filled with earth and waste material, and then on top of the whole a secondary raft of concrete, 6 inches thick, also reinforced with expanded metal, was laid. On this raft the settings were erected; locally made "Darley" fire-bricks being used throughout, with the exception of the facings of the main piers and the front walls of the retort-settings. English retorts were put in nineteen of the settings; the twentieth containing sectional retorts specially made for us by the Darley Fire-Brick Company. The regenerators are of quite plain tile design, bonded in a particular way to prevent short-circuiting.



Photo. No. 4.—View on the Ground Floor of the Retort-House, showing the Furnace Fronts



Photo. No. 5.—The Girder Work in the Coal-Store to Carry the Overhead Railway, and Reinforced Concrete Division Wall. (Photograph taken May 5, 1908.)

The mouthpieces were supplied by Messrs. Tangyes Limited; the ascension and arch pipes, also the stoking machines and coke-conveyors, by Messrs. W. J. Jenkins and Co., Limited; the hydraulic mains by the Austral Otis Engineering Company (a local firm); the buckstaves, cross girders, retort bracing, and

the world may be upset, it may be recorded that completion of the plant was delayed by the ship carrying the major portion of the coke-conveyor running ashore off the West Coast of Africa, necessitating the shipment having to be duplicated, and so delaying its arrival here for five months. In consequence, we had,

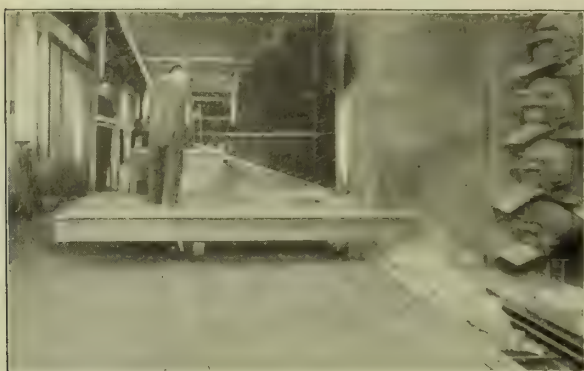


Photo. No. 6.—Showing the Travelling Platform and Coke Shoot, with Moveable Bottom Plate Withdrawn, and Coke being Directed into the Coke Conveyor.

stage-floor on the discharging side by Messrs. Johns and Waygood, Limited (also a local firm); while the stage floor on the charging side, and also the coal-store division wall, were carried out by, and to the detail designs of, the Reinforced Concrete and Monier Pipe Construction Company, of Melbourne. Messrs. Noyes Bros. (Melbourne) Pty., Limited, carried out the contract for the electric generating plant and motors.

As an instance of how an engineer's calculations at this end of



Photo. No. 7.—Showing the Travelling Platform and Coke Shoot, with the Moveable Bottom Plate in Position and the Method of Filling Coke into the Furnaces.

unfortunately, to start the installation to work without the conveyors. Some of the beds were first put into action on July 14, 1908; the new plant taking up the whole of the make at these works four months later, when the conveyor was in position.

CAPITAL COST.

The total cost of the work, including the demolition of the old benches, was £45,099. Including only the bench itself, stage floors, stoking machinery, crushers, elevators, and power plant, the installation cost £37,632; equivalent to a sum of £117 12s. per mouthpiece.

METHOD OF WORKING AND WORKING RESULTS.

From the commencement, we have worked the retorts with eight-hour charges—a course justified by the successful working in this way at West Melbourne—and although they were kept rather under 8 cwt. for some time after putting the plant into action, the charges have averaged for the greater portion of the time about 8½ cwt. With this system of working the results have certainly been most satisfactory; while the carbonizing operations are conducted without any hitch or minor troubles.

It is not possible to quote results over a long period, since for most of the time other carbonizing plant at the works has also been in action, and the gas is not purified and measured separately. It may be said, however, that we produce at any rate 11,000 cubic feet per ton of 15-candle power gas tested with the old type 15-hole argand at the 5-foot rate, the calorific power being about 580 B.Th.U. net; while the coke made for sale will average nearly 11 cwt. per ton of coal carbonized. These figures, however, do not probably convey very much, since the majority of your readers are necessarily unfamiliar with Australian coals. Speaking generally, however, the eight-hour charges have given us most satisfactory results, "six-hour work," in the words of the American, being "a back number." It remains, however, to be proved whether twelve-hour charges would give still better results, and whether also they would offer relief in regard to the carbon nuisance, which has developed under the existing system—the retorts having to be scurfed every ten weeks.

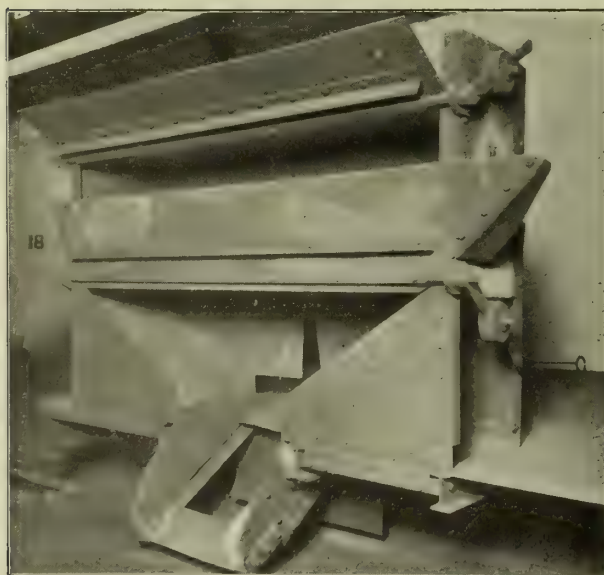


Photo. No. 8.—Showing the Design of the Coke Shoot Opposite the Retort Mouthpieces—the Moveable Bottom Plate Withdrawn.



Photo. No. 9.—Interior of the Power House.

Wages are so much higher in Australia than in England that it would not be advantageous to quote manufacturing costs. It may, however, be stated that, with twenty beds at work, eight men per shift are employed—two machine men and one backer-up on the charging side, two platform men on the discharging stage, and two firemen and one coke-conveyor attendant. Additional men are engaged at the coal-crushers, the number varying according to circumstances. Ordinary draws (twenty retorts) take about twenty minutes, and firing draws twenty-five minutes.

OTHER EXTENSIONS.

Mention may be made that considerable other alterations have been recently undertaken at these works, apart from retort-house reconstruction. With the object of improving the general arrangement of the plant, and in order to place the ammonia extraction plant under better control, connections to the washers and scrubbers were altered so as to place all the various apparatus—with the exception of the condensers—on the pressure side of the exhausters; the washers being hitherto on the suction side. This involved the laying of two 24-inch mains, and a great deal of work in cutting and altering various connections; necessitating numerous stoppages of manufacture in order to carry out the alterations, and an expenditure of some £1500. Work of this character, necessitating as it did cutting over thirty live mains (chiefly 24-inch), requires special precautions against risk of accident; and every care had to be exercised in carrying out the alterations. In order to reduce the possibility of sparking, all tools

were kept wet while cutting, and bronze hammers used for striking, and as soon as a main was burst open, wooden discs were placed in the open spigots and clayed-up temporarily. The work, carried out during the summer of 1907-8, has well repaid itself; the yield of sulphate of ammonia having increased considerably since the alterations were made.

Photograph No. 1 is a panoramic view of a portion of the works, and shows the raised portion of the retort-house, the coke-conveyor emptying into the yard, and the new sulphate-house just on the point of completion. It will be noticed that this building is divided into three portions; the boiler-house being on the left, the plant-house in the centre, and the store on the right. The plant-house is especially high to accommodate one of Messrs. C. & W. Walker's complete plants, with overhead saturator, having bottom discharge, and capable of manufacturing 4 tons of sulphate per twenty-four hours.

Such is a brief description of the reconstruction at one of our Melbourne works. More retort-house reconstruction and extensions loom ahead. And the question is, Shall it be horizontals designed for heavier charges, vertical retorts, or carbonizing chambers? The point is an all-important one at present for any works. Possibly we in Australia find it a bigger question to solve satisfactorily than our *confrères* at Home.

THE "BURKHEISER" PROCESS OF PURIFYING GASES OF DRY DISTILLATION,

WITH SIMULTANEOUS PRODUCTION OF SULPHATE OF AMMONIA, WITHOUT THE ADDITION OF ACID.

[COMMUNICATED.]

REDUCTION of cost of production is the prime essential of industrial progress. Increasing wages, rates and taxes, and cost of raw material combine in forcing this necessity upon the producer. The most obvious, and at the same time the most important, means for reducing cost of production are: (1) Simplification of plant and processes; and (2) increased efficiency in utilization of raw materials. Means for both these purposes are afforded to producers of gas and coke by the Burkheiser process.

In regard to simplification of plant and process, it will be seen that the astonishingly simple Burkheiser process combines the operations of cleansing coal gas and producing sulphate of ammonia, and enables the same to be carried out in a minimum of space. This combination alone represents an important step in the direction of simplification and reduction of cost. Heretofore, the purification of the gas and the production of sulphate of ammonia have been regarded as separate processes. All the purifying operations were carried out with the sole object of producing gas free from impurities. The production of sulphate of ammonia was a totally separate process, requiring expensive plant. In the Burkheiser process, the sulphate of ammonia is an immediate product of the purification, obtained without inconvenience or extra cost; this result being secured by the most complete utilization of the raw material—coal.

The presence of sulphur in coal is a well-known fact; but this constituent has hitherto only been regarded as a deleterious impurity, for the removal of which large and expensive plant has

been provided. By means of this plant, the sulphur was removed, but at the same time rendered useless for industrial purposes; and in this way a most valuable bye-product was wasted. It was left to the author of the Burkheiser process to recognize the value of the sulphur, and to take advantage thereof by utilizing it for binding the ammonia in the gas and producing sulphate of ammonia. The inventor recognized the fact that the proportion of sulphur in any kind of coal used for the manufacture of gas is sufficient for binding the whole of the ammonia present; and from recognition of this fact, he has developed a system of the most beautiful simplicity. The process banishes sulphuric acid from gas and coke works, and substitutes therefor the sulphur contained in the coal. This represents a saving of hundreds of thousands of pounds. In the district of Dortmund alone, more than 5 million marks were expended for sulphuric acid in the year 1907 (reckoning the acid at 32 marks per ton), for producing 155,791 tons of sulphate of ammonia. The output of England in the same year (300,000 tons) involved an expenditure of about £500,000 for sulphuric acid. A gas-works of average capacity (about 350 million cubic feet per annum) can, by adopting the Burkheiser process, save about £500 per annum on sulphuric acid alone, in the manufacture of sulphate of ammonia.

To revert to the question of simplification of plant, the amount of space occupied by the apparatus for separating the sulphur is reduced to one-sixtieth of that formerly required—partly by reason of increased absorption capacity of the purifying mass, and partly by the fact that the velocity of the gas can be increased to twenty or thirty times the former velocity. The immense value of this saving will best be recognized by gas-works managers whose work lies within large towns, where they are hampered on all sides by lack of space, while compelled to cope with an ever-increasing output. This saving alone is, therefore, an immense advantage. At the same time, the cost of the Burkheiser purifier is perfectly negligible; the apparatus consisting merely of a cast-iron vessel of a few cubic metres capacity. The system is carried out without the use of any free acid whatever, so that expensive lead linings are dispensed with, and the entire plant is exceedingly

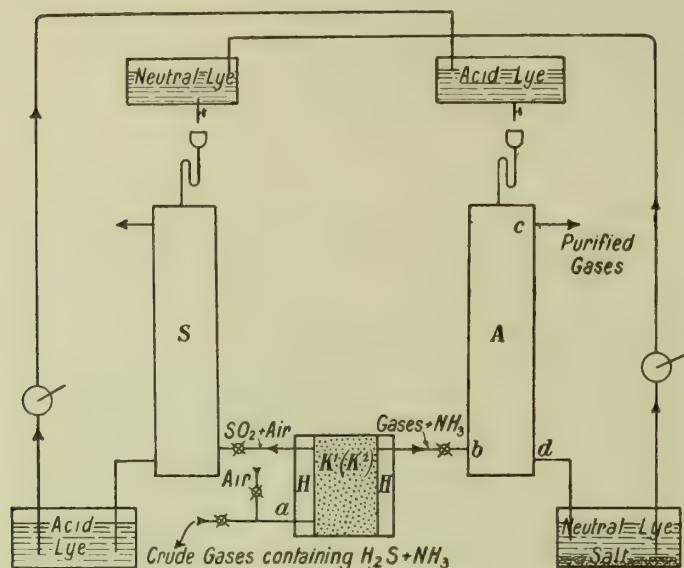
cheap. The Burkheiser process can be installed at any gas or coke works without interruption of working, and without structural alteration of buildings, &c.; and the cost of the installation is covered by the saving effected in one year. The amount of space liberated in existing buildings and rooms affords scope for any conceivable increase of output.

In the case of coke-works in particular, the Burkheiser process affords not only the advantages of simplification and cheapening of the sulphate of ammonia apparatus, and saving of the cost of sulphuric acid, but also the advantage that gas free from sulphuretted hydrogen is directly obtained. This is a factor of daily increasing importance, in view of the tendency of coke-works to undertake the supply of illuminating and power gas, free from sulphuretted hydrogen.

A SHORT DESCRIPTION OF THE PROCESS.

[See also "Register of Patents," p. 326.]

In the Burkheiser process, the sulphur contained in the gas itself is converted into sulphurous and sulphuric acid and used for binding the ammonia.



The apparatus substantially consists of two uniform, but separate, chambers K^1 and K^2 , surrounded by a heating jacket H , and of two washers A and S . The chambers K^1 and K^2 contain a specially prepared mass of bog-iron ore, which has an exceedingly high capacity for absorbing sulphuretted hydrogen. With the gas travelling at 150 to 200 millimetres per second, this mass is capable of separating more than 20,000 times its volume of sulphuretted hydrogen without being regenerated (as compared with former capacities of 10,000 volumes with only some ten or fifteen regenerations).

Coal gas free from tar, but retaining its ammonia and sulphuretted hydrogen, passes at a into the chamber K^1 , containing the mass; and the sulphuretted hydrogen is separated in the chamber. The gas, still retaining the ammonia, then passes at b into the washer A , in which the ammonia is separated. The gas free from all impurities passes out at c .

When a certain quantity of gas (according to the absorbing capacity of the bog-iron ore) has passed through the chamber K^1 , the stream of gas is deflected into and through the chamber K^2 , so that the latter performs the function previously performed by the chamber K^1 . While sulphuretted hydrogen is being separated in K^2 , a stream of air is passing through K^1 ; and by this means the compounds of sulphur and iron therein are so violently oxidized that sulphurous acid is produced. This acid is washed out in S . The mass in K^1 is in this manner prepared for again absorbing sulphuretted hydrogen, and the stream of gas can again be deflected into K^1 , while a current of air is passed through K^2 .

The washer A is traversed by the liquor flowing from the washer S , and *vice versa*—that is to say, a single volume of circulating liquor is retained in the process, and becomes gradually charged with salt until the point of saturation is reached.

The amount of circulating liquor is so calculated that the discharge from S , used for washing out the ammonia in A , mainly consists of $\text{NH}_4^+ > \text{SO}_3$, and is therefore highly capable of ab-

sorbing the ammonia without rendering the gas acid.

This latter point may be particularly emphasized with reference to the processes in which the ammonia is directly washed out of the gas by means of sulphuric acid. In these processes, the gas must necessarily become acid—i.e., must absorb sulphuric acid; and this fact may be regarded as fatal to the utility of such processes, inasmuch as in course of time the pipes must become corroded, however much care is taken to provide lead linings. Moreover, the free acid considerably reduces the illuminating power. The Burkheiser process entirely excludes free acid, and in no way reduces the illuminating power of the gas.

The exactly neutral liquor discharged at d is acted on by the oxygen of the air, and yields sulphate of ammonia which is, in

respect of appearance and purity, at least equal to the other sulphate. A fact favourable to the process is that nearly all kinds of coal contain sufficient sulphur for binding the whole of the ammonia.

The following summary of advantages may be made: A very considerable saving of space is effected by adopting the process; the saving in regard to space for sulphur separation alone amounting to 50-60ths. Savings are also effected in regard to purifying material, lime, steam, and water for ammonia washers. The use of protective lead is unnecessary; and the employment of sulphuric acid is entirely dispensed with.

AMERICAN ILLUMINATING ENGINEERING.

Third Annual Meeting of the Society.

IN the "JOURNAL" for the 19th ult. (p. 186), we gave a *résumé*, from the "American Gaslight Journal," of the first portion of the proceedings at the third annual meeting of the American Illuminating Engineering Society, which was held in New York towards the end of September. Further particulars have since come to hand which allow of the account being completed.

At the evening sitting on the second day of the meeting, the members were fortunate in having among them Mr. Walton Clark, who is President of the Franklin Institute and Past-President of the American Gas Institute. He briefly addressed the meeting. The only paper was that presented by Dr. C. P. Steinmetz, on the "Physiological Effects of Radiation, especially those Outside the Visible Spectrum." He stated that, in spite of the fact that daylight contains far more ultra-violet rays than do artificial illuminators, the latter are much more harmful, so that we must look for something besides ultra-violet light as the cause of eye troubles. These he divided into three classes—viz., indirect, due to impairment of colour distinction; direct, due to the power or quantity of radiation; and specific, due to high frequencies. Regarding the trouble due to the second phase of the question, the author explained that the harm done by a 4-watt lamp is greater than a 2-watt lamp, on account of the greater energy or power outside the visible spectrum which reaches the eye. The paper was discussed by several members.

The first paper at the morning sitting next day was by Mr. H. E. Ives; his subject being "Allowable Amplitudes and Frequencies of Voltage Fluctuations in Incandescent Lamps." The matter covered a test made at the Bureau of Standards in Washington. In the discussion, Mr. Fisher pointed out that a low frequency was permissible in street lighting where the intensity of illumination was low. Dr. Sharp remarked that the sensation of flicker was stronger when an illuminated object was looked at than when one looked at the lamp. The next paper (by Dr. Louis Bell) was entitled "The Principles of Shades and Reflectors." While no new ideas were brought out, an impartial statement of the facts was presented. Mr. Jones described a metal trough reflector with glass shields for a lamp, which he said gave practically uniform illumination. The paper was also discussed by Messrs. Wolhauer, Lansingh, and Owens. The concluding paper of the morning sitting was entitled "Standard Relations of Light Distribution," by Mr. A. J. Sweet. Our contemporary says "this was a most ambitious paper, and the work presented should prove of value to those who are dealing with practical problems of lighting installations." Mr. Woodwell stated that the specialist should be encouraged to take up each separate problem rather than use general rules as suggested by the author. Mr. Hopton thought the curves shown in the paper would give normal values which would be too high for residence lighting; and Mr. Thurston Owens said the reverse was the case with commercial lighting. Mr. Elliott congratulated the author on bringing forward suggestions for standardization, of which the art was badly in need.

The concluding sitting was opened with a paper upon "The Problem of Heterochromatic Photometry" by Mr. P. S. Millar. Owing to the fact that modern light sources have such varied colour characteristics, this subject is one of increasing importance; and the paper should be of considerable assistance to those who are endeavouring to solve the problems connected with it. Dr. Steinmetz said the measuring of lights of decided colour could be done by three operations: By using the bolometer to determine the radiation, a photographic plate for the actinic rays, and a flicker photometer for the effects of after-image. He recommended the use of an illuminometer, having a reading card with black letters on a white background for low intensities, and white letters on a grey background for high intensities. Dr. Bell stated that with the last-named instrument the trouble would be that the result would be one of adaptation rather than of perception. Mr. Sweet described a tungsten lamp which was constructed to meet the necessary requirements of a standard. The next matter taken up was the conclusion of the discussion on the papers of Drs. Ives and Simonini, which had been interrupted the previous day. In this debate, Dr. Steinmetz gave it as his opinion that the spectrum of the single firefly would show an even narrower area than that produced from the large number used by Dr. Ives. He further discussed the earliest, as well as largest, application of selective radiation; the Welsbach mantle showing that the greenish colour was characteristic of this phenomena. The paper by Mr. Norman Macbeth, on "Some Results Obtained through Illuminometry," contained a great number of tests of

illumination by means of mantle gas-burners. No conclusions were drawn by the author, and the subject was not discussed. Mr. L. B. Marks then read a paper on "Factory Lighting," which showed in great detail the conditions existing under both artificial and natural light. A short discussion followed. A paper on "Operating Efficiencies of Some Commercial Installations of Lighting Systems," by Mr. A. L. Eustace, was then presented. The object of the author in endeavouring to show that commercial conditions greatly change the situation regarding the efficiency of prismatic glassware, was successful. The paper on "Tests of Moore Tube Lighting Installations in the New York Post Office," prepared by Mr. E. P. Hyde and Mr. J. E. Woodwell, was omitted, as the authors were not present. The final paper on "Tests of a Moore Tube," by Mr. C. H. Sharp and Mr. P. S. Millar, was read by the latter. The data covered tests made by the authors for the Association of Edison Illuminating Companies.

In connection with the meeting, an interesting exhibit of lighting appliances was held in a building close to the assembly hall. It was notable for the elaborate displays of individual exhibits, rather than for the number of exhibitors.

THE EVOLUTION OF THE GAS-ENGINE.

It has already been reported in the "JOURNAL" [see Vol. CVI., p. 968] that a paper on the development of the gas-engine was read by Herr Joh. Körting, of the firm of Körting Bros., of Düsseldorf, at this year's meeting of the German Association of Gas and Water Engineers. In the first instance, the Council of the Association had approached Dr. W. von Oechelhaeuser, the Managing-Director of the German Continental Gas Company, asking him to give an address at the meeting comprising a review of the development of the gas-engine during the fifty years which had elapsed since the Association was founded. The occasion was specially appropriate for the delivery of such an address, because approximately fifty years have passed since the gas-engine was first evolved in a form suitable for practical work. Unfortunately, Dr. von Oechelhaeuser was unable to devote the necessary time to the preparation of such an address; and the Council of the Association thereupon asked Herr Körting to read a paper on the subject, to which request he acceded, as already reported. At the meeting a large number of photographs and drawings of various types of gas-engine, illustrating its evolution up to the present day, were thrown on the screen. These illustrations were reproduced in two recent numbers of the "Journal für Gasbeleuchtung," when the text of Herr Körting's paper was given. Much of the historical matter contained in the paper will be found in the latest editions of the text-books on the gas-engine by such well-known authorities as Mr. Dugald Clerk and the late Mr. Bryan Donkin. It is therefore unnecessary to do more than briefly indicate the ground covered by Herr Körting in his paper.

The first gas-engine constructed and put to practical use is ascribed to Herr C. Reithmann, a watchmaker of Munich, whose death was reported in the "JOURNAL" a few months ago [see Vol. CVII., p. 372]. In the year 1852, he constructed a gas-engine, which was fed with hydrogen, for driving machinery in his workshop. The hydrogen proving too costly a fuel, he converted the engine so as to make it suitable for the consumption of coal gas; and in the year 1858, it was started in operation in connection with the ordinary Munich gas supply. Hearing, in 1860, that there was a movement in Paris for the commercial manufacture of gas-engines, he applied for, and obtained, a patent in Bavaria for his engine; but, lacking financial support, he allowed the patent to lapse in two years. In 1873, Reithmann devised a new gas-engine of the four-cycle type, which remained in use in the eighties in his workshop. He was thus the first to make practical application of the four-cycle, the theory of which had been elaborated in the sixties by M. Beau de Rochas. In 1860, Lenoir had produced his gas-engine with a double-acting cylinder somewhat resembling that of a steam-engine. The oil consumption, however, of this engine was extremely heavy, and the working charges very high. This engine should apparently be ascribed to M. Hugon, the Manager of one of the gas-works in Paris.

In 1867, the firm of Langen and Otto brought out their atmospheric gas-engine, which, notwithstanding its noisiness and its impracticability in large sizes, came into extensive use. Up to 1878, the firm of Langen and Otto had constructed 4500 engines of this type. The gas industry endeavoured to further the introduction of the gas-engine in every way; and at Minden, in 1877, the gas undertaking went so far as to offer to bear the prime cost of installing gas-engines for industrial use. In the later half of the seventies, N. Otto, a member of the firm of Langen and Otto, brought out his new gas-engine, which for years served as the type for other designers. By the year 1880, 3000 Otto engines had been constructed, and by 1889 30,000 were in use. The Otto engine, as is well-known, is of the four-cycle type. In 1879, Mr. Dugald Clerk exhibited in London an engine working on the two-cycle principle, which becomes important historically in view of the recent development in the construction of large gas-engines of the two-cycle type.

It is unnecessary to refer to the gradual improvements which were embodied in the Otto type of engine for ordinary use. At the beginning of the eighties, gas-engines of large power began to be constructed. A 60 H.P. twin-cylinder engine was introduced in the sugar refinery of Elsdorf in 1881 consuming coal gas made

in the private works of the refinery. The construction of gas-engines of larger size followed on the development of the gas-producer by Dowson. It is interesting to note that it was about the middle of the eighties that the gas-engine was first applied for pumping water for town supplies, for which purpose it has since been so largely adopted on the Continent. Then followed the use of the gas-engine for driving dynamos for the supply of electric current. One of the first instances of this use was afforded by the adoption, by Herr W. von Oechelhaeuser, in 1886, of gas-engines aggregating 160 H.P. for the electric supply station at Dessau of the German Continental Gas Company. These engines were supplied with coal gas. Subsequently, however, when the power required had considerably increased, coal gas was superseded at the Dessau station by producer gas; and at the present time there are at these works two suction-gas engines each of 600 H.P.

At the beginning of the nineties, the tendency was rather to multiply the number of cylinders than to increase the diameter of the cylinder with a view to obtaining greater power. But the efforts of Messrs. Körting Bros. and of Herr von Oechelhaeuser and others, resulted in the construction in the second half of the nineties of gas-engines with cylinders of large diameter. A 200 H.P. Junkers engine, in the design of which Herr von Oechelhaeuser had collaborated, was erected in the works of the Berlin Anhalt Engineering Company, and was fed by coal gas. Messrs. Körting Bros. constructed 600 H.P. four-cycle engines which were brought into use for the consumption of blast-furnace gas in May, 1898. Meantime, however, French engineers had succeeded in constructing four-cycle engines of 600 H.P. with a single cylinder. In 1899, these engines were introduced at Seraing; and the following year it was stated that sixty engines of this type had already been constructed. They were followed by a 700 H.P. engine, with a single cylinder, constructed by a Nuremberg firm.

All these engines had been of the four-cycle type; but it now appeared that, if the power of a gas-engine was to be further increased to a considerable extent, economy of space would be attained by the use of double-acting engines of the two-cycle type. The cylinders would be considerably smaller, and the working would be more uniform than that of engines on the four-cycle principle. Messrs. Körting Bros. constructed an experimental engine of 400 H.P. on these lines; and two such engines of 600 H.P. were exhibited at the Düsseldorf Exhibition in 1902. At the same exhibition also, there was a single-acting four-cycle engine, with four cylinders, of 1200 H.P., made at the Deutz Gas-Engine Works. Concurrently the Oechelhaeuser two-cycle engine had been developed. In this type there were two pistons working in opposite directions in one long cylinder. Of Messrs. Körting's double-acting two-cycle engines, installations aggregating over 200,000 H.P. are now in existence. In 1903-04, the Lackawanna Steel Works in the United States already had one installation of these two-cycle engines with a total of 40,000 H.P.

Herr Körting next went on to refer to installations of gas-engines in use in connection with gas and water works. Among water-works for which the power is obtained by gas-engines may be mentioned those at Dantzig, equipped in 1903, and those at Worms, in which engines directly coupled with the pumps were installed in 1906. Large installations are also in existence for the pumping of sewage. At Wilmersdorf, Körting two-cycle gas-engines, totalling 300 H.P., are coupled directly with the pumps. These engines, like those in use at the Dantzig and Worms Water-Works are intended for the consumption of coal gas; but the Wilmersdorf engines are adaptable, if required, for consuming producer gas. Plant at the Berlin sewage-pumping station, erected in 1907, also consumes coal gas.

The remainder of Herr Körting's paper deals chiefly with the development of engines for the consumption of liquid fuels—i.e., petroleum oil, alcohol, and petrol. Illustrations are given of a 70 H.P. petrol engine with eight cylinders, as used on the German military airships, and of a two-cycle four-cylinder petroleum motor, which is in use in the German submarines.

In the discussion after the reading of the paper, reference was made by Herr Terhaerst, the Manager of the Nuremberg Gas-Works, and by Herr Elvers, of Wandsbek, to engines of the Diesel type working at Halle and Wandsbek with tar oil as fuel in place of petroleum. In the second case, an addition of 5 to 10 per cent. of petroleum gas oil is made to the tar oil before use. The tar oil is obtained by a single distillation of gas-works tar; and the cost of fuel for the engines is said to be about one-third of what it would be if petroleum were used. In considering this figure, however, regard must be paid to the effect of the heavy import duty on petroleum oils in Germany.

At the conclusion of the discussion, Herr Körting received a hearty vote of thanks for the interesting paper he had presented.

"Gas-Works Directory and Statistics" for 1909-10.—We have received from the publishers, Messrs. Hazell, Watson, and Viney, Limited, the above-named Directory. Having reached its thirty-second year, the work is too well known to require more than a brief notification of the publication of the issue for the year 1909-10, the contents of which have been revised to August last. As usual, the statistics are preceded by lists of the Chairmen, Managers, Engineers, and Secretaries, as well as of the Technical Associations connected with the gas industry. The price of the book is 10s. 6d. net.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

General Meeting at St. Helens.

THE One Hundred and Fifty-Seventh General Meeting of the Institution was held at St. Helens on Saturday. There was a larger attendance than usual; 122 members being present. On arrival at St. Helens, they at once proceeded to the Corporation gas-works for an inspection of the new installation of the Glover-West vertical retorts. Mr. Samuel Glover and his colleague, Mr. John West, explained the working of their invention, and answered the various questions put to them.

HOSPITALITY OF THE SHEFFIELD GAS COMPANY.

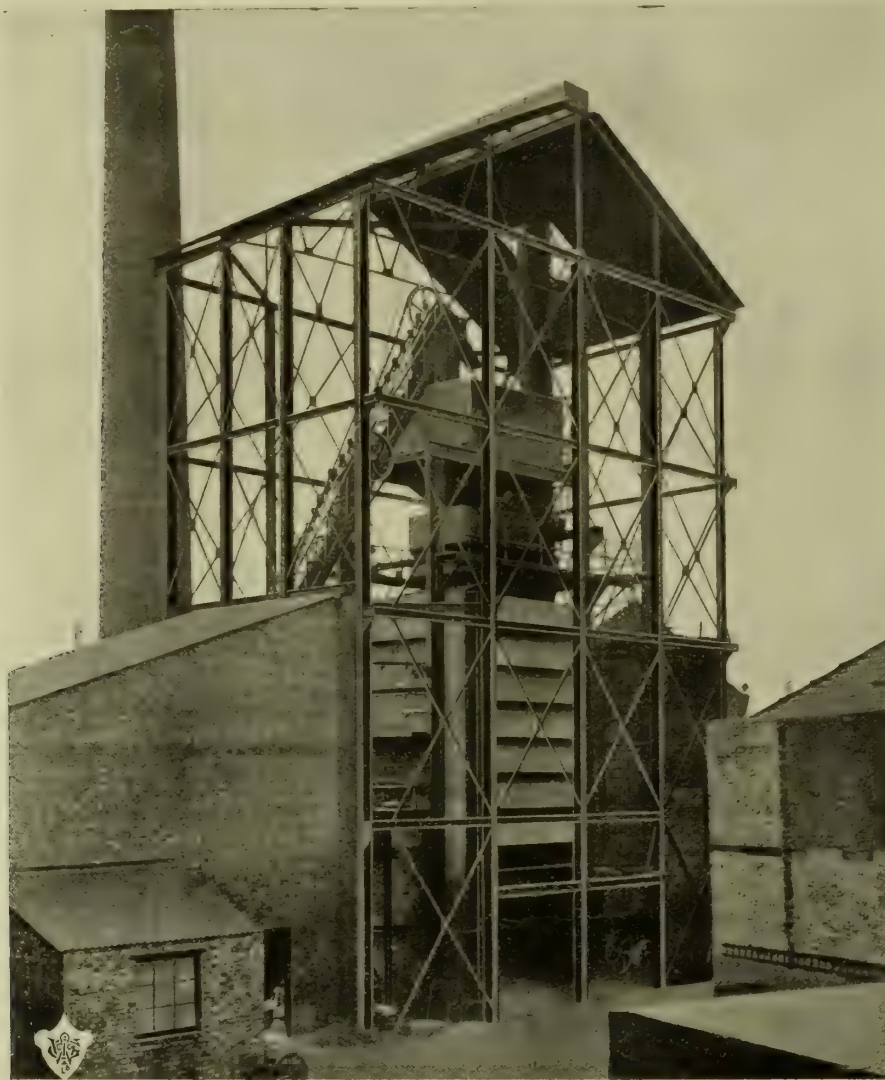
Later in the day, at the Town Hall, the members were the guests, at luncheon, of the Chairman and Directors of the Sheffield United Gas Company. Mr. J. W. MORRISON (Sheffield), President of the Institution, was in the chair, and those supporting

him included Mr. J. W. Helps (Croydon), the President of the Institution of Gas Engineers; Mr. James Crooks, the Chairman of the Gas Committee of the St. Helens Corporation; Mr. W. Langford (Longton), the President of the Midland Association; Mr. Thomas Newbigging (Manchester); and Mr. W. Whatmough (Heywood), the Hon. Secretary of the Institution.

A COMPLIMENT TO ST. HELENS.

After the toast of "The King" had been honoured,

Mr. H. KENDRICK proposed "The Mayor and Corporation of St. Helens," coupling with the toast the name of Mr. Crooks as representing the Mayor, who was unable to be present. In the course of his remarks, he paid a high compliment to those who had built up the chief industries of St. Helens, and also to those who were responsible for the government of the town, which he said held an enviable position, with its rates at only 6s. 5d. in the pound on a population of about



Setting of Eight Vertical Retorts on the Glover-West System at St. Helens.

84,000. With regard to its gas undertaking, St. Helens held a unique position in that part of Lancashire; and Mr. Glover and the Corporation were to be congratulated on being able to supply gas at the price they did.

Mr. CROOKS, in responding, said he was pleased, on behalf of the Mayor and Corporation, to welcome the members of the Institution to St. Helens. Their visit was not only a compliment to Mr. Glover, but to the town; and he was gratified to know they had at St. Helens something which was of interest to the visitors.

Mr. S. GLOVER, also responding, said he had served the Corporation of St. Helens ever since they acquired the gas undertaking. He was associated with the works before they were purchased; and he thought the Corporation deserved the compliment which had been paid by Mr. Kendrick for the way in which they managed the affairs of the town. They looked upon the gas undertaking from a purely commercial point of view; and it was managed in a business-like way in the interests of the consumers. To this he attributed its success.

The PRESIDENT gave the toast of "Kindred Associations," and expressed pleasure at the presence of Mr. Helps, the President of the Institution of Gas Engineers, and Mr. Langford, the President of the Midland Association.

Mr. J. W. HELPS, replying, said he was pleased to attend such gatherings, because they gave him the opportunity of meeting men he would not otherwise meet in the South of England.

Mr. W. LANGFORD, in his response, remarked that, as the result of their visit to St. Helens, they would go away with new ideals.

THE PROBLEM OF CARBONIZATION.

Mr. T. NEWBIGGING (Manchester), on rising to propose the toast of "The Sheffield United Gaslight Company," was greeted with hearty applause. He said those present had seen a great deal to admire; and he desired especially to congratulate Mr. Glover and Mr. West on their setting of vertical retorts. As they all knew, these were the very foundation at the root of gas manufacture—he meant carbonization. What they had seen that morning had been intensely interesting to them as gas engineers. If there was one thing he admired more than another in Mr. West, it was his tenacity of purpose in all that he undertook. He showed this many years ago, when he was at Maidstone; and he still displayed it. He felt assured that Mr. West and Mr. Glover had gone far to settle the difficult problem of carbonization in vertical retorts. In their further efforts towards perfecting the machinery, he (Mr. Newbigging) had no doubt as to their efforts being successful. Inventors did not always get the encouragement they deserved—especially the poor inventor; but he hoped that in the present case Mr. Glover and Mr. West would reap all they expected and all they deserved from their invention, and have good health for many years to enjoy their reward. He was very glad to know that the Manchester Corporation had now determined to have an

installation of Glover-West retorts on a considerable scale at one of their stations. He thought also that a great deal of credit was due to the Burnley Corporation and their Gas Manager, Mr. Leather, for leading the way. As to the Woodall-Duckham system, he could only hope it would be a success, as well as the one they had seen that day, because it was "very nice to have two strings to their bow." (Laughter and applause.)

The PRESIDENT, replying to the toast, stated that when he mentioned the matter of the St. Helens visit to his Directors, they at once told him to "go ahead." This showed the good feeling existing between the Directors and himself; and he hoped it would continue for many years to come. His was a progressive Company; and he was looking forward to the day when they could sell gas at 1s. per 1000 cubic feet. He thought it would come to that. As it was, they were now at 1s. 2 9d. per 1000 feet.

The Business Meeting.

The business meeting which followed the luncheon was also held in the Town Hall. Mr. MORRISON again occupied the chair. After the minutes of the previous meeting had been confirmed, a discussion took place on the paper read at the last meeting by Mr. Edward A. Harman, of Huddersfield, on the "Slot-Meter System," which was published in the "JOURNAL" for May 25.

DISCUSSION ON MR. HARMAN'S PAPER ON THE "SLOT-METER SYSTEM."

The PRESIDENT said it would be remembered that the discussion on the paper that Mr. Harman read at the May meeting was postponed owing to want of time. He hoped that the lapse of time had not diminished the interest in the paper, and that members, having had time to think the subject over, were now well prepared to discuss it. There were, he added, four points in the paper that struck him as being exceptionally good. The first was that the Huddersfield Corporation put in gas-services and fixed meters free of charge. This must, of course, be a great inducement to people to take gas. The second point was that the duties of the collector were arranged so that fraud was obviated—a matter that would appeal to all of them having slot-meters in use. The third point was that at Huddersfield they had an excellent system of getting rid of their coppers from the slot-meters. The fourth was that the discount rebate was a very commendable arrangement and one that made consumers interested in the money in the meter-boxes, and therefore lessened robbery. He did not think, however, that Mr. Harman had clearly stated the present selling price of gas by their slot-meters. The author mentioned that in April, 1908, the quantity of gas for a penny was increased to 40 cubic feet, and a discount of 3d. in the shilling allowed. He thought Mr. Harman meant that 30 cubic feet were sold for a penny and a discount of 3d. in the shilling allowed, which was equivalent to giving the consumer 40 cubic feet for a penny. He also noticed that the author sold gas to ordinary consumers at 2s. per 1000 cubic feet, less 5 per cent. for cash, equivalent to 1s. 10 3/4d., and that his price to slot-meter consumers worked out at 2s. 1d.—the difference being 2 1/4d., which, on Mr. Harman's average consumption of 13,700 cubic feet per slot-meter, amounted to 2s. 6d. a year. This seemed to him (Mr. Morrison) to be a very small figure to compensate for the extra cost of meters, collecting, damage, and repairs. He could hardly think it possible that an extra revenue of 2s. 6d. per meter per annum could pay. If not, then the ordinary gas consumer was paying more than he should do. If Mr. Harman went more fully into all the charges for providing slots, compared with the ordinary meters, he would find that the difference in the selling price should be nearer 6d. per 1000 cubic feet than the 2 1/4d. he charged. It would have been more satisfactory if Mr. Harman had given the actual cost of collecting per slot-meter consumer, against an ordinary consumer using the same sized meter. He would like to know how often the collections were made from the slot-meters, and to what extent introducing these meters had affected the number of 2-light and 3-light ordinary meters in use, and how many ordinary meters of this size he had still in use, in addition to slot-meters. He (Mr. Morrison) found that at Sheffield they had 72,270 2-light and 3-light meters out of a total of 93,681, or 77 per cent. The average annual consumption in Sheffield of 2-light meters was 11,757 cubic feet, and of 3-light 17,067 cubic feet. They had no slot-meters in use; but he thought their sales of gas were well maintained. In Sheffield, they had a population of 450,000; and as they had 94,000 consumers, it would be seen that they had 4000 more than if they divided the population by five per house as was generally done. This demonstrated, he thought, that with cheap gas slot-meters were really not necessary.

Mr. S. GLOVER (St. Helens) observed that it might have been thought, from what he said at Bamford, in seconding a vote of thanks to Mr. Harman for his paper, that he was to take up the cudgels against slot-meters and Mr. Harman. That was not so. Mr. Harman's paper had served the purpose he had in view, and a very useful purpose too. In bringing the subject forward, Mr. Harman had made many of them review their position relative to the small consumer. Those present would be assured of his (Mr. Glover's) interest in the subject, when informed that in St. Helens £21,000 was collected last year without the loss of one penny upon the total gas sold through slot-meters, and that from about 13,000 meters they had in use. This was because their system was good. At the same time, he thought Huddersfield had been very successful indeed in the application of the slot-meter system to meet the wants of the small gas-consumer. But

circumstances altered cases; and each of them had different conditions to consider in getting at the small consumer. In some places—such as Sheffield and Oldham—it was not thought necessary to have the slot-meter system; but in other towns it served a useful purpose, and increased the consumption of gas. (Hear, hear.) Members would recall the difficulty that they had in the beginning, and that the making of slot-meters had almost to be forced upon the meter manufacturers. He thought it had been proved that those opposing the system were short-sighted in their views, and that slot-meters were very useful instruments in the hands of gas supply companies and corporations to-day. (Hear, hear.) In forming a comparison with Huddersfield methods, he (Mr. Glover) was led to make inquiries of several of his friends; and the result had been to confirm his confidence in the system they had in operation in St. Helens. Speaking generally on the subject, Mr. Glover held they should make it a *sine qua non* to have correct and reliable meters, set by means of changeable crown-wheels to the price fixed upon. They ought to avoid fostering any unsound commercial principles in these transactions such as rebates or anything which pandered to the notion of getting something for nothing. (Hear, hear.) The amount of money taken from the slot-meter should correspond exactly with the gas consumed and a receipt given each time. If there should be any balance, this ought to be replaced in the box. Each transaction should be complete; and there ought to be no lumping together of "shorts" and "overpluses." With proper and reliable meters, there need be none of this. There ought to be frequent collections, and the money counted and checked in the office with the receipt-book. It was undesirable for collectors to go about the town to get the copper changed by some friend. At St. Helens, the money was taken to the Gas Offices, where they had a coin-counting device which made the copper up in 5s. packets (four making the pound); these being subsequently taken to the bank. There should be no system of hiding the position from each inspector, or the takings from the consumer. An open, simple, business-like system was the one to give lasting satisfaction. He agreed with Mr. Harman that this class of business was worth looking after; and if the consideration of the paper helped them to do it better than formerly, then he was sure Mr. Harman would be gratified. (Hear, hear.)

Mr. E. ALLEN (Liverpool), having complimented Mr. Harman upon the practical character of his paper, said he did not know what some of them would have done but for the advent of the slot-meter system. It was in 1892 that they started the system in Liverpool; and though it had grown considerably in the interval, they had not lost business from the ordinary meters. The increase in the consumption had been largely taken up by the slot-meters in the seventeen years. Of these, they had nearly 58,000; while the ordinary meters numbered between 76,000 and 77,000. So that the former had become an important proportion of the meters in use in the district. In 1904, they introduced cookers for slot-meter customers, and this had been much appreciated; the number in use now being 13,000. He was quite sure the working class had received great benefit by the introduction of this system in the cities and towns. One great reason why the working man liked the slot-meter was because there was no deposit to pay. As those present were aware, the demand for a deposit was a great bar to many a poor man who wanted to have gas in his house. The slot-meter got over this difficulty; and by it they secured consumers they would not otherwise have. Of course, the system had its disadvantages; and an important one was the robbing of the meters. In this respect, St. Helens seemed to be in a very happy position, from what Mr. Glover had said. Unfortunately they in Liverpool had a number of thieves who robbed slot-meters; and sometimes people, to finish up a "spree," would break open the meter to get the money it contained. He thought Mr. Harman was right in saying there should be an agreement with the consumer binding payment for all gas consumed through the meter. This he considered most important. As to Mr. Glover's suggestion about changeable crown-wheels, it might be all very well in St. Helens, where the number of meters was small, but with Liverpool it would be a big thing to change nearly 60,000 meters.

Mr. R. WATSON (Doncaster), referring to the question of costs in connection with slot-meter gas supply, said the President had suggested that the extra amount received per 1000 cubic feet over the ordinary price through slot-meters in Mr. Harman's case was only 2 1/4d., whereas the extra cost of distributing gas was much more. In his own case at Doncaster, with conditions somewhat similar to those of Huddersfield—that was to say, the supply of service-pipe, meter, and boiling-ring, but no fittings—the extra amount received through slot-meters was much the same as Mr. Harman's. The average gas consumption for these meters was 11,000 cubic feet, and for all ordinary meters 30,000 cubic feet per annum. The annual cost of main and meter maintenance amounted to about 5d. per consumer; and this worked out per 1000 cubic feet for the two classes of meter indicated that the maintenance cost about 3d. more for slot than for ordinary meters. The capital cost of mains (about 7 yards per customer), service-pipe, meter, &c., ran to some £4 5s. per customer; and interest and sinking fund on this amount came to 5 1/4d. per 1000 cubic feet for slots and 2d. for ordinary meters—a difference of 3 1/4d. The two charges coupled with the extra expense of collection could be taken to be about 4 1/4d. per 1000 cubic feet. As against this, it should be borne in mind that slot-meter custom was obtained principally off gas-mains already existing, and therefore

the capital charge about 1½d.) for new main-pipe per 1000 cubic feet per slot-meter was saved. For practical purposes, this might be credited against the 4½d.; and the extra cost became reduced to 3d. This, by coincidence rather than by calculation, had long been the additional charge made for slot-meter gas at Doncaster. There were other pecuniary points which should also be remembered; as, for instance, the fact that the slot-meter customer took his gas rather more equally throughout the year than did many of the ordinary consumers—thereby lessening the necessity of disproportionate extension of plant.

Mr. HARMAN, in his reply, said it was not his intention in the paper to set out a system that would apply to all places. It was more to record what had been done in Huddersfield. He was quite aware that what might serve in one place would not do for another. He did not claim that the system they had at Huddersfield was by any means a perfect one; but he did say his Committee had adopted the very best system applicable to the town. The question about the difference in the price of gas between the slot-meter consumers and the ordinary consumers was one to be settled locally. As to the cost of collection, he pointed out in his paper that if the monetary value alone was taken into account the cost might appear heavier. To be strictly correct, the basis of comparison should be per consumer; and if this was considered, then it could be shown that the cost of the slot-meter customer for inspection and collection was practically the same as for the ordinary consumer. In conclusion, Mr. Harman said he hoped his paper and the expression of opinion given that day would be of advantage to them in dealing with the subject of the slot-meter system.

ELECTION OF OFFICERS.

The report of the Scrutineers (Messrs. Booth and Pickles) on the election of officers was next presented, as follows:—

President.—Mr. H. Kendrick, of Stretford.

Vice-Presidents.—Mr. Robert Watson, of Doncaster; and Mr. Samuel Glover, of St. Helens.

Hon. Treasurer.—Mr. T. Newbigging, of Manchester.

Hon. Secretary.—Mr. W. Whatmough, of Heywood.

Committee.—Mr. Harold Barker, of Buxton; Mr. John Bond, of Southport; Mr. E. A. Harman, of Huddersfield and Mr. E. H. Hudson, of Normanton.

Auditors.—Mr. W. L. Donaldson, of Lymm; and Mr. Charles Potts, of Hyde.

Mr. KENDRICK, acknowledging the compliment paid him by his election as President, said it was an office he had not sought, and one that he felt he had not earned. What little work he had been able to do for the Association was amply rewarded at the time he gave up the secretaryship. He thanked the members for the honour done him, and trusted he would be able to show twelve months hence how much he had appreciated it.

NEW MEMBERS.

The following new members were elected: Mr. Harold Smith, Bingley, Yorks.; Mr. Sidney T. Smith, Leek, Staffs.; Mr. Lawrence Hislop, Uddingston, N.B.; Mr. Chas. F. Broadhead, Middleton, Lancs.; Mr. Albert C. Shortt, Kirkheaton, Huddersfield; Mr. Walter Frost, Matlock Bath; Mr. William Prince, Southwell, Notts; Mr. Edwin C. Riley, Gas-Works, Great Western Railway Company, Swindon; Mr. F. Arnott, Gaythorn, Manchester; Mr. Geo. W. Fligg, Dewsbury; Mr. Harry Walker, Chapel-en-le-Frith; Mr. Benjamin Goddard, Glossop; Mr. Harold Davies, Brighouse; Mr. John H. Hill, York; Mr. Chas. S. Shapley, Neepsend, Sheffield; and Mr. Walter Shadbolt, Llandudno.

Mr. S. GLOVER (St. Helens) read the following paper:—

VERTICAL RETORTS AT ST. HELENS.

The installation of vertical retorts which you have done us the honour of coming to St. Helens to-day to inspect, has been erected for the purpose of settling in a practical manner the question of whether retorts set vertically could compete successfully with horizontal or inclined retorts, both from the point of cost of working and make of gas per ton of coal. The installation was therefore coupled up to a complete and separate gas-making plant, and has been in use for upwards of twelve months, during which time many experiments and extensive tests have been carried through, which have been sufficient to satisfy the author that extensions of the gas-making plant to meet the future needs of St. Helens will be on the lines of this installation.

Saving of ground space was an important factor in this case, in addition to our desire to secure all the other advantages that the vertical system provides. The manner in which we can make use of the small area of land that will be made available by removing the old plunge baths is shown on the plan ["JOURNAL," June 8, p. 635] from which it will be seen that 64 retorts can be erected on land which would not accommodate a horizontal house with the necessary floor-space. The small area required for these settings of verticals will be a valuable asset in favour of verticals in cases of small available areas. In speaking of the vertical system, the author would have it clearly understood that it is intended to convey the idea of vertical retorts worked on the continuous system, and not those intermittently charged.

The author's attention was first attracted to the possibilities of the use of vertical retorts in the manufacture of coal gas when he was visiting some shale-oil works in Scotland with the late Mr. William Young; and inspirations then received have not been

allowed to wane. Different combinations were thought-out to suit various purposes. The installation inspected to-day is the material expression of some of the ideas conceived by those responsible for its construction and working; and it is offered for your consideration as embodying in the simplest manner the aspirations of gas engineers for a more intelligent method of conducting the important operation of the destructive distillation of gas-making coals, in the various forms in which coals are marketed to-day. The objects aimed at were, briefly: To simplify the process of carbonizing coals, and to increase the output per retort and reduce the mechanical operations; to increase the make of gas per ton; to improve the working conditions of retort operators, and avoid as much as possible dust, smoke, and steam being evolved into the atmosphere; to get more efficiency out of the fuel used in heating the settings, and to prevent loss of heat by avoiding the discharging of red-hot coke from the retorts and without saturating it with water. To secure these desired objects, and to maintain the larger volume of gas of good calorific value and suitable illuminating power, we were satisfied, if need be, to sacrifice something on the tar, the nature of which we knew would be changed. We expected to realize an increase in the production of ammonia per ton of coal carbonized to find a reduction in the quantity of cyanide compounds, and also much less naphthalene. It is gratifying to have found all our expectations realized, and more.

In designing the installation, we have kept in mind the desirability of having control of the heating of the vertical retort in horizontal sections, as well as the rate of travel of the charge downwards through the retort; also the temperature of the coke discharged. These objects have been attained in a complete and simple manner, and the heat efficiency of the setting is very high. Working with this setting has proved to us that, with vertical retorts heated and operated in accordance with the principles here carried out, improved results can be realized over those obtained with horizontal retorts from the poorer classes of gas coals, while much higher results can be obtained from the better classes of gas coals. The nature of the coke from both classes of coals is altered. It is of a closer texture, is more valuable for many purposes for which coke is now used, and realizes a better price in the market.

In the endeavour to simplify the mechanical work of operating vertical retorts, a process of charging by gravitation has been evolved here, which works in an entirely satisfactory manner. This has helped to satisfy the author that the vertical retort is now such an instrument as can be put into the hands of the carbonizing engineer to enable him to get better results per ton of coal. It may be that in the majority of places it would be most economical to work each coal for the making of the largest volume of gas per ton, and, if necessary, to enrich up to the standard required the gas so obtained, as the gas evolved from coal carbonized in vertical retorts is of such a composition as develops, on combustion to the full, the enriching materials put into it. Enrichment with benzol can be secured at the present time at about ½d. per candle per 1000 cubic feet. There is a very low percentage of inert gases in the gas produced from these retorts.

The objects aimed at have been secured along with several other advantages, and with a lower consumption of fuel than with horizontal retorts. The tar is not decreased in quantity, and it is of a different quality, being much more nearly free from carbonaceous matter. The absence of long connecting-pipes between the retort and the gas-main, while it may seem a small matter to some, is one of the helpful features of these retorts. The higher make of gas per retort is a very striking feature of the system. The through-put of coal per retort is very greatly increased—thus securing for the future that a very much larger output of gas can be provided on a given ground space, and in case of new works with considerable saving of expenditure on land and buildings. By means of these retorts, gas will be manufactured in future under improved conditions as to labour, and at a considerably reduced cost.

When it was decided to hold this meeting at the St. Helens Gas-Works to inspect the vertical retorts, it was arranged that, after Dr. Colman had completed his series of tests, a long and continuous test with two kinds of coal used on these works should be commenced, and should continue up to the date of the meeting. This test was commenced on the 28th of September with a combined mixture of washed nuts and fine slack, and continued up to Thursday, Oct. 28; the results being as follows.

Test with Washed Nuts and Fine Slack Coal of this District with Eight Vertical Retorts, 20 Feet Long.

Total coal carbonized containing 5 per cent. of moisture for which no allowance has been made	622 tons 9 cwt. 0 qrs.
Coal carbonized per retort per 24 hours	2 " 10 " 3 "
Total gas produced (N.T.P.)	7,131,738 cubic feet
Gas made per ton	11,457 "
" per diem.	237,724 "
" per retort per diem	29,715 "
" per foot of retort per diem	1,485 "
Illuminating power ("Metropolitan" No. 2 burner)	14'83 candles
Calorific value (gross)	575'0 B.Th.U.
" (net)	512'1 "
Coke (dry) produced per ton of coal	13'97 cwt.
Fuel (dry) per 100 lbs. of coal carbonized	12'39 lbs.
Tar (free from liquor) per ton of coal	12'9 gallons
Ammoniacal liquor (10-oz.) per ton of coal	42'7 "
Equivalent to sulphate of ammonia	35'9 lbs.

The cost for labour [given below], after the coal is delivered into the bunkers, includes feeding the coals into the retorts, discharging the coke from the bottom of the retorts into the coke-barrows, and wheeling and tipping it into the coke-yard, attending to the producer, and looking after the driving-engines, exhauster, and pump. In fact, everything in connection with the plant and works is carried out by one man per shift; and as his time is only partially occupied in attending to the retorts, he could undertake two beds, and wheel the coke to the yard, &c., if the duty of looking after the works were taken off him. If coke-conveyors were used, one man could look after three beds of retorts and upwards; and inasmuch as some of the retorts now being erected will carbonize about 3 tons of coal per retort per day, the labour per ton will be very materially reduced.

During this test of 30 days' duration, with the one setting of eight retorts, one man per shift of eight hours has been employed, and the cost per ton and per 1000 cubic feet is as follows:—

	Capacity.	
	Per Retort.	Per Setting.
Coal carbonized in 24 hours.	2'58 tons	20'7 tons
Gas made in 24 hours	29,715 cub. ft.	237,724 cub. ft.

	Cost.	
	Per Ton.	Per 1000 C. Ft.
Wages with three shifts per 24 hours—		
Three stokers at 5s. 6d. per day each = 16s. 6d.	9'5d.	0'83d.
Or if, as in some works, only two shifts were employed, the cost would be, with two shifts per 24 hours—		
Two stokers at 5s. 6d. per day each = 11s.	6'3d.	0'55d.

The cost for labour for working two settings of eight retorts, each carbonizing 3 tons of coal per retort per 24 hours, would be as follows:—

	Capacity.	
	Per Retort.	Per Setting.
Coal carbonized per 24 hours	3 tons	48 tons
Wages with two shifts per 24 hours—		Cost per Ton.
Two stokers at 5s. 6d. per day each = 11s.		2'750d.
Or with three shifts per 24 hours—		
Three stokers at 5s. 6d. per day each = 16s. 6d.		4'125d.

Where coke-conveyors are used, the cost of labour for working three settings of eight retorts and upwards, carbonizing 3 tons of coal per retort per 24 hours, would be as follows:—

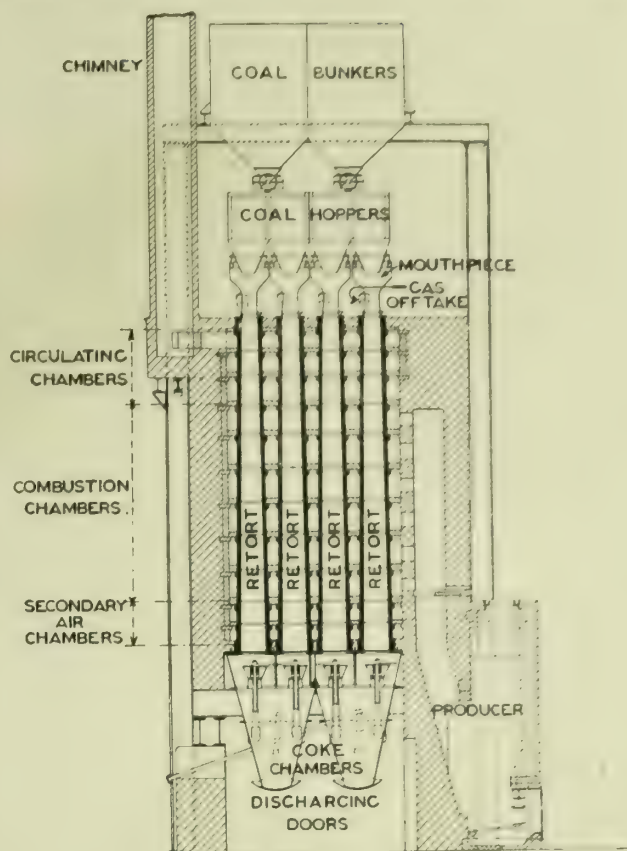
	Per Retort.	Per Three Settings.
	3 tons	72 tons
Coal carbonized in 24 hours		Per Ton.
Wages with two shifts per 24 hours—		
Two stokers at 5s. 6d. per day each = 11s. for every three beds		1'833d.
Or with three shifts per 24 hours—		
Three stokers at 5s. 6d. per day each = 16s. 6d. per day for three beds		2'750d.

It was hoped to make a test with the same mixture in the old retort-house with West's manual machinery; but it was found that this could not be carried out conveniently at this late period of the year. However, for your information, it may be stated that this mixture would produce about 10,250 cubic feet of gas.

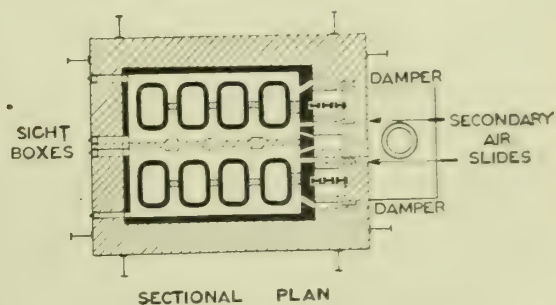
Your attention is particularly called to the large volume of gas produced and the tonnage of coal passed through each retort per day of 24 hours, and you are asked to compare the same with the working results of the intermittent or Dessau system, as taken from the best examples published in the Technical Press. The following extracts are taken from the "JOURNAL OF GAS LIGHTING," on information given by Mr. Hayman and Dr. Bunte. In the paper read by Mr. A. F. P. Hayman before the Institution of Gas Engineers [see "JOURNAL" for June 23, 1908, p. 799, Table II.], it states that "at Mariendorf, 84 retorts carbonize 100 tons per 24 hours, or approximately 24 cwt. per retort per 24 hours." As to the Mariendorf tests, Dr. Bunte, in his report to the Research Committee of the German Gas Association, dated June, 1908, states "that the average weight of coal carbonized per retort per 24 hours is 22 cwt. 98 lbs. with steam and 25 cwt. 61 lbs. without steam." In the Zurich tests, "the average weight of coal carbonized per retort per 24 hours is 22 cwt. 41 lbs. with steam, and 23 cwt. 77 lbs. without steam."

It will be seen from these comparisons that about double the volume of gas is obtained, and double the weight of coal is carbonized, per retort with the Glover-West system of continuous carbonization on approximately the same ground area.

As many of you will be desirous of knowing something about the very important question of wear and tear of the retorts, it may be stated with confidence that, after a recent careful inspection, and from the experience gained during the thirteen months' working of these retorts, we are satisfied that they will compare more than favourably with the other systems, taking into consideration the amount of work done. As to the mechanism for working the gear in connection with these retorts, you no doubt have observed that it is of a strong and substantial character, and that the wear and tear on it is very little indeed, owing to the slow-moving action of the whole of the parts; and it is satis-

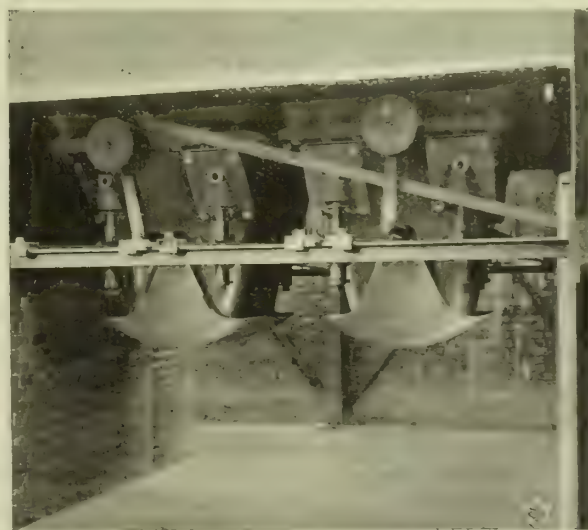


SECTIONAL ELEVATION



SECTIONAL PLAN

Sections of the Glover-West Vertical Retort-Setting.



The Coke Chambers and Discharging Doors.

factory to note that since the plant was started it has not cost anything for repairs.

We may say, from the experience gained in working these retorts, that it is not advisable to admit any steam with the view of making water gas in the same retorts; and we have concluded that, should it be thought desirable to add water gas, it would be more economical to make it in a separate apparatus.

The author desires to express his hearty appreciation of the help he has received in carrying out the introduction of vertical retorts at the St. Helens works, and in conducting the initial experimental work, from having an enterprising and thoroughly businesslike

Committee, a willing and efficient staff of workmen and officials, and a firm of Contractors of the ability and experience of West's Gas Improvement Company.

Discussion.

The PRESIDENT said that, without going into the whole question of vertical retorts, he might remark that the name of West had long been honoured as one holding a foremost position in the gas industry. It was now nearly thirty years since he had the pleasure of first operating the West machinery; and he had some now at Sheffield which he should be sorry to put on the scrap heap. That day they had seen the results of the labour of Mr. West and Mr. Glover. It was not by any means an experimental plant, but sufficient to produce gas for many a small town; and they had been given results second to none. What struck him most was the easy and silent way the work was done in the retort-house; and they must not forget that it would reduce labour. It did away with the hard and laborious work that men had to do in front of the retorts. He thought it would not be long before they saw a great extension of the system.

Mr. J. G. NEWBIGGING (Manchester), as one who would have the honour of putting in the second installation of Glover-West retorts, would be expected to say something in regard to them. For some two or three years, they at Manchester had been contemplating the extension of their carbonizing plant; and in considering this matter, it was necessary to give attention to the different methods. Whatever installation they put in would have something to compete against in their horizontal retorts charged and drawn with West's compressed-air machinery. They carbonized from 8 to 8½ cwt. of coal per 20-foot retort, with six-hour charges, and produced from 9000 to 10,000 cubic feet of gas per mouthpiece per 24 hours; the candle-feet working out at 200,000 and upwards per ton of coal (only) carbonized—11,200 cubic feet \times 18 candles ("Metropolitan" argand burner No. 2) = 201,600 candle-feet. Finally they decided to have the Glover-West vertical retorts; and the work had just been started. They were struck with the simple way in which the coal was carbonized and the excellent results which had been obtained on the unimpeachable authority of Dr. Harold Colman. It was these facts that had induced them at Manchester to give the Glover-West system a trial; and they had decided to put up an installation of very much greater size than the one the members had just seen. They fully believed it would be a success.

Mr. J. C. BELTON (Chester) said the comparisons set out in the handsome souvenir presented to them by Messrs. Glover and West were doubly interesting, as showing the different results obtained from the same coal when carbonized in verticals and in horizontal with West's manual machinery, with which many of them had practical acquaintance. Having used these machines for about 15 years, he could safely say that he believed they were the best that could be used where power machinery was not available, judging by carbonizing results; and the plant that could beat them must be good. Therefore, to set out on a series of comparisons of the working of verticals and horizontal with West's machinery meant subjecting the new departure at its very inception to a test so stringent and severe that the designers might well feel some apprehension as to how their unweaned infant would come out of the ordeal. But those of them who had to do with Mr. John West knew something of the indomitable spirit which characterized his method of handling any difficult problems, and the absolute thoroughness of his mastery of details; and when they heard that Mr. West had joined Mr. Glover in this enterprise, they felt assured that, come failure or come success, they should presently arrive at a reliable conclusion with regard to the much-debated claims of the vertical retort. He had to congratulate Mr. Glover and Mr. West upon the highly satisfactory results they had achieved throughout a long series of experimental and test operations, all of which had been carried out with such great care and minuteness, and the results watched, recorded, and certified by experts of such eminence and authority that they might be unhesitatingly accepted as absolutely reliable. Another result of the trials recorded in the souvenir was that future installations of these verticals would have the advantage of the experience now being gained at St. Helens by the correction of errors and by the adjustment of methods to requirements, which was the fruit of all experimental work. The system of regeneration by the absorption of heat from the coke near the bottom of the retort, could, of course, only be applied to verticals; but it possessed obvious advantages over the prevailing practice. The cleanness and quietness of the process, the great reduction—in fact, the absence—of arduous manual labour and the simplification of machinery for operating the plant, were advantages of solid value, which would appeal to all gas engineers. The improvement of the coke and tar, and the absence of all trouble with stopped pipes and pitched hydraulics, were further attractive features of this system of carbonization, the full value of which could only be appreciated when a large installation was got to work. Mr. Glover had been good enough to give in the souvenir results obtained from two kinds of cheap slack carbonized in the verticals; and these results were very fair. He (Mr. Belton) noticed from the book that the average yield of the several kinds of cheap coals carbonized in the horizontal retorts with West's machinery was about 10,000 cubic feet per ton. This, however, did not give a comparison so accurate as the other tests; and he thought it would be very useful if Mr. Glover would tell them what was the average price paid for these cheap coals.

Mr. GLOVER: It depends upon the market price.

Mr. BELTON (continuing) said perhaps Mr. Glover would tell them what he obtained in the horizontal retorts from the two kinds of cheap slack with which the verticals were supplied for this particular test. In conclusion, he (Mr. Belton) said they had seen that day a new system of carbonization which has proved to have a producing capacity some 60 per cent. greater than any existing system, which could be worked on the same ground space; and in view of this one solid fact alone, they must agree there was a great future before them in the system of carbonization by vertical retorts.

Mr. J. W. HELPS (Croydon) said he was extremely glad earlier in the day to hear Mr. Newbigging refer to the work done by Messrs. Woodall and Duckham in the class of retorts they had seen in operation that morning, and producing such excellent results. For after all they ought to give credit to the men who had done work before on this system. Then he thought they must acknowledge that the main principles of the two systems were the same. Messrs. Woodall and Duckham had followed out their work under great difficulties; and he thought it only fair they should be given credit for what they had done in this field of labour. (Hear, hear.) Messrs. Glover and West had succeeded in working on a small ground space, which was a very important point. Though they had obtained from the Glover-West retorts such excellent results, he would not advise his friends to scrap their horizontal retorts to put in verticals, because there were sure to be great improvements in the near future in horizontal retorts. Messrs. Glover and West had, in his opinion, been very wise in calling in such an eminent authority and honest expert as Dr. Colman.

Mr. THOMAS NEWBIGGING (Manchester) said they had confidence that Messrs. Glover and West had settled the question with regard to retorts.

It was suggested at this stage that, as time was getting on, the discussion on the subject be adjourned to the next meeting; and this was agreed to.

Mr. JOHN WEST (Manchester), in the course of a few remarks, said that by the next meeting they would have something more to show them.

Mr. GLOVER said that, as the full discussion on the subject had been postponed, he would reserve his reply. He might, however, answer Mr. Belton's question by saying the figures were 10,250 and 10,300. As to what Mr. Helps had said, he, while not behind anyone in praise of what Messrs. Woodall and Duckham had achieved, disclaimed having got the least inspiration or the slightest idea or guidance from anything that they had done. Messrs. Woodall and Duckham went their way, and he went his own. He had had some guidance from his very old friend Mr. Young, who had been working on this subject for ten years before he heard of anyone else taking up the question of vertical retorts. With this knowledge, and the assistance of Mr. West, he had been able to produce what they had seen that day—thus removing a rebuke that had rested on the gas industry such a long time.

Mr. WEST said he also wished to give credit to Messrs. Woodall and Duckham for what they had done; but at the same time he desired to say that he had never seen any of their retorts, either in or out of their works.

A vote of thanks to the Mayor and Corporation of St. Helens for the use of the Town Hall concluded the business meeting.

Afterwards the members had tea with Mr. Glover in the reception-room of the same building; this bringing to a close the proceedings of the day.

Mr. E. A. Hedley, of Windsor Crescent, Newcastle-upon-Tyne, the Deputy-Chairman of the Newcastle-upon-Tyne and Gateshead Gas Company, who died on the 12th of September, aged 83, left estate of the gross value of £23,355, with net personality £20,804.

The fourth annual meeting of the American Gas Institute was opened in Detroit (Mich.), on the 20th ult., under the presidency of Mr. Charles F. Pritchard. There were upwards of 300 members present. The first day's proceedings consisted largely of the President's Address and the presentation of reports of Committees; but some papers were read, and the remainder were disposed of next day. These will be noticed in subsequent issues of the "JOURNAL." The new President is Mr. W. H. Bradley, of New York.

To determine concrete proportions for greatest density, Mr. Albert Moyer suggests experiments with a receptacle holding 4 cubic feet, as, for example, a 15-inch sewer-pipe. By using two or three sizes of crushed stone properly proportioned, a denser concrete may be obtained, and cement and sand saved. If there are two sizes of stone, one passing a 1½-inch and the other a ¾-inch ring, the latter should be screened to remove all that will pass a ¼-inch screen, regarding this as sand. Then 2 cubic feet of the smaller and a like quantity of the larger stone are well mixed and put into the pipe, and the top of the mixture marked on the side. A mixture of 2½ cubic feet of the larger stone and 1½ cubic feet of the smaller stone, and a number of other proportions, are then tried, and the one giving the least volume will give the densest and strongest concrete with the least sand and cement.

FLICKER PHOTOMETRY AND THE EYE.

SOME interesting points in connection with flicker photometry are discussed by Mr. J. S. Dow in a recent contribution to the "Illuminating Engineer." In view of the apparent fact that the tungsten lamp gives lower candle power results when tested by the flicker than when tested by the ordinary photometer, the question is raised whether the appreciable differences possible in readings obtained by the latter instrument may not, to some extent, occur in the use of the former. If this be not the case, the varying readings of the ordinary photometer due to the retinal peculiarities must sometimes lead to conclusions differing from those indicated by the flicker instrument. In any such comparison of results, Mr. Dow rightly suggests the need of a deeper knowledge of the physiological basis of the flicker photometer, and more particularly as to the action of the retinal rods and cones. For a short explanation of the rod-and-cone theory, readers may be referred to the "JOURNAL" for Sept. 10, 1907 (p. 686). Mr. Dow's experiments are in accord with those of others in indicating that the flicker photometer is less subject to the Parkinje and yellow-spot effects than are photometers which utilize the principle of equality of brightness; and the supposition follows that the struggle for predominance on the part of the rods and cones of the retina is in some way lessened when the first-named instrument is used.

Mr. Wild, in the "Electrician," had previously suggested that the reading of the flicker photometer might depend only on the action of the rods. Mr. Dow, however, does not agree with this, since the instrument can be effectively used at somewhat high illuminations when the cones are believed to be predominant; and he offers an explanation on different lines. Granted that the cones and rods exercise distinct functions, the sum effect in the flicker apparatus can be imagined to consist of flickers due both to cone and rod actions taking place simultaneously. With either set of organs inoperative, there would be only rod flicker or cone flicker respectively. Thus at very low illuminations with the cones out of action and the central part of the retina practically blind, there would be rod flicker alone, which could only be perceived by bringing the peripheral region of the retina into play by looking at the flicker obliquely.

It is believed that, in addition to their distinct action from the cones as regards perception of light and colour, the rods also differ in the duration of the luminous impression received. It seems possible that an impression received only through the rods remains active for a longer period than one obtained through the cones, and that therefore a flicker speed satisfactory for cone flicker might be high enough to blend the impression received through the rods. A flicker due to cone action would thus be obtained, and superimposed over this a steady luminous impression resulting from impulses received through the rods, which succeed each other too rapidly to give rise to any flicker sensation. Mr. Dow suggests that this would account for the apparent fact that the retinal colour effects due to the struggle between the rods and cones are so much less marked in the case of the flicker photometer, for it might well be that, under the normal conditions of use, the speed was too high for the rods to materially affect its readings. It also seems to accord with the fact that the "critical speed" of the flicker instrument is known to increase with increasing illumination.

Reference is made to the fact that when a coloured object is rotated before the eye, under certain conditions, a "recurrent image" is visible; and evidence suggests that the latter is perceived through the rods, while the main image is connected with the cones. Mr. Dow adds, as further corroboration, that the quality of flicker of a very low illumination is of a peculiar violent character, and quite different from the fine trembling sensation noticeable at high illuminations. He is inclined to think that the violent quality is associated with the action of the rods, and the fine trembling variety with the cones. In support of this, it is pointed out that the former is most readily observable at slow speeds and low illuminations; and, too, by indirect vision—vanishing when one looks straight at the object. The finer flicker is best perceived by using the central portion of the retina.

On the theory thus advanced, Mr. Dow says it might be expected that photometers of both the flicker and equality of brightness types would give results agreeing very well with each other at high illuminations when the cones are the predominant organs; but some differences are to be anticipated at lower illuminations, when the struggle between the rods and cones is in progress. The readings, however, of both instruments must probably be considered to some extent as arbitrary when different coloured sources of light are concerned.

The article concludes with the suggestion that further data are required; and as the basis of the problem is essentially physiological, the help of both physicists and physiologists, working in co-operation, is desirable.

Society of British Gas Industries.—The autumn meeting of the Society will be held at the Waldorf Hotel, Aldwych, on the 23rd inst., under the presidency of Mr. Thomas Newbigging, M.Inst.C.E. The proceedings will include an address by Mr. C. E. Brackenbury, Barrister-at-Law, on "Some Legal Aspects of the Smoke Nuisance." At the close of the meeting the members will dine together.

WATER LEGISLATION FOR 1909.

IN preceding issues of the "JOURNAL," the principal features of the Gas Acts of the present session have been noticed. We now deal with the measures relating to water supply; taking first those applying to Companies.

By the Act of the Aldershot Gas, Water, and District Lighting Company, authority is given for the construction of a well and pumping-station, a pipe-line connecting it with the reservoir station at Cargate Hill, a covered service reservoir there, and a second pumping-station. Subject to the provisions of the Act, the Company may take the water from any springs and streams that may be intercepted by these works. They are not, however, to abstract water from the River Thames, or any tributary thereof, or from any defined surface channel discharging into the river, without the consent in writing of the Conservators. The capital is to be consolidated and converted; and authority is given for the raising of an additional £200,000 of "C" stock, including premiums. The other portions of the Act have already been dealt with. [*Parliamentary Agents: Messrs. Blyth, Dutton, Hartley, and Blyth.*]

The Bungay Water Act incorporates the Bungay Water Company, and authorizes them to supply water in the parishes of Holy Trinity and St. Mary, Bungay, the borough of Eye, and the parish of Mendham, in the county of Suffolk, and the parishes of Ditchingham and Redenhall-with-Harleston, in the county of Norfolk. The capital of the Company is £25,000, in £10 shares; and borrowing powers to the amount of one-third are granted. The Company are authorized to make and maintain a well and pumping-station at Bungay, another at Eye, and a third at Redenhall, together with a reservoir, two water-towers, and several conduits or pipe-lines, and other ancillary works, for the completion of which five years are allowed. The charge for water for domestic purposes is to be based upon the rateable value of the premises supplied, with a minimum of 8s. 8d. per annum, and extras for a second closet and every fixed bath. Where the supply is by measure, 1s. 6d. per 1000 gallons is to be the maximum charge; but the Company are, on demand, to afford the Corporation of Eye a reasonable supply of water for sanitary purposes at a price not exceeding 1s. per 1000 gallons. Authority is given for the sale of water in bulk, and for making bye-laws for the prevention of waste, undue consumption, or contamination of the water. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Clevedon Water Act incorporates and confers powers upon the Clevedon Water Company; the present Company being dissolved. The limits of supply are to be the urban district of Clevedon and the parishes of Tickenham and Kenn, and part of the parish of Walton-in-Gordano, in the rural district of Long Ashton, in the county of Somerset. The capital is to be £55,000, of which £40,000 is to be original, and to be entitled to maximum dividends of 7 per cent. per annum in respect of £29,000 ordinary and $4\frac{1}{2}$ per cent. in respect of £11,000 preference, and the remainder additional capital, which is to be sold by auction or tender. The dividends are not to exceed the above-named rates. Power is granted to borrow to the extent of one-third of the capital raised, as well as to issue debenture stock. Authority is given to maintain and renew the existing works, consisting of two wells, pumping-stations, and reservoirs in the parish and urban district of Clevedon, and two aqueducts, conduits, or pipe-lines connecting them. The charges for water are based on the gross estimated rental of the premises supplied, and are 8s. 8d. per annum where this is under £5, and $8\frac{1}{2}$ per cent. where it is above this figure, with the usual additions for an extra closet and a fixed bath. The charge for water supplied by meter is not to exceed 1s. 6d. per 1000 gallons; but water required for public purposes is not to cost more than 9d. per 1000 gallons. The Company seek power to sell water in bulk, supply fittings, &c. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Donington Water Act incorporates the Donington Water Company, and enables them to supply water in that parish and others in the county of Lincoln. The capital is to be £12,000, in £10 shares; and the usual borrowing powers are granted. It is intended to construct a well and pumping-station at Donington, a water-tower on the road leading therefrom to Horbling, and a line of pipes connecting them—all to be completed within two years. The charge for water for domestic purposes is based on the rateable value of the premises, with the usual minimum of 8s. 8d. per annum, and extras for a second closet and every fixed bath. For supplies by meter, the maximum price is to be 1s. 6d. per 1000 gallons. The Company are authorized to sell water in bulk, supply materials, make bye-laws for preventing waste, &c. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Frimley and Farnborough District Water Act extends the limits of supply of the Company so as to include a number of parishes and places in the rural districts of Basingstoke and Hartley Wintney, but in the case of the latter place only with the consent in writing of the Rural District Council, who are to have the same right of supplying water from works of their own to any part of the parish not served as they would have had if the Act had not passed. Provision is made for the use by the Company of lands at Sturt Lane Junction for the purposes of their undertaking, and for the maintenance and extension of the pumping-station and other works already constructed by them thereon. The expenditure of capital on these works, as well as on those at Blackhill, in the parish and urban district of Windlesham,

in Surrey, is sanctioned and confirmed. Authority is given for carrying out new works, comprising a well (already partially sunk) and pumping-station in the parish of Odiham, a service reservoir in the parish of South Warnborough, and two pipe-lines. The well and one of the pipe-lines are to be completed, and the reservoir made capable of holding 500,000 gallons, within five years after the passing of the Act; the reservoir and the other pipe-line to be completed within ten years. The Company are given authority to raise additional capital to an amount not exceeding £70,000 by auction or tender; and the limits of dividend upon it are 7 or 5 per cent. per annum, according as it is issued as ordinary or preference. Power to borrow one-fourth of the amount is granted, and also to create debenture stock. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Grantham Water Act confers further powers upon the Grantham Water Company. Authority is given to construct additional works, comprising a dam or weir, with a catchpit or intake and other works in connection therewith, across the Cringle Brook, a reservoir upon the River Witham and adjacent lands, a diversion of the river, and an aqueduct or pipe-line; and a period of ten years is allowed for their completion. Confirmation is given for the construction of a sedimentation reservoir in the parish of Little Ponton, on the east side of the River Witham. The Company are empowered to appropriate the waters of the Cringle Brook by means of the dam already referred to. As from the 1st of January next, the shares are to be converted into 5 per cent. stock, at the rate of £20 of stock for each existing share; and sufficient additional capital may be raised by auction or tender to produce, with premiums, £40,000. Authority is given to raise by loan any sum or sums not exceeding, with the £7200 already borrowed, one-third of the nominal amount of the consolidated ordinary stock issued in exchange for the existing shares; and also up to one-third of the additional capital. Other powers conferred by the Act relate to the supply of fittings, the sale of water in bulk, and the erection of cottages for the officers and servants. [*Parliamentary Agents: Messrs. Rees and Freres.*]

The Pontypool Gas and Water Act is principally to empower the Company to construct additional water-works and raise further capital. The works authorized comprise an intake weir, a reservoir, and a catchwater in the parish of Panteg, a number of pipe-lines and drifts, and a well and pumping-station in the parish of Blaenavon. For some portions of these, however, and for others which have been constructed, confirmation was sought in the Bill, and it has been granted. The reservoir referred to is to be so far completed within five years as to be capable of holding not less than 10 million gallons of water; likewise two lines of pipes and the intake weir; and all the works sanctioned are to be finished within fifteen years. The waters of several springs and streams are to be appropriated; and the Company are authorized to enter into, vary, or rescind agreements with Westlake's Brewery Company, Limited, for the purchase of their surplus water at Cwmavon. As from Aug. 1, 1914, section 55 of the Company's Act of 1873 is repealed, and for it is substituted a provision to the effect that the water need not be constantly laid on under pressure, but be supplied at such pressure as will be afforded by gravitation from the respective reservoirs or tanks from which it is being drawn. The other water clauses of the Act relate to the making of bye-laws for preventing pollution and waste, and give power to the Company to hold lands for the protection of their works, sell water in bulk, sell or let meters, and supply fittings. The Company may raise for the purposes of their water undertaking £65,000 (the maximum dividend on which is to be 7 per cent.), with borrowing powers to the extent of one-third. The clauses of the Act relating to gas have already been noticed. [*Parliamentary Agents: Messrs. Rees and Freres.*]

The Pontypridd Water Act empowers the Pontypridd Water Company to construct railways and other works in the counties of Brecon and Glamorgan, and to abandon certain works authorized by their Act of last session. The new works consist of four railways, a service reservoir, two aqueducts, a road widening, and an approach road; and they are to be completed within three years. It is intended to abandon the construction of the Lan Wood reservoir and the connecting lines of pipes, which are rendered unnecessary by the service reservoir now sanctioned, and also the tramroad authorized by the Act already referred to; and compensation is to be made for any damage done in respect of these works. The Company may use their existing capital powers for the purposes of the Act. Certain specified portions of the Act of 1908 are to be amended and repealed. [*Parliamentary Agents: Messrs. W. & W. M. Bell.*]

The South Lincolnshire Water Company are authorized by their Act to extend their limits of supply so as to include the parish of Pinchbeck, in the county of Lincoln, and construct additional works, comprising a well and pumping-station in the above-named parish, and a conduit or pipe-line therefrom to the parish of Weston, to be completed within two years. An agreement entered into on March 22, 1909, between Mr. J. E. Aldersley and the Company, for the purchase by the latter of the undertaking of the Fen Water Company, is confirmed. The Company may apply their funds for the purposes of the Act. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Act of the South Staffordshire Water Company authorizes the construction of additional works, sanctions and confirms existing works, and empowers the Company to increase their capital. The new works consist of a pumping-station in the parish of Burntwood Edial and Woodhouses, in the county of Stafford, and

a pipe-line running from it to a point near the Company's Scout House reservoir at Cannock. The works already constructed, for which the Company have obtained parliamentary sanction, consist of eleven pumping-stations and four reservoirs. Seven years are allowed for the completion of the new works. Authority is given for raising additional capital to an amount not exceeding £60,000, by the issue of either ordinary or preference stock, to be entitled to 7 or 5 per cent. dividend according to the nature of the stock; and the Company may borrow to the amount of one-third, and also create debenture stock—the dividend in both cases being limited to 4 per cent. per annum. In the Bill, the Company asked for £300,000 of new capital, with borrowing powers to the extent of one-fourth. The Act contains a large number of provisions for the protection of various parties, including the Seisdon Rural District Council and the owners and occupiers in part of their district in which are situated the Company's Ashwood and Hinksford pumping-stations. On and after June 30, 1912, the rates for the supply of water for domestic purposes in Burton-on-Trent are to be the same as those charged in other parts of the Company's limits. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

By the Act obtained by the West Gloucestershire Water Company, further powers are conferred upon them in respect of their undertaking. The Act extends their limits of supply to the several parishes and places specified, where the charges are not to exceed those paid for a supply of water under similar conditions by consumers in the original area. Additional capital to the amount of £90,000 is sanctioned, to be issued either as ordinary or preference, and to be entitled to 7 or 5 per cent. dividend. Borrowing powers to the extent of one-third of the new capital, as well as for the creation of debenture stock, are granted. Sanction is given to hold certain lands at Oldland and Bitton, in the rural district of Warmley; and also at Cowhorn Hill, on lease. A section in the Act specifies that the Company and the Bristol Gas Company are to give each other notice before commencing to dig any trench for the laying of mains. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Worksop Water Act authorizes the Worksop Water Company to raise more capital; and it sanctions and confirms certain works already existing. By the Bill, it was proposed to make a well or wells and erect a pumping-station at Checker House, in the parish and urban district of Worksop; but these works were abandoned. The works for which sanction has been obtained are a well or wells adjoining the existing pumping-station at Sunnyside. Additional capital is authorized to the amount of £24,000, to carry 7 per cent. maximum dividend if issued as ordinary, and 5 per cent. if as preference capital. Borrowing powers to an amount not exceeding one-third of the issued capital are granted; and the Company may create debenture stock. The interest on the money raised by these means is to be limited to 5 per cent., unless the Board of Trade sanction the payment of a higher rate. The Company are to supply the Blyth and Cuckney Rural District Council with such daily quantity of water in bulk, at a price not exceeding 7d. per 1000 gallons, as the Council shall require and may agree to take. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

Mansfield's Oil-Gas Apparatus.

The lighting of small villages and towns, country mansions, isolated houses, and places out of reach of ordinary gas-works, is a problem which has frequently presented itself; but of late years it has been to a large extent solved by the introduction of acetylene, electricity, and oil gas. Among others who have assisted in overcoming the difficulty are Messrs. Mansfield and Sons, Limited, of Liverpool, who have produced a simple, compact plant which makes gas from any kind of mineral, animal, or vegetable oil for any commercial, domestic, or industrial purpose where light, power, or heat is required. The apparatus is described and illustrated in a neat booklet which the firm have just issued, wherein will be found particulars as to the places for the lighting of which the gas is specially suitable, and a few figures in regard to its illuminating quality and cost. The apparatus, which is easily erected and can be worked by any unskilled labourer, has been in successful operation for upwards of forty years in all parts of the world. It may therefore be safely commended to the notice of those who have under consideration the lighting of localities such as those mentioned at the outset.

Cost of Water Heating by Electricity.—It is stated that hot water is to be supplied to the lavatories in the Marylebone Town Hall by means of small Therol electrical heaters. The cost of supplying and fixing the apparatus will be £45; and the annual cost for energy, which will be supplied at 1d. per unit, is estimated at about £10.

Southern District Association of Gas Engineers and Managers.—The agenda for the meeting of the Association which will take place on Thursday of this week at the Hotel Cecil includes two motions for alterations of the rules as affecting the Committee, and three papers. The latter are as follows: "Some Notes and Experiences on Gas Lighting," by Mr. H. N. Clark; "Capital—an Aftermath," by Mr. D. T. Livesey; and "High Temperature Carbonization—Its Difficulties and their Cure," by Mr. W. B. Randall. At the conclusion of the business, the members will sit down to "high tea."

COSTS OF A GAS-ENGINE AND OF A COMBINED STEAM PLANT.

By T. M. CHANCE, of Philadelphia, in "Engineering Record."

In the many excellent articles upon the relative financial economy of steam and gas driven stations which have appeared in the Technical Press during the last few years, the issues have been variously discussed, and reliable data furnished, from which somewhat definite conclusions may be drawn as to which of the two is preferable for any particular service. At or near full load, the gas-engine has so far shown a decided economic superiority, and even in the lower ranges of load-factor is an important rival of the engine or turbine-driven steam-plant. But the first cost of a gas-engine (with its producer, scrubbers, and auxiliaries) is high; and where cheap anthracite or coke cannot be had, the operation of the producer on soft coal requires more intelligent attendance and skill than the steam-boiler. If a plant can be installed that will have the small first cost and low fixed charges of the steam plant, and at the same time approach the gas-engine in low operating costs, without, however, the necessity of a troublesome bituminous producer, it will go far toward a satisfactory solution of the power problem. In the past two years, such a solution has been found in the adoption of the low-pressure turbine, utilizing the exhaust of high-economy Corliss steam-engines.

For the purpose of comparing the economy of this type of power plant with that of the gas-engine, the total cost of operating and maintaining, under like conditions, a 1000-kw. plant of each type will be considered. It must be borne in mind, however, that the conclusions so reached apply with even greater force to larger-sized stations, as the first cost per kilowatt of the combined steam plant decreases more rapidly as the power per unit increases than does that of the gas plant. We will assume the locality to be one in which good steam coal can be bought for \$1 to \$4 a ton, condensing water to be plentiful and at a fair mean temperature, and labour to be average in price. Both plants are to run 24 hours a day, 365 days in the year; and are to carry at least 20 per cent. load-factor. Each plant will be assumed to have a reserve unit of one-half the total capacity of the plant. It will be understood that the term "load-factor" will here be used to mean the fraction "(100 per cent. \times total kilowatt per 24 hours) \div rated kilowatt," assuming continuous operation of the plant throughout the 24 hours. Under these conditions, a low load-factor denotes a high fuel consumption.

The gas-driven plant requires three tandem four-cycle double-acting 500-kw. units, with generators, producers, and auxiliaries. In the case of the steam plant, we can assume the exhaust turbine to be capable of delivering 80 per cent. of the rating of the non-condensing engine serving it. Hence, a 550-kw. compound Corliss engine and generator delivering all of its exhaust steam to a low-pressure turbo-generator of 450-kw. capacity meets the requirements of 1000-kw. output. The turbine may be a balanced double-flow reaction machine or, as the exhaust areas are comparatively small for this sized unit, it may be built single-flow and fitted with balancing pistons. The mixed-flow impulse type, being provided with high-pressure nozzles for admitting boiler steam when overloaded, is also well fitted for this class of work. The turbine may serve a separate circuit, in which case a governor and live steam connection with the boiler are required; or it may run in electrical unison with the engine, obviating the necessity for independent governing mechanism. At times of low load the engine can be connected directly to the condenser, and the turbine cut out if both engine and turbine are on the same circuit, or if the circuit that the turbine serves does not require current at such times. A reserve duplicate Corliss unit is an ample safeguard against shut-downs, as in case of injury to the turbine the two engine units can carry the load, or, if either engine is out of commission, of course, the other may be run in conjunction with the turbine.

The producer equipment of the gas plant will consist of three individual units, fitted with suitable scrubbers, superheaters, tar-extractors, and such auxiliaries, and may be either of the up or down draught type. No attempt has been made to consider a by-product recovery plant of the Mond type, as the total amount of coal burned at full load would be less than 21 tons per day—a tonnage entirely too small for economical operation by the Mond system.

The maximum boiler capacity of the steam plant will be that required when the turbine and condenser are shut down and both engines operated non-condensing. Assuming a maximum water rate of 29 lbs. per kw.-hour under these conditions, the plant output of 1000 kw. will require 29,000 lbs. of steam per hour, or 900 boiler-horse-power. As maximum economy is not a necessity when the plant is run by the engines only, three 225-H.P. units, driven one-third above rating, will supply the required amount of steam. Hence, allowing one stand-by unit, the boiler equipment of the steam plant may consist of four 225-H.P. horizontal front-fired water-tube units, with economizers, stokers, internal superheaters, feed pumps, and the usual equipment. The advisability of superheat in a plant of this size may be questioned; but as it serves to deliver dry steam to the turbine, and obviates the necessity of steam separators in the exhaust line of the engines, its use is perfectly rational, and the efficiency of the plant will be improved by its employment. A centrifugal jet condenser with rotative dry-air pump or a barometric tube may be employed to produce the necessary turbine vacuum of 28 inches;

either of these types of condenser being efficient and moderate in price.

The two Corliss compound engines, three-phase generators, exciters, switchboard, steam-boilers, and auxiliaries will cost about \$88,000, or \$80 per kilowatt. The turbo-generator, with its condenser and auxiliaries, will cost about \$22,500, or \$50 per kilowatt, making the total cost of the steam plant machinery \$110,500. The cost of the three four-cycle gas-engines with three-phase generators, exciters, switchboard, air-starting apparatus, and gas generating plant will amount to about \$142,500, or \$95 per kilowatt. The cost of buildings or foundations is not included in either of these estimates.

A day engineer at \$4, and a night engineer at \$3, with two helpers at \$2 and two firemen at \$2, are required for either plant, making the total labour expense for the 24 hours \$15. Oil, waste, and supplies have been charged at \$5 in each plant.

In Table I. interest has been computed at 5 per cent., and depreciation, maintenance, and repairs charged to both plants at the rate of 10 per cent. This 10 per cent. charge includes an 11 per cent. charge for depreciation, maintenance, and repairs of the engines and boiler plant, and a 6 per cent. charge for depreciation, maintenance, and repairs of turbine; the latter charge being relatively smaller because no boiler costs are entailed by its use, except when the live steam connection is employed in cases of emergency or severe overload.

It will be seen from Table I. that there is a constant hourly charge of \$2.725 against the steam plant and of \$3.273 against the gas plant, whether the load-factor be high or low. This constant cost may be designated as the "plant charge," to differentiate it from the various items of fixed charges and from the total power cost. At low loads there would be a slight decrease in the cost of waste, lubricants, and such supplies, and consequently in the "plant charge;" but as this would affect each plant equally, it has not been considered.

TABLE I.—Costs and Interest of Steam and Gas Plants.

	Steam Plant.	Gas Plant.
Two 550-kw. engine units with generators, boilers, and all steam and electric auxiliaries . . .	\$88,000'00 ..	—
One 450-kw. exhaust turbine with generator, condenser, and other auxiliaries . . .	22,500'00 ..	—
Three 500-kw. engine units with generator, producers, and all gas and electric auxiliaries . . .	— ..	\$142,500'00
Total cost of plant . . .	\$110,500'00 ..	\$142,500'00
Interest at 5 per cent. . . .	5,525'00 ..	7,125'00
Depreciation, maintenance, and repairs at 10 per cent. . . .	11,050'00 ..	14,250'00
Attendance of plant at \$15 per 24-hour day for year of 365 days .	5,475'00 ..	5,475'00
Oil, waste, &c., at \$5 per 24-hour day for year of 365 days . . .	1,825'00 ..	1,825'00
Yearly cost, exclusive of fuel	\$23,875'00 ..	\$28,675'00
"Plant charge"—i.e., hourly cost, exclusive of fuel.	\$2.725 ..	\$3.273

To determine the relative cost of fuel per kw.-hour the two curves in fig. 1 have been plotted, showing the coal consumption, including stand-by losses, of the two plants at different loads.

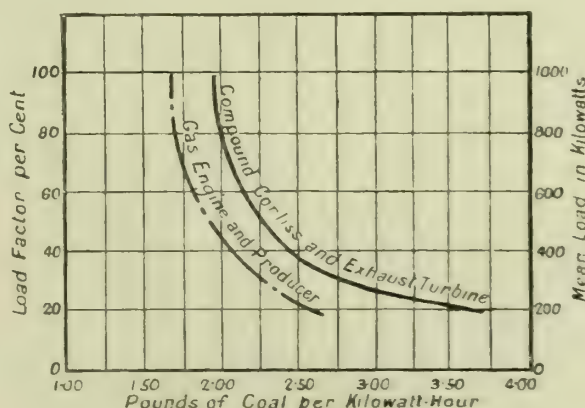


Fig. 1.—Cost of Coal for the Plants.

The curve of coal consumption for the steam plant is based upon an actual evaporation in service of 8 lbs. of water per pound of coal burned, and on an assumption of 165 lbs. initial pressure expanding to 17 lbs. in the engine and to 28-inch vacuum in the turbine, allowing 1-lb. pressure-drop between the engine and the turbine, as recommended by Mr. J. R. Bibbins, in his paper before the Canadian Society of Civil Engineers, Nov. 26, 1908. An engine working through such a pressure range may be expected to give good economy, and the allowance of 1-lb. drop between engine and turbine obviates the injurious effects upon the engine of a variable back-pressure due to the turbine. In plotting the

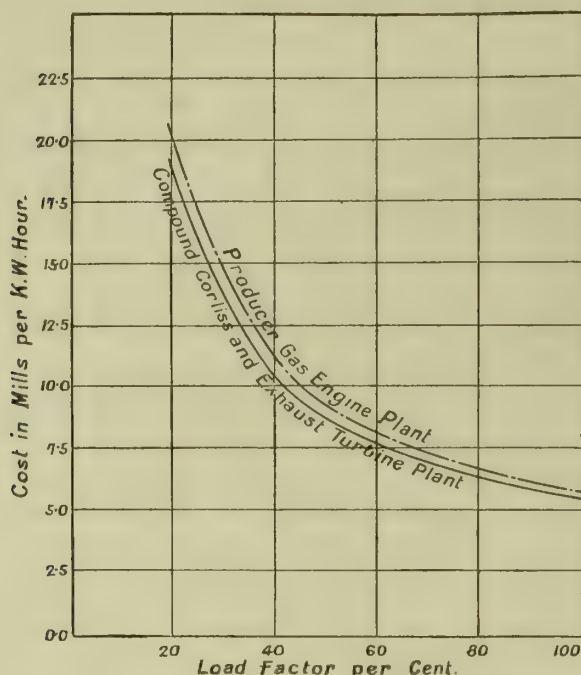


Fig. 2.—Increase in Cost with Different Load Factors.

curve of coal consumption for the gas plant, it has been assumed that the load carried is of a violently varying nature, with severe peaks, such as are met with in electric railway work or in rolling mills. Hence two units must be kept in use for the greater part of the time. Where the low load-factor is caused by a steady light load, with a heavy peak of short duration, the coal consumption shown by this curve can be decreased by running one unit only when the load falls off. In large stations, with a number of individual units, light loads would not cause the great increase in fuel per kw.-hour indicated by these curves, as the load could be divided between a few machines, and these driven at full load; so that the loss in economy would be small—being principally due to the banking of the extra boilers or producers.

The cost per kw.-hour (exclusive of the fuel charge) may be determined for any particular load-factor by dividing the plant charges, \$2.725 and \$3.273, by the load carried in kilowatts. This quotient of plant charge divided by the load, added to the cost of coal per kw.-hour at the load-factor investigated, gives the total expense of generating one kw.-hour; and a curve may be drawn showing the relation of this total cost to the load-factor. In fig. 2 curves have been plotted for the two plants, showing the increase of cost per kw.-hour with loads ranging from 1000 to 200 kw. The pounds of coal per kw.-hour used in determining the fuel cost at various loads are those shown by the curves in fig. 1. Coal is assumed to be worth \$3 per ton of 2000 lbs.; plant charges to be \$2.725 and \$3.273 an hour. A glance at these two curves shows that, with \$3 worth of coal, the steam plant is the more economical at every stage of load above and including

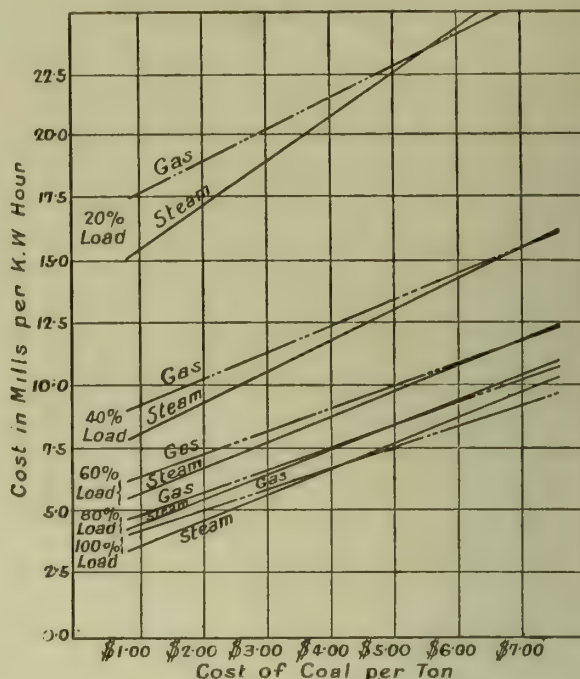
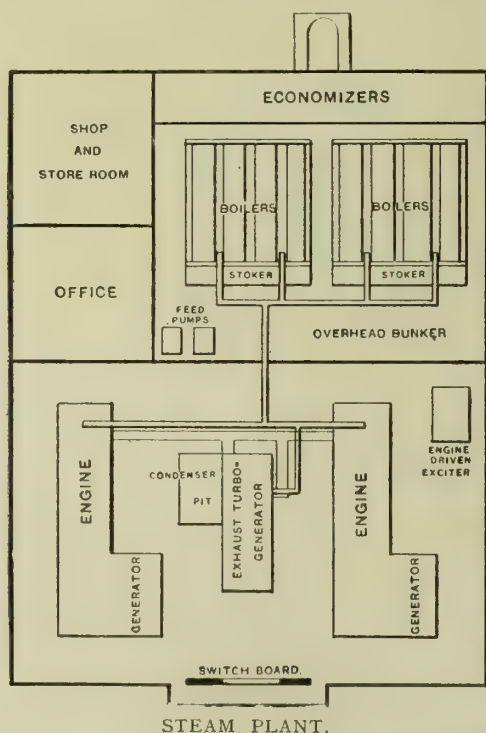


Fig. 3.—Effect of Cost of Coal on Power Cost.

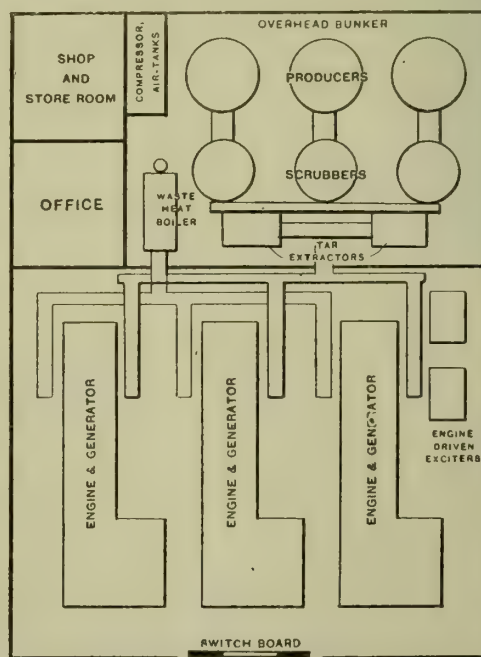
200 kw., the lowest load considered, and that the difference in cost per kw.-hour increases as the load-factor dealt with grows smaller.

The curves of fig. 3 illustrate the effect of the price of coal on the cost per kw.-hour; the load-factor being assumed to be constant for each pair of curves drawn. These curves are all straight lines; and they show that the greatest difference in cost exists at the lowest price of coal—the steam-plant curve approaching that of the gas-plant as this price increases. At the coal cost per ton corresponding to the intersection of these curves, both stations are of equal economy. At any price of coal greater than this "critical" price, the gas plant is the more economical; at any price less, the steam plant.

The cost of the foundations for the turbine and engines of the steam plant will be much less than the cost of those upon which the three gas-engine units are erected, and will offset to some extent the increased cost of the boiler foundations, settings, chimney, and such equipment, over that of the foundations required by the producers, scrubbers, and auxiliaries of the gas-driven station. The total floor-space occupied by the two Corliss engines, at 2.3 square feet per kilowatt, will be about 2800 square feet, and, allowing 2.6 square feet per boiler-horse-power, the station area, exclusive of turbine, will be about 5100 square feet. Assuming that the turbo-generator and electrical equipment do not require more than 900 square feet, the total area of the plant, without office or shop, will be in the neighbourhood of 6000 square feet. The area of the engine-room of the gas plant, at 3 square feet per kilowatt, will be 4500 square feet, and that of the producer,



STEAM PLANT.



GAS PLANT.

Fig. 4.—Proposed Arrangement of Steam and Gas Plants.

at 1.5, 2250 square feet—making the total plant area, exclusive of office or shop, approximately 6750 square feet.

In fig. 4 a layout of each plant is shown, planned without provision for high-tension apparatus. The producer room of the gas-plant contains a compressor and starting tanks, and a small fan for blowing-up the producers when cold. Both auxiliaries are driven by a small oil-engine. Steam is supplied to the jet-blowers of the producers by a waste-heat boiler utilizing the engine exhaust. Duplicate exciters, driven by separate engines, are provided; one being held as a reserve. The engine-room of the steam plant is also equipped with exciters in duplicate; one being direct-connected to the turbine and used to excite both generator fields when the turbine is in use; the other being engine-driven and used when the turbine is closed down. As there is little waste steam available for heating the feed-water (the condenser auxiliaries being electrically driven), the boilers are equipped with economizers.

In Table II., the total costs per year of 8760 hours have been computed for each plant; the price of coal being assumed to be \$3 a ton and fixed charges—insurance and taxes on buildings and land not considered. Although the difference in cost per kw.-hour is greatest at 20 per cent. load factor, it will be seen from this table that the greatest saving per year is at a factor of 40 per cent.

TABLE II.—Total Costs per Year, Exclusive of Fixed Charges, Insurance, and Taxes.

Load-Factor, Per Cent.	Steam Plant.	Gas Plant.	Difference.
100 . . .	\$49,756.80	\$51,009.48	\$1,252.68
80 . . .	44,893.25	46,750.37	2,057.12
60 . . .	40,429.15	43,020.36	2,591.21
40 . . .	36,749.95	39,497.09	2,747.14
20 . . .	33,412.39	35,504.28	2,091.89

If cheap condensing water is not plentiful and cooling towers are employed, an increase of about \$4000 must be charged against the first cost of the steam plant. The difference in the cost of buildings, foundations, and other structural features will not exceed \$6000; and this, with the cost of the cooling towers, will make a debit of \$10,000 against the steam plant, on which about 10 per cent., or \$1000 a year, must be charged. Thus, under unfavourable condensing conditions, the steam plant still shows a saving of \$252.68 at 100 per cent. load-factor—the most advantageous factor at which the gas plant can operate.

It may be argued that the gas-producer will show better relative economy, compared with the steam-boiler, when low-grade fuels are used, than the curves in fig. 1 (which were plotted for good steam coal) would indicate. At the Government fuel-testing station in St. Louis, it was found that the fuel consumption of a comparatively small producer plant increased from 2 to 4.5 lbs. per kw.-hour when the heat value of the fuel decreased from 14,000 to 6500 B.Th.U. It may reasonably be claimed that no coal-fired boiler plant could give such efficiency on fuels that are so low in thermal units; but if the boilers be fired with producer gas, this objection is no longer valid, as they will then deliver practically the same efficiency with fuels varying widely in their thermal value. As Mr. Ernst Schmattolla observed in an article, on "Gas-Producers and Gas-Firing," in the "Mining Journal" of London, Feb. 6 last, a far more complete combustion may be attained with gas-firing than by either hand or automatic stoking, the smoke nuisance may be eliminated, and an excess of air in the furnace may be avoided.

A small thermal loss must inevitably occur when producer gas is passed through scrubbers for purification and cooling, preparatory to its use in an engine cylinder; for it is virtually impossible to utilize all the sensible heat of the gas in superheaters or boilers, and that abstracted by the scrubbing apparatus is thrown away. This loss does not occur in the gas-fired boiler, since the gases are delivered directly to the combustion chamber through a short flue and in a highly heated state. Practically all the heat radiated from the combustion chamber is taken up by the incoming air, which forms an air-jacket about it. The cost of such a producer, having no scrubbers or tar-extractors, would be largely offset by the cost of the automatic stoking apparatus required for firing the ordinary boiler-furnace.

No discussion of this subject would be complete without reference to the comprehensive paper of Mr. H. G. Stott, "Notes on the Cost of Power," read (April, 1909) before the Toronto Section of the American Institute of Electrical Engineers. It is illustrated by more than twenty cost and load curves of representative power plants of various types. From these data it would seem that, apart from hydraulic installations, the most economical type for ordinary load-factors is one in which gas-engines are used to take the low load portion of the curve, assisted by steam-turbines in carrying the peak. It should be remembered, however, that Mr. Stott deals with station capacities of not less than 30,000 kw., and inferences drawn from plants of this size may not be entirely applicable to small installations consisting of a few relatively large units, for the latter must run at low load when the load-factor drops, with correspondingly high fuel consumption. Of course, it is obvious that in a majority of reciprocating engine plants running on bituminous coal, the addition of exhaust turbines may be a better method of improving the station economy than the abandonment of steam and the installation of a producer-gas plant.

OBSERVATIONS ON RETORT-BENCHES.

At the Eighteenth Annual Meeting of the Michigan Gas Association, a paper on "Retort-Benches" was submitted by Mr. A. S. B. LITTLE, of St. Louis (Mo.). The full text of the communication was given in the issue of the "American Gaslight Journal" for Sept. 27; and from it the following abstract has been prepared.

After a few introductory remarks, the author said the past thirty odd years in American retort-house practice might be correctly termed "the age of the half-depth six," as probably 50 per cent. of the horizontal benches in use were on this principle. When he was not so well versed in this class of construction, he wondered why the shallow recuperators were so much favoured, as in Europe the three-quarter and full-depth benches had held the premier position for years, due to the belief that fuel economy could only be gained by having a long and close connection in the separated waste-gas and secondary-air flues. Practical experience, however, with the half-depth bench proved why it had been preferred to all others. Personally, he would sooner have it for moderate-sized works than any European horizontal he had ever seen. It was a good gas maker, and, when handled properly, would not "eat a hole in the coke pile." But how many of his hearers could, he asked, claim that when their backs were turned the stokers handled the bench fairly? Not half the time did the furnace have good, hot coke fed into it, which meant that there was a loss of nearly 4 per cent. in the heating value of the fuel. There were many ways of arranging simple contrivances which made it quite easy to shoot the coke direct from the retort to the furnace. The best arrangement he had ever seen was in use at Roanoke (Va.). Having described this, and offered a few remarks on the firing of retorts, the author said that Mr. K. L. Simons, of Birmingham (Ala.), worked his coke-fired benches as well as anybody he had ever heard of. He used a 370-lb. charge every 4 hrs. 48 min., or five charges per retort per day. This was much better than the usual 300 to 330 lbs. of coal every four hours, as it was becoming daily more evident that a heavy charge was preferable to a light one. At Birmingham, they could burn off the 370 lbs. in four hours; but they very wisely refrained from doing so, and thereby enjoyed immunity from naphthalene troubles. They used 22 per cent. of the coke made; and reckoning 66 per cent. of coke to the coal used, they had 14½ lbs. of coke per 100 lbs. of coal carbonized. This was really excellent work for a half-depth installation using Alabama coal. They would find very few full-depth or three-quarter-depth benches doing better. He usually reckoned 28 lbs. for direct-fired furnaces, 16 lbs. for generator furnaces, 14 lbs. for half and three-quarter depth recuperators, and from 12½ to 14 lbs. for full-depth furnaces.

These remarks led Mr. Little to the much-discussed question of the depth of the bench. He said that Mr. W. A. Baehr tried to get some standard made by which one could tell exactly what was meant by half, three-quarter, and full depth. The half-depth standard was 5 ft. 2 in. from the top of the foundation to the under side of the bottom retort; and every true half-depth bench had the recuperators extending up from a paving course on top of the foundations. A three-quarter-depth furnace ought to be 9 ft. 9 in. instead of 5 ft. 2 in.; and a full-depth one need never be used on settings of six retorts. Writers differed in their views as to the minimum depth of fuel required for the constant generation of carbon monoxide; but this did not play so important a part in benches as the design of flues to get the slowest possible travel on the gases. With a minimum depth of 18 inches of good, hot coke, one could get a sufficient supply of combustible gas for heating six 9 ft. 3 in. retorts, provided they had the outgoing flues and supporting walls so arranged that the gases travelled slowly.

It might be asked why some people pinned their faith to full-depth benches. If they did so for saving fuel, he thought they were wrong. Given a furnace (say) 3 feet wide and 6 ft. 6 in. from the grate to the under side of the roof, which would mean 8 ft. 6 in. from foundation to floor, they would have a gas-producer more than sufficient to meet heat requirements, and large enough to conceal the negligence of the stokers. A number of gas engineers thought the deep bench was a condition rendered necessary by the depth of the recuperators. To a certain extent this was true, but only because of a mistaken notion as to the function of a recuperator. One of the best gas men in Europe—Mr. Charles Carpenter—had shown the phenomenal results he obtained with shallow generators. Other prominent men had proved that the true benefit derived from the deep recuperator was in the conservation of heat in the arch which would otherwise be lost by radiation and conduction. As was well known, it took a long time for fire-clay to pick up the heat from gas passing across its face; but it required scarcely measurable time for air to become heated by contact with such fire-clay. This showed that the aim of the gas manager should be to have a furnace with a good reserve of fuel space, and arrange to bring the waste gas down with a travel backwards and forwards alongside, but not touching, the furnace walls. At the top part, provision must be made for the secondary-air passages; but there was no need for any very long travel. In a 9 ft. 4 in. arch, about 24 feet was ample, provided the cross sectional area was sufficient to ensure slow movement of the secondary air. This was a positive statement,

made by reason of an actual test on some full-depth 20-feet inclines in 1896. They started with the full number of flues, but gradually shut off passages one by one till they had only three left; and the results were just as good as when the air was travelling over 80 feet in ten flues. The waste-gas flues were left the original length—giving a travel of 84 feet.

Passing on to deal with rear-clinkered furnaces, the author said they were excellent in some places; the only difficulty connected with them being to keep alive the fuel which rested on the sloping wall under the firing floor. It was too much to hope that the stokers would regularly dig up and push back this dead lump of fuel. If they built this as a vertical wall, to make all the fuel space operative, it was next to impossible to shovel fuel away back into the space towards the rear wall. The fault lay principally with half-depth furnaces; and on these it was advisable to place the ashpan as far back as possible. To have it only 6 feet long, and recess the dip only about 9 inches in the back wall of the bench, was to court failure from the start. Where coal was used as fuel, it was a simple matter to get over the difficulty; and yet, strange to say, there was only known one works where the scheme was in use, and that was the place of its inception. To Mr. H. O. Channon and his Assistant, Mr. McDonald, of Quincy (Ill.), is due credit for this excellent innovation. It was really a treat to see the furnaces at work. They were charged with any kind of coal in any condition, about 120 lbs. at a time, broken up in the usual way after it began to coke. There was a 14-inch round hole firing-door in the back wall, and level with the bottom of it a floor of wood purlins, resting on cross girders, carrying a waggon loaded with small coal for firing the furnaces. He believed the wood strips were about 2 inches square, set $1\frac{1}{2}$ inches apart, which gave light and air space to the clinkering floor, and kept the space above the platform at a good, low temperature.

The author next referred to a simple generator setting of seven retorts. He explained that under the top middle retort there was a large block extending to the front wall, where the central hole was open to the air. Here entered the oxygen for secondary combustion, and it travelled to the end, where it branched right and left, and then returned in the two side holes. At several points, it spurted into the combustion chamber. The secondary air was heated directly from the furnace gases; and the waste gases, after their passage round the retorts, went direct to the chimney. These benches were built and worked by Mr. John Young, whom he described as "one of the cleverest and most unassuming men in the gas profession." Mr. Little also gave an illustration of the full-depth settings of twelve retorts erected by Mr. Alexander Yuill, at the Dundee Gas-Works, and described by him at the meeting of the North British Association of Gas Managers in 1907.*

Looking into the future, the author remarked that as soon as gas managers found their minimum make going above 200,000 cubic feet per day, and they had a chance of considering new plant, it was time to leave off building settings of six; and he pointed out that a number of engineers decided on putting up nines. This was a good style of bench; but it was not to be compared with the so-called "vertical eight." Unless it was treated with the utmost care and attention, trouble would arise, and very soon the cost of upkeep would show where the fault lay. The "bull's-eye" retort, as the one over the producer arch was called, had not the same chance of withstanding the heats as the others did; and the consequence was that, after two years' work, one often found this retort in a bad state of collapse. The main fault with nines was the small combustion chamber. Eights—the same style with the "bull's-eye" left out—were a little better in this respect, as they gave some distance between the point of ignition and the nearest shield tiles; but even this class of bench caused trouble, through the middle row of retorts getting too hot. It was advisable to adopt the twin rows four high for eights, instead of the triplets three high. It saved floor space, simplified the stand-pipes, reduced the cost of construction, and shortened the hydraulic mains. Twins would rest comfortably and behave well in a bed 8 feet wide, whereas triplets required at least 10 feet; and yet in the last arrangement it was impossible to get as large and convenient a combustion chamber as with the 8 feet. What might be considered the only drawback was the distance from the charging-floor to the top row of retorts—making it next to impossible to charge and draw by hand tools. However, anybody who decided on this style of bench would have machine chargers and drawers, even if they were of the manual description.

Coming to the subject of inclined retorts, Mr. Little said it was surprising to find a good number of gas engineers who almost considered the system dead; whereas others were only now beginning to realize that it had passed the experimental stage. These retorts were not favoured in London, if they excepted Mr. Shoubridge, of the South Suburban Gas Company. Despite the previous failures in certain works, he repeated in their vicinity, at Lower Sydenham, the wonderful results he obtained at Salford years before. At Brentford, similar good results had been, and were still being, obtained; and recently at West Ham good work had been done. Nevertheless, visitors to England would go to the larger companies for opinions, when, for comparison's sake, those of the independent and smaller ones were more accurate guides, as affecting American conditions. One point that must

never be lost sight of was this: Any works having the equivalent of twelve double benches of eights could operate equally well with horizontals or inclines, provided in both cases charging machinery and coal-conveyors were employed. But below this capacity the economy of the horizontal working went back considerably; whereas approximately similar low costs per ton were obtained with inclines down to five benches of sixes. Even below this, inclines showed wonderful economy where horizontals could not possibly economically employ charging machinery; and he was convinced that three benches of inclined fours could be worked much cheaper than the equivalent capacity in horizontals. With inclines, muscular effort almost entirely disappeared; the only hard labour required being for clinkering the fires, which was purely a question of getting the right design of grate and producer to eliminate this source of trouble. The author said he was not going to enter into a long description of inclined retort construction, as it would do no good. Two things only were actually essential—good heats, under perfect control, and even charges. Both could be easily obtained (with correct design) when using any kind of coal varying in the same works; but they must be careful to get these. They must not expect to obtain more or better gas from inclined than from horizontal retorts; but as soon as they were allowed to send out "calorific feet" rather than "candle feet," let them by all means go in for 45° "slopers" and fill their retorts.

Mr. Little next offered some remarks on vertical retorts. He said a great deal was heard about the system employed in Europe, but not much benefit was derived from it. Nothing could ever make it clear to him that the continuous process now being tried would be successful until means were found for getting the coke out automatically without the use of mechanical appliances constructed either of steel or iron; and there would have to be some phenomenal change in the nature of these materials before a mechanical discharger could be expected to work constantly. In the case of coke-conveyors, the moving parts had to be replaced in two years, while the stationary parts were not good for more than four years. This failure of machinery being certain in handling cold coke, all in an accessible position, and capable of repair during the intermittent stops, what was to be expected when the moving and fixed parts were inaccessible, and subject to continual use on solidly packed hot coke, with its attendant water slaking? He thought that nothing but the highest praise could be given to Messrs. Woodall and Duckham for the wonderful demonstrations they had made; but, at the same time, one did not detract from their labours when he boldly faced the limits of successful work in automatically handling coke. What Messrs. Glover and West would finally do at St. Helens was a matter of conjecture. With the intermittent vertical retort, the element of failure to which he had referred was not a factor in the success or non-success of the system. The inventors and users of the Dessau and other German systems had demonstrated what nobody ever doubted. They had made a success of what many tried; but, unlike those trying for continuous work, they had not endeavoured to do what had never before been accomplished.

The concluding portion of the paper was devoted to the subject of the construction of retort-benches. The author's advice was this: "Get your design right with regard to flue sizes, retort number and disposition, and then reduce the elements of construction to the most simple in shape and number suitable for the situation, but at the same time also suitable for the man who has to put them together. Give a good mason (or, as it is preferable to call him, a retort-setter) a quantity of bricks of varying thicknesses, and he will lay them up in almost any desired shape. Cut out the blocks and tiles as much as you possibly can." He assured his hearers that this was no attempt to foist on them any pet theory of his own, but was a very earnest attempt to show them the advantages of the old and tried method of construction. He used the idea himself because he thought it the best; and service had proved it to be so. When they needed new benches, their aim should not be solely to dissect the designs of the brick and clay work. There was room also for great improvement in parts of the ironwork.

Determination of Water in Tar.—This subject was dealt with by Herr H. Beck in an article in the "Chemiker Zeitung." According to an abstract translation in the "Journal of the Society of Chemical Industry," the estimation of water in tar is usually made by distilling about 1 kilo. of the tar in a metal flask of about 2 litres capacity, until the oil distilling over is free from drops of water. The operation takes from three to four hours; and there is always danger of the liquid frothing, and thus boiling over. The time is much shortened, and the operation simplified, if a given quantity of the tar is run slowly into a metal flask containing "heavy oil" heated to from 250° C. to 270° C. The rate of flow of the tar into the flask is regulated so that, although the vaporization of the water is instantaneous, there is no frothing; and when all the tar has been run in, the temperature of the oil is raised to about 300° C. to drive over all water vapour. Any water remaining in the condenser tube is rinsed into the graduated receiver with a little xylol; and after standing for a short time in a warm place, the volume of water is noted. The method was tested upon known mixtures of dehydrated tar and water, and gave very satisfactory results. The operation, with a 50 per cent. mixture, was easily carried through in the course of about 35 minutes.

* See "JOURNAL," Vol. XCIX., p. 386.

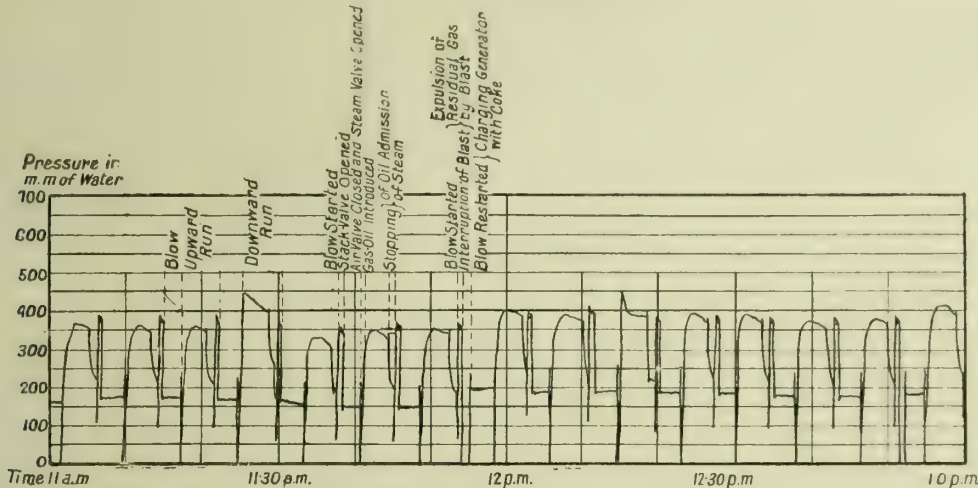
CONTROL OF WATER-GAS PLANT
AND VALUATION OF GAS OIL.

The last number to hand of the "Journal für Gasbeleuchtung" contains an article by Herr L. Kalbfuss, Assistant at the Darmstadt Gas-Works, on gas-making trials in carburetted water-gas plant, and the determination of the gas-making value of carburetting oils. The matter is dealt with partly from the standpoint of the consumer of German mineral oils, which are not used in this country for gas making; and these portions of the paper will be passed over very briefly in the following summary of its contents.

The high price of petroleum oils in Germany makes it more than ordinarily imperative that economy should be practised in their utilization for gas making; and on this account special attention is given to preliminary tests and trials of samples of oil

and of variations in the methods of working the water-gas plant. Communications published on the matter deal largely with the valuation of the oils for gas making from the standpoint of the illuminating power of the gas produced in the plant; whereas at the present day it is in German gas-works now necessary only to take account of the calorific power. The author of this communication treats the valuation of gas oils from the standpoint of the calorific power of the oil and of the gas made from it.

The water-gas plant at the Darmstadt works was erected by the German Water Gas Lighting Company, of Berlin, and brought into operation on June 1, 1908. It comprises two sets, each of a productive capacity of 441,450 cubic feet of carburetted water gas per diem. Allowing for three pauses for clinkering, of from half to three-quarters of an hour duration, each set should have a normal productive capacity of 19,600 to 20,300 cubic feet of gas per hour. By careful observation of the make of gas, and with corrections for variations of temperature and pressure, the working of the plant is controlled so as to maintain a uniform and good yield of gas of uniform calorific power as registered on a Junkers recording calorimeter.



Typical Pressure Record for Controlling the Working—Taken by the "Heinrich-Pforzheim" Pressure Recorder.

TABLE Showing the Mean Results Obtained with Five Varieties of Oil.

Gas Oil.	Specific Gravity of Oil at 59° Fahr.	Make of Gas per Hour per Set. Cubic Feet.	Mean Gross Calorific Power of Gas B.Th.U.	Mean Consumption of Coke.		Mean Consumption of Oil.		Cost of Oil at Works per Ton.	Cost of Coke (at £1 0s. 3d. per Ton) and Oil for Volume of Gas representing 1,000,000 B.Th.U.
				Lbs. per 1000 Cubic Feet of Gas.	Lbs. per Million B.Th.U. in the Gas.	Lbs. per 1000 Cubic Feet of Gas.	Lbs. per Million B.Th.U. in the Gas.		
No. I. German	0·866	21,190	550	30·6	55·6	28 0	51·2	£ s. d.	s. d.
No. II. Austrian	0·858	20,483	554	31·1	56·2	26·4	47·8	4 16 1	2 8½
No. III. Austrian	0·862	21,825	548	34·2	73·4	26·6	48·4	4 10 6	2 5
No. IV. Austrian	0·877	21,507	520	33·3	63·9	27·4	52·8	4 10 6	2 7½
No. V. Austrian	0·866	21,260	527	33·3	63·4	27·8	52·8	4 10 11	2 8½
								4 12 6	2 9

The trials made extended over a long period; and it was impossible to weigh exactly the whole of the coke used. The generators were, however, charged from conical iron hoppers, which were filled with large coke; and the average weight contained in a hopper was pretty uniformly 595 lbs. The oil was measured by Kennedy's piston measurer, and the weight of a litre of the warmed oil was ascertained by direct weighing. The gas made was measured by a station meter placed after the equalizing gasholder, the contents of which were taken into account with each reading of the meter. Towards the end of the trials, a Strache "Autolysator" was installed for obtaining a continuous determination and record of the percentage of carbonic acid in the gas. It was connected to the main between the equalizing gasholder and the meter. The curves obtained with it show regularly recurring fluctuations, which indicate that during the runs a stream of gas passes directly from the inlet to the outlet pipe of the equalizing gasholder. This holder therefore serves only to take up the excess of gas made during the runs, and to send out this excess during the blows; but it does not give a proper mixing of the gas which is poor in carbonic acid from the beginning of the run with the gas which is rich in carbonic acid from towards the end of the run. Consequently, it is undesirable to pass the carburetted water gas directly into the coal-gas holder which is being used at the time for distributing gas into the town, as the result would be that there would be great want of uniformity in the distributed gas. There are also some small variations in the curves, which apparently must be due to the construction of the calorimeter, because they occurred also when the instrument was used on the gas in the town.

The plant was ordinarily in action only for seven to eight hours every day; and only the last five or six hours of each day's working were taken for estimating the value of the oil in use. Four

varieties of gas oil of Austrian origin and one of German origin were tested. The Austrian oils were selected merely on the ground of their cheapness; and the results showed that the dearer kinds were not generally better in quality. The blows were of 2½ minutes' and the runs of 5½ minutes' duration; and 35 litres (7·7 gallons) of oil were used in each run. The variations of pressure in the generator were registered by means of a pressure recorder, which proved useful in controlling the working of the apparatus. These records are of some interest as showing the variations in pressure which occur in the course of the series of operations in the working of the plant. A typical record of the pressure indicator is reproduced. The table shows the mean results obtained with the five varieties of oil.

It appears from the results shown in the table that, taking coke at the same value throughout, the No. II. oil was the cheapest on the basis of the calories obtained in the gas. If this oil is given the value of 100, the relative or percentage values of the other oils should be: No. I., 93·7; No. III., 90·8; No. IV., 87·2; and No. V., 87·4. The calorific value of oils Nos. II. and III. was determined with a view to ascertaining the thermal efficiency of the plant. The net calorific value of No. II. oil was 19,926 B.Th.U. per lb., and of No. III. oil 18,509 B.Th.U. per lb.; and taking the calorific value of the coke at 12,960 B.Th.U. per lb., the unit of heat contained in the oil and coke per cubic foot of carburetted water gas made were for No. II. oil 928 B.Th.U., and for No. III. oil 935 B.Th.U. The net calorific value of a cubic foot of the gas was, however, from No. II. oil 515 B.Th.U., and from No. III. oil 510 B.Th.U. These figures represent 55·5 and 54·6 per cent. respectively of the calorific value of the coke and oil used per cubic foot of gas made. Hence there is used up in the apparatus for the conversion of the fuel into gas, and in the formation of tar and oil-coke, and in various losses, 44·5 and

45·4 per cent. of the calorific value of the coke and oil employed in the plant. It is possible at any time to check the coke and oil consumption per 1000 cubic feet of gas made; and, by comparison with the earlier results obtained from similar oil, or from a sample of oil of standard quality, to check the quality of the oil in use at the time. The recording appliances for controlling the working of the plant render it easy to reproduce the same working conditions as obtained in the trial runs.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

About forty members of the Eastern District Section of the Scottish Junior Gas Association paid a visit on Saturday afternoon to the works of the Pumpherston Oil Company, Limited, near Uphall. They were met at the gate of the works by Mr. J. Boyd (Under Manager), Mr. E. Bailey (Chief Chemist), and Mr. R. Montgomery (Engineer); and these gentlemen became the guides of the party.

It was explained to the members that the shale was brought from the pits, at a considerable distance, in pit hutches, drawn by wire rope. Tipped into the breakers, it fell into hutches with trap bottoms—on one side of the breaker to be sent up the sloping railway to the top of the retort-bench, and on the other side to be stored in large hoppers for use on Saturday afternoons and Sundays, when the mines are closed. The company walked to the top of the retort-bench, and had explained to them the method of charging the huge vertical retorts, which are built according to the patent of Mr. J. Bryson, the Manager. There are three stacks in the bench, containing, in all, 60 retorts. Descending to the ground, the method of taking away the spent shale was explained—an operation which must be done twice during a shift. The arrangements for drawing off the vapour distillate, which is effected by exhausters placed after the condensers (these, by the way, being huge batteries of 4-inch pipes, vertical), were examined. The incondensable gas is returned to the retort-bench, where it is used as fuel. The condensed liquid is run into tanks, in which the ammoniacal liquor and oil separate. The liquor passes to the sulphate plant, which is an ordinary oil-works continuous process, improved by Mr. Bryson. The yield per ton of shale is 48 lbs. or 50 lbs. of sulphate, very white in appearance and finely crystallized. The crude oil is sent into the refinery, where it is heated in stills placed over tar furnaces, and the resulting vapour condensed; driving off in the first process naphtha, in the second green oil, and so on in several successive runs, to produce the different qualities—the oil after each run being sent to another department to be treated, first with acid and afterwards with soda. The process is known as Henderson's continuous, which is based upon the fact that the oil does not give off all its products in one run through the stills. Thus, for instance, the first run does not take out all the naphtha, but only the lighter sorts, which are made into benzol and motor spirit. When the green oil is sent through the still, the first product yielded is again naphtha. The visitors were informed that the oil may come back to the stills a dozen or more times before it yields up all its products. Much interest was taken in the process of extracting the scale, or wax, from the oil, and the repeated sweating of the wax to extract the tar and oil from it, till a very hard and pure white substance is obtained; also in the care taken to eliminate all trace of oil and tar from the water effluent—chiefly from the ammonia plant.

The production of the oil and other substances is a long and continuous process, which is very simple in appearance, now that it has been discovered, but which was evolved only by dint of much thinking combined with long experience. The continuous and repeated treatments were a revelation to the visitors, who were not slow to admit that, compared with oil making, the making of coal gas is but child's play. The size of the works will be understood when it is mentioned that the make of oil per annum is 20 million gallons. In the laboratory there was shown a preparation clear as water, which has been named "Solvine," of which 2000 gallons have been sold to the South Metropolitan Gas Company—used to prevent deposition of naphthalene.

At the close of the walk round the works, the visitors were entertained at tea in the concert and lecture hall of an institute which has been erected by the Company for the benefit of the workmen.

The President (Mr. H. Rule, of Falkirk) said the members had seen the most up-to-date works of the Pumpherston Oil Company, and the whole process of the manufacture of oil from the raw product, shale. He was afraid they in the gas industry were accustomed to imagine that in the handling and carbonizing of coal they were ahead of all others; but he left it to the members to say now whether, in cost or in plant, they could beat anything they had just seen. It was, at any rate, significant that the whole trend of gas-making operations at the present day was towards the manufacture of coal gas in vertical retorts, such as the members had seen at work. To all of them, especially those who had visited oil-works for the first time, it had been a very great treat indeed. On more than one occasion, he had said that the success of the Association depended to a great extent upon the kindness of such undertakings as the Pumpherston Oil Company in throwing open their works for inspection. He repeated this statement;

and he was sure that the members who were present would agree with him that they had begun their visits this session in a most auspicious manner. They were much indebted to the Directors of the Company for their kindness and hospitality; and he begged to propose a hearty vote of thanks to them, and also to Mr. Boyd, Mr. Bailey, and Mr. Montgomery, who had had a hard afternoon's work answering all the questions put to them.

Mr. Boyd returned thanks for the very flattering things which had been said of them. They were more than pleased to have such a scientific body at the works, and to answer all their questions. He wished they had more of such societies coming to see them. They had visits from art and industrial societies, the questions put by whom, after an hour or two of explanation, fairly floored them; but they had had nothing of the sort that day. He hoped the Association would visit them again, and when they did so there would be something new for them to see.

The party were then shown over the institute, which contains a library in which there are 2000 volumes, a reading-room, recreation-rooms (including a billiard-room), and baths. The institute is so popular that, from the revenues—partly voluntary contributions by the workmen, and partly the drawings at the billiard-tables—the Committee in charge are able to spend upwards of £100 a year in providing lectures and concerts, and to keep the library and reading-room supplied with popular literature.

The visitors were driven from the railway station to the works, and back again, in brakes provided by the Company.

REGISTER OF PATENTS.

Charging Gas-Retorts.

ROBERT DEMPSTER AND SONS, LIMITED, and TOOGOOD, H. J., of Elland.

No. 20,851; Oct. 3, 1908.

This invention relates to apparatus especially suitable for use in connection with that described in patent No. 19,437 of 1908.

According to our present invention (which was fully described and illustrated in the "JOURNAL" for Oct. 19, p. 179), the patentees propose to deliver the coal to the retorts from a travelling hopper, truck, or similar appliance, through a movable shoot, which enters for a certain distance into the mouthpiece and the retort in charging. Upon the retort being filled up to the point at which the coal reaches and seals the lower aperture of the shoot, the flow of coal down the shoot is stopped until the shoot is raised. Such raising of the shoot then cuts off the supply of coal to the upper aperture of the shoot; and the shoot, on being raised, empties itself into the retort—completing the charge.

Where the coal is fed at one side of the retort, as described in the earlier patent, the lower aperture of the shoot during the charging operation may be inclined at an angle to the axis of the retort; and the shoot, in rising, delivers over the part of the retort not previously filled the small quantity of coal remaining in the shoot—the capacity of the shoot being such as to regulate this according to requirements.

By this means, it is pointed out, an intermittently charged retort is made to act as its own measure—that is to say, it cannot be overcharged or undercharged; the charge being automatically adjusted to the capacity of the retort. The importance of this will be obvious, as it is well known that a retort, when fouled with a deposit of carbon, will hold less coal by (say) 2 cwt. or 3 cwt. than when in a clean condition, after being scurfed. Also, if the travelling hopper be charged from overhead bunkers, and the door of the bunker remain open during the charging of one retort, the hopper will be full of coal after the charging has been completed. This coal may then be used to charge the next succeeding retort; and, consequently, it is only necessary to open one of the doors in the storage bunker for every two retorts charged.

Purifying Gases.

BURKHEISER, K., of Aix-la-Chapelle.

No. 20,920; Oct. 3, 1908. Date claimed under International Convention, Oct. 14, 1907.

This is a process for obtaining bye-products from tar-free gas mixtures containing sulphuretted hydrogen and ammonia with simultaneous purification of the gas, by causing the gas mixture to pass over a heated oxygen-yielding mass and continuously or intermittently regenerating the mass so that the sulphurous anhydride produced reacts with the ammonia present to produce ammonium sulphite or sulphate, or both.

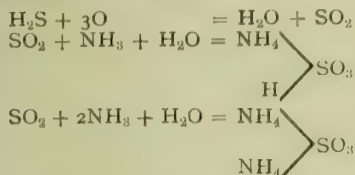
The patentee points out that the processes heretofore used in the production of coal gas and coke and other distilling operations, for the purpose of cleansing the crude gases and securing valuable bye-products therefrom, are mainly directed to the production of sulphate of ammonium. The necessity for using large quantities of sulphuric acid and extensive apparatus for this purpose involves very considerable cost and working expenses. His invention therefore has for its objects "to simplify and cheapen the obtaining of the bye-products, with simultaneous purification of the gas."

It is well known, he says, that heated oxides—more particularly oxides of iron—are adapted to cleanse coal gas by contact therewith, and purifying processes have been proposed in which the iron, reduced from the oxide, is to combine with the sulphur contained in the gas, thus freeing the gas from one of the principal impurities present. It has also been proposed to pass coal gas, previously freed from tar, through hydrated peroxide of iron heated to a temperature of 240° Fahr. to 420° Fahr., for the purpose of decomposing the sulphur compounds in the gas and producing sulphuretted hydrogen, which can be removed by ordinary means of purification. Coal gas has also, for purifying

purposes, been conducted over oxides and hydrates other than those of iron, heated to a temperature below dull redness.

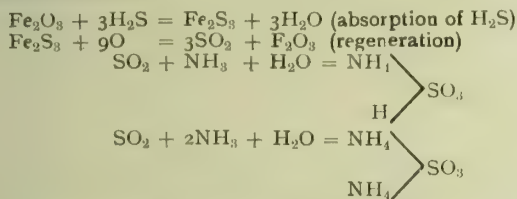
He has, however, found that, by passing the gas which contains ammonia over an oxygen-yielding mass—for example, bog iron ore—and arranging for a continuous or an intermittent regeneration of the mass by means of a supply of free oxygen, the oxygen liberated from the mass, together with the added oxygen, reacts with the sulphur contained in the gas as sulphuretted hydrogen, to produce sulphurous anhydride, which then reacts with the ammonia in the gas to separate the latter in the form of sulphite or sometimes of sulphate.

The reactions are represented as follows:—



In order that the reactions may be as represented, the oxygen-yielding mass must be continuously regenerated—that is to say, air or pure oxygen must be mixed with the coal gas. The bog-iron ore, reduced to a highly porous state by combustion of the organic matter therein, only furnishes the oxygen required to convert the sulphuretted hydrogen into water and sulphur; the nascent sulphur being oxidized by oxygen introduced with the gas. Some of the oxygen introduced regenerates the ore by re-converting the ferrous oxide into ferric oxide.

If, however, the regeneration is not continuous but is intermittent—that is to say, is performed by passing air or pure oxygen over the oxygen-yielding mass alternately with the gas—the reactions may be represented as follows:—



With this intermittent regeneration, the sulphur is bound during the passage of the gas over the oxygen-yielding mass. The subsequent regeneration of the mass causes sulphurous anhydride to be evolved; and this anhydride reacts with the ammonia originally contained in the gas. The ultimate result is thus the same as when the oxygen-yielding mass is continuously regenerated as described.

The resultant product also contains, however, some sulphate of ammonia. This may be due to the oxidation of sulphite, or to the conversion of sulphurous anhydride into sulphuric anhydride.

The gas is freed from tar in the usual manner before its passage over the heated oxygen-yielding substance. Dense, heavy vapours are produced, which solidify into a crystalline mass. The latter can be directly used as manure, or may be employed as material for the manufacture of other ammonium compounds. Under normal conditions, the heat liberated by the reaction is sufficient to secure continuity of the process. For continuous regeneration of the oxygen-yielding substance, air or pure oxygen is preferably added to the crude gas, as has been heretofore proposed with reference to the regeneration of the spent hydrated ferric oxide in the process of separating sulphuretted hydrogen from gases of distillation. If the process of regeneration is intermittent, the oxygen-yielding mass is raised to a temperature of about 120° C., and preferably not to a temperature much exceeding this; since otherwise sulphur is liable to be carried away by the stream of gas. It is probable, he remarks, that, with intermittent regeneration, higher temperatures cause Fe₂S₃ to become 2FeS + S. If the process of regeneration is continuous, higher temperatures may be used, since the sulphur liberated is directly oxidized; but in any case the temperature should not exceed approximately 400° C. The proportion of sulphate produced increases with increasing temperature, provided there is sufficient oxygen present. The amount of oxygen introduced must, of course, be proportionate to the amount of sulphur in the gas, since it is used for its oxidation.

The apparatus required for the process is very simple, and the process is said to be extremely cheap and economical, both as a purifying process and as a method of obtaining by-products. In this connection, attention may be called to an article descriptive of the process appearing on p. 311 of to-day's issue of the "JOURNAL."

Controlling Gas-Lights from a Distance.

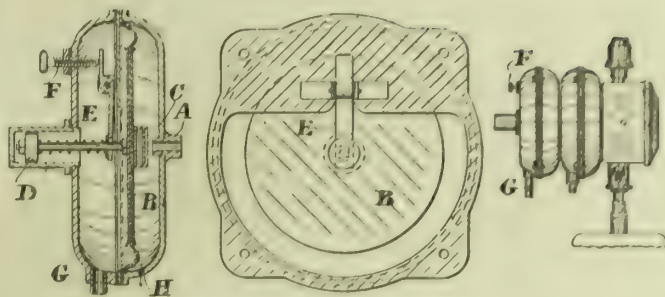
TOURTEL, J. M., of Chiswell Street, E.C., and MEALING, W. R., of Twickenham, S.W.

No. 21,185; Oct. 7, 1908.

This apparatus, for lighting and extinguishing gas-lamps by varying the pressure in the mains, relates to the class of such plant in which a diaphragm or liquid-sealed bell (provided with means for turning on and off the supply of gas to the burner) is connected to the gas supply, and is subjected to substantially the full pressure of the gas when a predetermined maximum pressure is reached, and is subsequently opened to the atmosphere for the purpose of discharging the gas it contains at a predetermined minimum pressure.

The illustration shows the escape-controlling diaphragm, and a side view with part of the diaphragm case removed; also the escape-controlling diaphragm fitted to a tap-operating diaphragm which may be substantially as that described in patent No. 7197 of 1907.

The escape-controlling diaphragm case is fitted by the connector A to the diaphragm case which contains the diaphragm operating the tap mechanism. The diaphragm B consists of a flexible web arranged between two metal plates, and has upon it a valve C, preferably formed



Tourtel and Mealing's Lamp Controller.

of felt with a leather face so arranged as to fit over the passage through the connector. A spindle fixed to the diaphragm carries a spiral spring, which presses against the nut or block D at one end, and against the slotted or forked end of a pivoted lever E, under the control of an adjusting screw F. The tendency of the spring is to draw the diaphragm with the valve away from the outlet; but as gas is admitted through the tube G to one side of the diaphragm, the pressure of the gas above a certain predetermined minimum, acting upon the surface of the diaphragm, overcomes the pressure of the spring and closes the valve C on to the connector H.

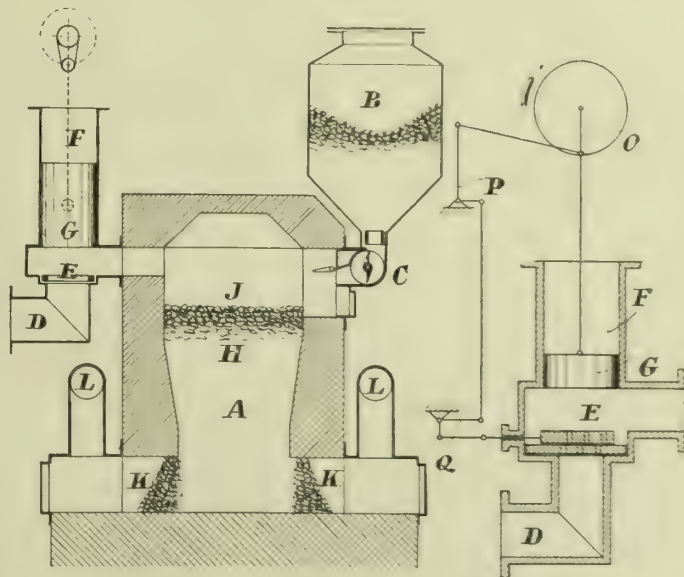
The gas pressure, having been admitted to the diaphragm, causes it to operate the gas-tap; and the same pressure will have closed the diaphragm tightly over the outlet, which will remain closed until the pressure falls to the minimum, which must be sufficiently low to enable the spring to overcome the pressure of the gas and to withdraw the diaphragm and the valve so as to allow the gas to escape through the outlet H to the air, and so permit the return of the diaphragm to its normal position.

Gas-Generators.

SCHIMMING, G., of Berlin.

No. 21,660; Oct. 13, 1908. Date claimed under International Convention, Oct. 14, 1907.

The patentee says: In order to obtain gas as far as possible free from tar from coal rich in gas, use is made of the ordinary method of conducting the gas in the direction of the freshly introduced coal downwards through the incandescent layer to the support of the fuel. Owing to this manner, the products of distillation of the layer of incandescent materials which are still evolving gas decompose in passing the layer of incandescent materials which have already been exhausted of products of distillation. In this process, two drawbacks arise, the removal of which forms the object of the process carried out in the generator to be described. After the introduction of fresh fuel, considerable quantities of tarry vapour are evolved, in consequence of the heat of the generator and the hot layer on which the fresh coal is distributed, the decomposition of which vapour causes difficulties in consequence of its evolution in large quantities; so that soot and tarry vapour escape. With caking coal, there is formed, after the feed, a large quantity of a thick kind of tarry coating, which also leads to irregularities in the working of the generator.



Schimming's Gas-Generator.

In order to diminish these two drawbacks, the generator is provided with one of the arrangements by means of which the fuel is mechanically fed, continuously, in small quantities. With very rich gas coal, the gas-producing process proceeds too slowly in the case of gas removal and generation in a downward direction, as heat is only slowly conveyed by conductivity by the radiation of the walls and by immediate contact with the incandescent material. In order to accelerate the transmission of heat to the freshly-fed coal, recourse is had to the following means: The air supply is periodically interrupted—for instance, 120 times per minute—and the gases formed from the combustion air introduced during the cessation of the air supply, partly expand

upwards from the incandescent zone and penetrate into the layer of freshly-charged fuel.

With certain coal, gas free from tar and the like is only with considerable difficulty obtained; and this means for accelerating the transmission of heat between the incandescent coal layer which has already been distilled and the coal layer which has yet to be distilled does not alone suffice. For such coal, recourse is also had to the following means: The volume of the space above the fuel is periodically diminished and enlarged—by means, for instance, of a piston working in a cylinder open to the space above the layer—so that when the piston is at the top of the cylinder the total volume of the space above the fuel is much greater than when the piston is at the bottom of the cylinder. By this means, the hot gases which are extracted from a lower layer are periodically passed back into a higher layer. In this way, the heat produced by the combustion of the coal is periodically transmitted to the coal which is about to be consumed. There takes place, however, also, a partial mixture of the hot combustible gas derived from the gas production, which is drawn back again with the tarry vapour and the air for combustion; and "thereby a partial combustion is produced, so that there arises periodically for this reason a great development of heat in the upper layer from which the gas has not been removed."

The process described is carried out in the generator shown. The coal is fed from a container B, by a distributor C, uniformly and continuously on to the surface of the layer of fuel in A. The supply of air enters through a pipe D, provided with a valve E, to periodically interrupt the flow of the air. The valve and piston work in conjunction with each other, and are suitably connected up for the purpose as in the example shown, in which the piston G is operated by the crank O, which also operates the valve E through the intermediary of cranks P and Q. By this arrangement, the valve is closed during the up-stroke of the piston and open during the down-stroke—opening at the beginning of, and closing at the end of, this latter stroke. As the piston rises in the cylinder F, it draws the gaseous products out of the layer H into the layer J; and on the piston descending and the valve E opening, the heated products pass back to H and combustion air flows through J to H.

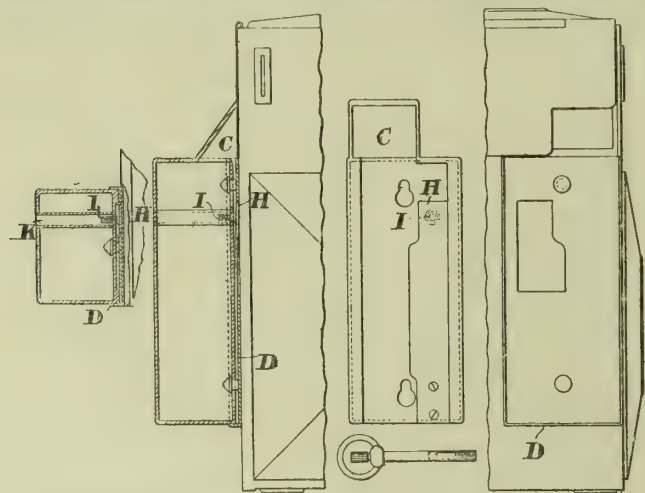
Instead of producing the periodical passage of the gaseous products through the layer from which the gas is to be removed, by means of an alteration of the volume of the space on the air-supply side of the generator (by means, for instance, of the piston G and cylinder F, as shown), it may be produced also by periodically drawing off and forcing back the gas produced at the gas removal end of the generator—using, for instance, a pump similar to F and G, and a gas-outlet valve similar to E; the pump and valve being arranged in the gas-collecting pipe L, and operated as described—the piston forcing the gas back through the combustion chamber to the newly-charged fuel when the outlet valve is closed.

Prepayment Gas-Meters.

METROPOLITAN GAS-METERS, LIMITED, and FORSTER, J. D.,
of Nottingham.

No. 1914; Jan. 26, 1909.

This invention relates to the combination with the meter-casing of a coin-receptacle which is locked thereto by means of stud-and-slot connections, and by means of a spring is secured upon the receptacle, engaging a recess or the like on the adjacent face of the meter-casing.



Metropolitan Gas-Meters Coin-Receptacle Attachment.

As shown, the upper end of the coin-receptacle is provided with an inclined extension C forming an opening so designed that, when the receptacle is against the meter-casing, it will coincide with the opening through which the coin is discharged. The meter-casing, at the part to which the coin-receptacle is to be applied, is fitted with a guide-plate D carrying studs designed to engage with slots formed in the inner side of the coin-receptacle A. The spring tongue H is attached to the inner side of the coin-receptacle; and a screw-pin I, secured to the upper or free end of the tongue, extends through the hole in the coin-receptacle, which is also provided with the corresponding hole K in its outer side—being connected by a tube which extends transversely across the inside of the receptacle and serves for the introduction of the key. This comprises a stem provided with a handle and made hollow (as shown) at its outer end; the hollow portion being internally screw-threaded so as to engage with the screw-pin I.

To apply the coin-receptacle, it is placed against the guide-plate D, and pressed downwards, so that the narrow portions of the slots engage beneath the heads of the studs, and the spring tongue H snaps into the recess in the guide-plate, which, in conjunction with the studs and

slots, securely locks the receptacle in position. To unlock the coin-receptacle from the meter, the key is inserted and turned so as to cause the internal screw-thread in its hollow end to engage with the screw-thread I. The latter can then be drawn forwards by means of the key, so as to withdraw the spring tongue H from engagement with the recess in the guide-plate.

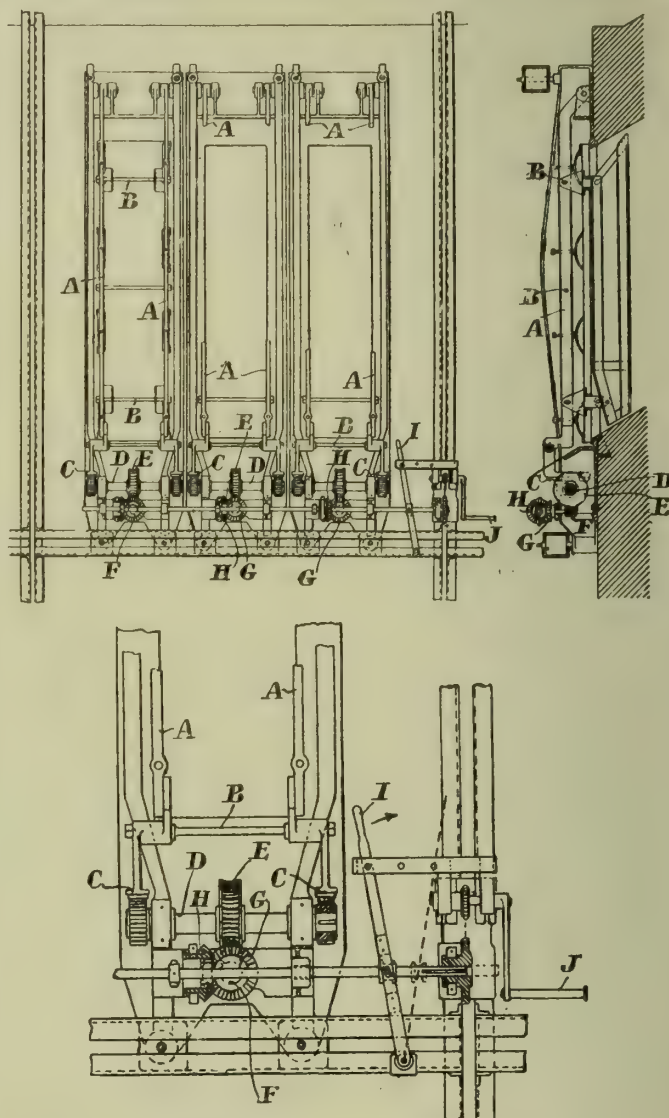
Actuating the Doors of Retorts, Coke-Ovens, &c.

OFENBAU GESELLSCHAFT M.B.H., of Munich, Germany.

No. 3678; Feb. 15, 1909. Date claimed under International Convention, Feb. 20, 1908.

This invention relates to apparatus for actuating from a distance the doors of retorts, coke-ovens, and the like, of the type wherein the doors can be individually operated from a single coupling rod by means of toothed gearing.

Hitherto, the patentees point out, when retorts or ovens have been arranged side by side, the discharge of coke has been effected either automatically by the weight of the incandescent mass sliding downwards on the inclined floor of the retort, or, in the case of the floor of the retort being horizontal, by means of a coke-ejecting machine, or of a "drawing" machine—in all cases the door being first unlocked and



Operating Munich Carbonizing Chamber Doors.

opened either mechanically or by hand. The doors of such individual retorts have, in previous constructions, been pivotally mounted above the opening of the retorts; while the bracket of the door supporting the door-plate proper is provided below the opening of the retort with teeth, which, on the door being closed, come into engagement with a pinion mounted on the setting of the furnace. Each of these pinions can be rotated—for instance, from a spindle by means of a worm; and in this way each individual door is locked or released from a distance according to the direction of rotation of the spindle. As hitherto, the rod carrying coupling members is mounted on the furnace in a rotatable manner, and is axially movable relatively to toothed pinions whereby the doors are actuated. According to the present invention, however, the pinions are provided with hollow hubs through which the coupling rod passes, and the coupling members on the rod are so relatively positioned that they are adapted to be brought into consecutive engagement with the hollow hubs to lock them to the shaft when the latter is moved longitudinally.

The illustrations show the invention as applied to a furnace having inclined retorts.

Here three adjoining retorts have their discharge openings set in frames let into the brickwork of the furnace and held in place by blocks or washers and bolts engaging channel irons arranged adjacent to the furnace. The doors for the discharge openings (in themselves old) preferably each comprise a door-plate closing the frame, adjustably

mounted through springs on lugs secured to brackets A, pivoted about pins in the frame above each discharge opening, and connected securely together by transverse bolts and provided below the discharge openings—where their ends are made U-shaped—with toothed racks C. On the doors being closed, the racks of the two brackets of each door engage pinions mounted on the ends of a spindle D supported in the frame below the shoot or inclined plane forming the continuation of the chamber floor. Between the pinions there is secured to the spindle D a worm-wheel E constantly meshing with a worm F, the spindle of which is also supported in the frame and carries at its outward end a bevel pinion G. Each bevel pinion is in constant engagement with a bevel pinion H, and all the pinions are disposed at right angles to the plane of the furnace doors, and are so mounted that they can rotate but not move axially.

The hubs of the bevel pinions are formed hollow; and through these openings a thin rod passes, which is rotatably and adjustably mounted at several points in the frame of each retort, and is carried at one end of the furnace in a bracket secured to the channel irons. To the rod are secured, at each bevel pinion, toothed coupling discs, which serve to clutch the pinions to the shaft when brought into engagement with the hollow hubs of the bevel pinion H, which are provided with corresponding clutch teeth. The distance between the coupling discs is calculated so that, when the bevel pinion H of a given door is connected to its respective clutch disc, all the other bevel pinions remain out of engagement with their respective clutch discs.

If, now, for instance, the contents of that retort which in fig. 1 is farthest from the operating lever I are to be discharged, the lever is brought into the outermost position shown, whereby a coupling disc is brought into engagement with the coupling teeth of the bevel pinion H belonging to that retort. After the lever has been fixed, the crank J is rotated to the release of the door, whereupon the clutch rotates the bevel pinion; and as the latter is connected to the brackets A of the door by means of the bevel pinion G, the worm F, worm-wheel E, and pinions, the toothed racks on the brackets of the door will be brought out of engagement with the pinions. The door, thus released, can then be entirely opened by any suitable means, so that the incandescent coke is discharged down the shoot.

When the door is being closed, the toothed racks C of the brackets A return in such position relatively to the pinions that they are engaged by the latter when the crank J is rotated in the opposite direction to formerly. In this way, the brackets are pressed against the furnace, and, consequently, the door-plate is forced against the frame owing to the action of the springs.

For the purpose of releasing the door of the central retort, the hand lever I is turned in the direction of the arrow into its central position, whereby the coupling disc corresponding to this retort is brought into engagement with its respective corresponding bevel pinion H; while the coupling disc of the retort on the left-hand side is disengaged from its pinion, and the clutch of the right-hand retort is not yet in engagement with its particular pinion. Consequently, by properly adjusting the hand lever I and rotating the crank J, the door of any individual retort can be released or locked at will.

APPLICATIONS FOR LETTERS PATENT.

- 23,807.—MANSELL, W. H., and CRAGGS, G. C., "Gas-stoves, &c." Oct. 18.
 23,831.—LAKE, H. W., "Manufacture of gas from liquid hydrocarbons." A communication from the Hydrocarbon Converter Company. Oct. 18.
 23,909.—POTTER, W. G., "Gas-driven hammers." Oct. 19.
 23,910.—POTTER, W. G., "Pumps driven by gas-engines." Oct. 19.
 23,914.—SHAW, J., "Regulating valves." Oct. 19.
 23,955.—POTTER, W. G., "Gas-engines." Oct. 19.
 23,988.—WAKEFIELD, C. C., "Acetylene apparatus." Oct. 19.
 24,014.—THIL, H. A. DU, "Gas-producers." Oct. 19.
 24,019.—ARMSTRONG, WHITWORTH, AND CO., LTD., and SODEAU, W. H., "Increasing the energy of stored compressed air or other gas capable of supporting combustion." Oct. 19.
 24,030.—FIELDING, J., and EADY, R. G., "Purifying and washing gas." Oct. 20.
 24,080.—BARNES, J., "Smoke consumer for inverted incandescent gas-lights." Oct. 20.
 24,095.—BLAND, C. W., "Inverted burners." Oct. 20.
 24,122.—DEUTSCHE GASLUHLICHT AKT.-GES. (AUERGESELLSCHAFT), "Inverted mantles." Oct. 20.
 24,211.—CHALLIS, C. E., "Heat-distributing mats or toasters for use on gas-stoves." Oct. 21.
 24,215.—BOTTELEY, A. A. T., "Grill-tins for use with gas-stoves." Oct. 21.
 24,261.—BURSTALL, F. W., "Extracting or separating suspended matter from gases, particularly tar from combustible gases." Oct. 22.
 24,292.—SHAKESHAFT, C. E. M., and CLARKSON, T. J. R., "Coin-freed gas-meters." Oct. 22.
 24,307-8-9.—DOWN, H. L., and TELEPHOS, LTD., "Lighting and extinguishing gas." Oct. 22.
 24,317.—SMITH, J., and EXTON, J., "Portable heating apparatus for gas." Oct. 22.
 24,353.—LESSING, R., "Carbonization of coal." Oct. 23.
 24,367.—DARWIN, H., "Incandescent lamps." Oct. 23.

At the Somerset Quarter Sessions last Wednesday, a pedlar named Jones was indicted for obtaining money by false pretences. He had called on people in Weston-super-Mare and professed to sell Welsbach mantles, the patent for which he stated he had sold to the Welsbach Company. Two officials of the Company repudiated all knowledge of him and his mantles. Prisoner said he had been dealing with the mantles for two or three years, obtaining them from his brother at Cardiff. He did not guarantee that they were Welsbach. The brother was called, and said he supplied prisoner with mantles, which he obtained from London. Accused was sentenced to three months' imprisonment with hard labour.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Proposed Test-Burner Bill.

SIR,—From the proceedings at last Thursday's meeting of the Gas Companies' Protection Association, it seems that the promoters of the proposed Bill contemplate going in for the change of burner pure and simple. I am under the impression that the model testing clause prescribes also the use of the pentane standard; but, be this as it may, in two recent Acts, which I have before me, this standard is prescribed, the section reading as follows:—

"For testing the illuminating power of the gas the burner to be used shall be that known as the 'Metropolitan' argand No. 2, the photometer shall be the bar photometer, the standard light shall be that supplied by Harcourt's ten-candle pentane lamp, and in making the test the burner shall be so used as to obtain from the gas when burned at the rate aforesaid the greatest amount of light: Provided that the Board of Trade may, on the application of the company or the local authority, approve the use of any other burner, photometer, or standard light which may appear to the Board to be equally or more suitable for the testing."

In the interests of a uniform method of testing, would it not be desirable to adopt such a clause as this? There can be no good reason for associating the pentane standard with any particular form of photometer; but the general opinion is, I believe, largely in favour of the pentane standard in combination with the bar photometer.

The "sweet reasonableness" of the Chairman's answer to Mr. W. Cash is of hopeful augury for the success of the Bill, and in refreshing contrast to the endeavour made last year to proceed under the aegis of the Board of Trade. It is likely enough that under any circumstances some amount of unreasonableness towards this proposal would have to be encountered; but it is at least equally certain that to ignore the local authorities is not the way to ensure a smooth passage for any Bill of this kind.

CHARLES HUNT.

17, Victoria Street, S.W., Oct. 30, 1909.

[The clause quoted by Mr. Hunt is the model one, with the exception that after the words "bar photometer," the words "or the table photometer" are included as an alternative. It is therefore left to the promoters of Bills to determine which photometer they prefer. If our recollection serves us right, the parliamentary authorities originally proposed the specification of the table photometer in the model clause; but there was some contention over the question at the time that the Cheltenham Gas Company were last in Parliament, and Mr. Paterson showed that, by a very simple modification in the bar instrument, it was quite easy to adapt it for the 10-candle pentane lamp. Mr. Hunt, we believe, had something to do with putting this matter before the parliamentary authorities. With our correspondent, we also think that it would be far better, as has been done in all Gas Bills the last two or three sessions, to adopt in the Joint Bill the model clause complete, so as to get absolute uniformity. We think this course would commend itself to the parliamentary authorities who framed the model clause, and who will have something to do with the Joint Bill.—ED. J.G.L.]

Horse-Power Rating of Gas-Engines.

SIR,—Mr. J. Ferguson Bell raises a point of considerable importance to gas-power users in his letter which you published on p. 190 of your issue for Oct. 19; and we fully endorse his views.

We may add that it has been our practice for, at any rate, the last five years to carefully differentiate in our tenders between the rated power of engines as a constant working load and the maximum power when firing every cycle. If this practice were followed throughout the trade, we believe it would be a great advantage not only to purchasers of gas-engines but also to engine makers.

On the other hand, it is well to emphasize that the purchasers are themselves not without blame in most cases where the engine is too small for its work. Tenders are usually obtained from all gas-engine makers; but in the absence of properly specified particulars in the inquiry, some makers appear to be tempted to mention the maximum power only—which is the absolute maximum the engine can possibly develop when firing every cycle. If another maker offers a larger engine with a proper margin of power, his price seems high beside the quotations we have referred to; and unless the purchaser looks very carefully into these matters, as he ought to do, he is apt to settle the order on price alone, without reference to the actual respective power capacities of the several engines offered.

The principle of settling gas-engine orders upon price alone—without regard to size of engine, excellence of design, or quality of work—accounts for most gas-engine failures which we meet with in these days; and it is consequently most encouraging to us to find the subject taken up in your columns, on the lines we have long advocated, by a gentleman in Mr. Bell's position, who is able to speak quite impartially, and from actual experience of the facts.

FOR THE NATIONAL GAS-ENGINE CO., LTD.,

Ashton-under-Lyne, Oct. 27, 1909.

P. W. ROBSON.

Gas Appliances at the Brewers' Exhibition.

SIR,—In your report on the above in the issue of Oct. 26, I observe that the Richmond Gas Stove and Meter Company's stand was brilliantly illuminated by Messrs. J. & W. B. Smith. Will you kindly allow me to mention that the whole of the fitting-up for lighting this stand was carried out by the workmen from the Goswell Road branch of the Gaslight and Coke Company, under the supervision of the

District Inspector. The lamps used were six "Silva" indoor inverted, and three 3-light inverted pendants, with a varied selection of glass ware; the installation being designed at this branch.

Gaslight and Coke Company, E. C. HOLT,
146, Goswell Road, E.C., Oct. 28, 1909. Inspector-in-Charge.

Connection of Washouts to Sewers.—A correspondent asks: "Have corporations or district or rural councils any power to prevent a water company from connecting washouts to sewers, after giving due notice to the corporation or council, as the case may be, of their intention to carry out the work?"

LEGAL INTELLIGENCE.

GAS-WORKS SIDINGS AND RAILWAY RATES.

RAILWAY AND CANAL COMMISSION.

(Before Mr. Justice A. T. LAWRENCE, the Hon. A. E. GATHORNE-HARDY, and Sir JAMES WOODHOUSE.)

Corporation of Birmingham v. Midland Railway Company,
London and North-Western Railway Company, and
Great Western Railway Company.

Wednesday, Oct. 27.

To-day, judgment was delivered in this case, in which the Corporation of Birmingham, who have constructed extensive private sidings at their Saltley, Nechells, Windsor Street, and Swan Village Gas-Works, asked for an order declaring them entitled to an allowance or rebate on charges made by the Midland, London and North-Western, and Great Western Railway Companies on inward and outward traffic to their various works. They also asked for a declaration that the London and North-Western Company had exceeded their maximum charge for the use of trucks. Further, they claimed damages in respect of the past six years' overcharges. The hearing took place as long ago as last March; and the arguments and evidence were reported at considerable length in Vol. CVI. of the "JOURNAL," pp. 105, 167, 240, 316, and 390.

Mr. Justice Lawrence's Judgment.

Justice LAWRENCE said: In this case, the Corporation of Birmingham claim against the three Railway Companies, who have been made defendants, relief in respect of a number of matters in relation to traffic to and from their several gas-works. The Railway Companies, either in their amended pleadings or at the trial, have admitted a right to some relief in respect of some of these matters, and the parties have by their Counsel undertaken to endeavour to agree orders as to these. Orders may be drawn up in accordance with any such agreement. There must be liberty to apply in case there should be a difference between them on any point. The substantial question in the case remaining for our decision is whether the Corporation are entitled to private siding allowances or rebates under section 4 of the Railway and Canal Traffic Act of 1894. The Corporation have claimed these allowances or rebates, the Railway Companies have refused them; and thereupon disputes have arisen, and this Court has jurisdiction to entertain and determine the disputes. The gas undertaking of the Corporation is of great magnitude. It supplies with gas an area of 114 square miles, having a population of 850,000 persons. For its several works, it requires an inward traffic by rail of 650,000 tons per annum; and it sends out 120,000 tons per annum. Four of its works are involved in this inquiry—namely, Saltley, Nechells, Windsor Street, and Swan Village. Each works has its private sidings communicating with the adjacent railway or railways. Saltley, Nechells, and Windsor Street are in the heart of Birmingham. The two former are within one mile of the Lawley Street Railway Station. Saltley is served by the Midland Railway only, Nechells by the Midland Railway and the London and North-Western Railway, Windsor Street by the London and North-Western Railway, and Swan Village by the Great Western Railway. Coal, which forms the principal inward traffic, is obtained from collieries in Derbyshire, Nottinghamshire, Yorkshire, and Staffordshire. It leaves the colliery and arrives outside Birmingham in full train loads. As a general rule, three to four trains arrive per day. I will deal first with Saltley. These works cover a considerable area, and have rails laid down to enable the trucks to be taken about to the various places where coal, &c., may be needed at the moment. It is admitted that no station terminal could properly be charged in respect of the traffic to or from these works. The applicants contend that the Railway Company do not perform any service entitling them to remuneration under section 5 of the Rates and Charges Order, and that the rate charged does in fact include a sum of 3d. per ton for station accommodation and terminal services. The Railway Company deny both these allegations, and, further, say that the whole rate charged is less than the authorized maximum rate for conveyance only. This last proposition appears to be true in fact. They say, next, "We have disintegrated the rate, appropriating a penny to services 'at or in connection with your sidings,' and the balance for conveyance." This they contend is a very low charge, and about two-thirds of what they might charge for conveyance alone. The main question of fact in dispute has been: Do the Railway Company perform any service in respect of this traffic beyond what they are bound to do as carriers conveying it from one private siding to another? If they do, they would be entitled to charge a reasonable sum in respect thereof under section 5, sub-section 1. The Railway Company have large sidings outside Birmingham, at Washwood Heath, which serve as a sort of service reservoir, from which trucks can be led to the works as and when required. In these Washwood Heath sidings, the Railway Company divide mixed trains

and make up trains for destinations beyond Birmingham. They also send on trucks destined for Lawley Street Station. The applicants seize upon this fact, and urge that this is all the Railway Company do for their traffic. Mr. Balfour Browne argued that the service at Washwood Heath was the same for the Corporation as for the trader to Lawley Street. This is plausible, and at first sight seems true; but it is not. The nature of the two cases is different. The trader could receive his traffic at Lawley Street. He is ready and willing to do so. It is entirely a matter for the Railway Company if their traffic is so large that it requires more siding accommodation than they have at Lawley Street. Whether his traffic uses both the Washwood Heath sidings and the Lawley Street sidings or the Lawley Street sidings only, the trader is liable for the terminal charges at Lawley Street. The Corporation, on the other hand, from the extent of their traffic and the nature of their siding accommodation, cannot receive their traffic as it arrives. It must be accommodated with, and fed from, sidings placed somewhere. In 1896, this was done from Lawley Street, Duddesdon sidings. Now it is done from Washwood Heath, and from a railway siding outside the Saltley works. Two of the sidings at Washwood Heath are set apart for the reception of Corporation traffic. From these, it is sent down, if for Saltley, to the siding outside the works. From this siding, the railway servants feed the works with coal day and night, as and when required by the servants of the Corporation. The siding is used almost exclusively for the Corporation traffic to the Saltley works. The case of the Nechells works differs only in that the siding which corresponds with the one just referred to is changed from time to time; and a short neck on which the trucks are finally placed, as and when required by the servants of the Corporation, is not on the Corporation's land, but upon the Railway Company's land. These differences are unimportant. The neck is very short; but it will hold as many trucks as can pass into the works at one time, owing to the gradients and the construction of the Corporation's sidings within the works. It was contended for the Corporation that these operations or services were all within the duty of the Railway Company as part of conveyance, on the ground that conveyance was not completed until the truck was tendered over the points of the works sidings. For the Railway Company, it was said that it was a service done at the request, and for the convenience, of the Corporation within the meaning of section 5 of the Railway Rates and Charges Order, for which a reasonable sum could be charged. There was no evidence of any express request to reserve these sidings for the use of the Corporation; and it was urged that the Railway Company did so for their own convenience. It was further said that at Saltley the Corporation could receive the coal into the works in full train-loads. This is one of those statements it is difficult to deal with. It is not false; for, under certain circumstances, and with ample pre-arrangement, it is probably true that a single train-load could be received, but it would be a feat disarranging the ordinary conduct of the works. I am satisfied it could not be done continuously as a practical business matter while the gas-works were being worked. In my judgment, Saltley and *a fortiori* Nechells need for their practical working the use of sidings of the Railway Companies as what I have called service reservoirs. It is of the first importance, not merely to the convenience and comfort, but to the safety, of the community at Birmingham that their supply of light should be assured and uninterrupted. This would be placed in imminent danger if a service of full train-loads only were provided by the Railway Companies. It is the having such works and such volumes of traffic which has determined the mode of dealing with this traffic, and has imposed these services upon the railways. In my opinion, these facts constitute a request as clear as the most formal letter. Mr. Balfour Browne argued that it could not be so, because the Corporation could not give notice in writing that they did not require the service. I do not agree. I think they could give such notice; but they would require to first clear a large tract of land adjoining their works whereon to put sidings similar in dimensions to those they now use belonging to the Railway Company. The truth is that in these questions there must be a certain breadth of treatment on both sides. Conveyance properly so-called does not terminate until the siding points are reached. There are many occasions on which a truck must go into sidings *en route*, for the convenience of the Railway Company in the management of their traffic; but it does not follow from these general propositions that all use of all sidings before the private siding points are reached is part of conveyance. I do not believe any general statement can be formulated decisive of the matter in every case. It must be a question of fact in each case whether the service rendered is incident to conveyance or is due to request express or implied of the freighter. In this case, I am clearly of opinion that there is a service not incident to conveyance, but which is due to the position, the configuration, and the area of the works, together with their internal requirements and the volume of traffic in and out which has to be dealt with. This Court had a similar question before it in 1896 with regard to these works; and it came to a like conclusion. It is true the sidings used were not at that time at Washwood Heath, but at or near Lawley Street; but this is not an essential difference, and I am sure that Mr. Barber, if he had been in the service of the Corporation at that time, would have felt this. The truth is this complaint has resulted from the Railway Companies treating Mr. Barber unfairly in another matter; and, being naturally incensed thereby, he has been led to take an erroneous view upon the question now before us. I need not deal at length with the case of the London and North-Western Railway at Nechells or Windsor Street; for no rebate is claimed in respect of coal. It is claimed only in respect of miscellaneous inward traffic. This traffic is small in amount; and though I am satisfied that some services are performed by the Railway Company in respect of it of the same nature as those I have dealt with above, I think these services are slight. The trucks arrive a few at a time; and the greater part of the shunting done is required in order to put the trucks off the train into the sidings from which the Corporation engines take them. Upon the whole, I do not think the rd. charged can be justified for these siding services; and having regard to the fact that the Railway Company have reduced the rates upon coal—the larger traffic—I think they might well for the future allow this rd. as a rebate upon this inward miscellaneous traffic. The same policy of competition may, one would think, be extended to it. If the Railway Company will not accept this suggestion, there must be a reference to the Registrar to ascertain what the rebate or allowance

should be. The applicants further make a claim to a rebate or allowance in respect to their outward traffic. The services rendered by the Railway Companies in respect of the outward traffic differ from those in respect of the inward traffic. The outward traffic consists of empties, coke, and the bye-products of the gas-works. These are placed by the Corporation servants upon their own sidings in whatever order the trucks happen to be ready. They are consigned to different destinations lying in different directions. Before the trucks can be attached to the train which is to convey them, they must be removed to sidings of the Railway Company, where they can be sorted ready for conveyance. It is urged that this is part of the duty of conveyance. I do not think that it is. If conveyance alone be considered, it is the duty of the freighter to tender his traffic upon his siding in a condition reasonably fit for conveyance. If he tenders a dozen trucks intended for, and consigned to, some different destinations, he knows that they cannot be conveyed to their destinations without a preliminary operation involving labour and accommodation before each starts upon its real journey. This has been called sorting in this case. It seems to me to be a service in connection with the Corporation sidings. It is quite distinct from conveyance and from the marshalling of the train which does in fact convey. This marshalling is putting the trucks which compose a train in such order that the train can most conveniently convey them towards, or to, their destination. It is a thing done for the convenience of the Railway Company. But it is the duty of the consignor to tender his traffic in such a way that the railway engine can come and take it away. If he places the twelve trucks as above mentioned, and asks to have them taken away together, he knows he is asking to have a service performed which, if he had the necessary accommodation and did the necessary work, he could do for himself. He knows that many of the trucks would have to stand upon his works for hours after others had gone, because trains do not run to every destination at the same moment. This sorting is work done for the applicants, and is done by their request made when they tender trucks mixed up in such an order as to make it impossible to convey them to their several destinations without doing it. These observations apply to the outward traffic at all four works. There is no question of law involved in this case. A great many cases were cited to us; but they do not determine the question before us, which is one of fact—namely, Is a service rendered by the Railway Companies to the Corporation in connection with their sidings, and at their request, express or implied? I am of opinion that, as a fact, there is such service so rendered. I have not dealt in detail with the case of Swan Village—either inward or outward traffic. The services in this case differ considerably in detail from those with which I have dealt above. They do not differ in principle. In each case a service is rendered for the applicants; and in each case it is necessary, in consequence of the nature and position of the private sidings with relation to the railway. The remaining question is whether the rd., as attributed by the Railway Company, or the 3d., as alleged by the applicants, is the charge made for these siding services. I think that there is no sufficient evidence to induce one to find that 3d. is the amount charged for these services. The case of the one truck of coal sent from King's Heath Station to Lawley Street Station upon which 3d. was charged, does not convince me. No coal traffic passes between these points; and this, therefore, is not any really comparable rate. It is admitted that 3d. is the terminal for other commodities in the same class; and a clerk making out a bill for such an unusual consignment as a truck of coal from King's Heath to Lawley Street would, unless he was a very cautious individual, be sure to attribute to it a rate that would cover the ordinary terminals. In the absence, then, of any evidence of the rate upon a comparable traffic, and in view of the fact that the whole charge made is much less than the authorized rate for conveyance only, I think one must accept the Railway Company's evidence that rd. is the amount charged for the accommodation and services afforded to coal into Lawley Street Station, and that the same sum is charged for the services above mentioned at the private sidings I have named. I see nothing to induce one to believe that the rate charged to the Corporation contains more than rd. for these services with which I have been dealing above. As to the reasonableness of this sum, I think it is clearly a reasonable sum to charge with respect to the services which I have mentioned. For these reasons, I think that, upon this question of rebate or allowance, our judgment should be in favour of the defendants. There is a further question as to truck hire in respect of distances not exceeding 20 miles. The Railway Company seek, where the journey is partly over the line of another Railway Company, to charge 6d.—treating section 9 of the Rates and Charges Order as limiting their power of charging upon their own line only. I see no ground for this construction. The section is perfectly general in its terms; and no argument was addressed to us showing why it should not receive a literal construction. I think 4½d. is the proper charge. Another point raises the question of what amount should be charged as the rate for bricks, &c., from Congreave sidings to the Saltley works. I have come to the conclusion that the figure mentioned by Sir James Woodhouse in his judgment would be a fair rate.

The Hon. A. E. GATHORNE-HARDY: I agree with the judgment just delivered, to which I have nothing to add.

Sir James Woodhouse's Judgment.

Sir JAMES WOODHOUSE, in the course of an extended judgment which was in agreement with that already delivered by Mr. Justice Lawrence, said that the case was one of great importance and some difficulty; and it had been considerably complicated by the fact that they had had to hear at one and the same time what were practically three separate and independent applications affecting three different Railway Companies and four sets of works. After carefully considering the detailed evidence as to the capacity of the storage accommodation at the Saltley works, he was satisfied, as a matter of everyday working, that it was not sufficient to enable the applicants to receive the traffic as the Railway Company could deliver it. Mr. Balfour Browne, for the applicants, admitted that the Railway Company might be entitled to some payment in respect of the special siding close to the works on the Railway Company's property. Some additional accommodation, for example, at Washwood Heath was required to facilitate the necessary operations; and this accommodation the defendants provided, and in connection therewith performed services which, in his judgment,

were extraneous and supplementary to the duty of conveyance. But it was said that the services for which a charge could be made under section 5 must be of such a nature that the party charged could give notice that he would not continue them, and further that in this case these services were not performed at the request of the applicants, and were not for their convenience, but for the convenience of the Railway Company. He disagreed with this contention. No evidence of any express request had been given; but the necessities of the traffic and all the facts and circumstances connected with its operation implied such request to enable the defendants to fulfil the obligations of their contract. He agreed entirely with the learned Judge that the determination of whether a particular service was or was not an incident of conveyance, was one of fact depending on the circumstances of each individual case; and he was of opinion that the provision of standing room and the operations consequent on the restricted accommodation in the applicants' works did involve extra service for which the defendants were entitled to some payment. As to the inward coal traffic to the Nchells works, the Midland Railway Company contended that, owing to the curve and upward gradient on the connecting line between the Company's siding and the gas-works, it would not be possible, to whatever length the Company's siding might be extended, for the applicants to receive into the works more than fifteen waggons at a time. This view was, in his opinion, borne out by the evidence; and he therefore saw no reason to differentiate the value of the services in the case of Nchells from those at Saltley. In addition to the inward traffic here, the applicants had also considerable outward traffic, in respect of which they made similar claims for rebates and allowances. If the waggons were already sorted in the gas-works, so that the defendants need incur no greater expense than was involved in attaching their engine and drawing them out of the works, no extra payment would be due. Owing, however, partly to the lack of the necessary accommodation within the works, and to the construction of the sidings, and to the proper working of the running lines, it was not possible to draw the waggons out of the sidings and unite them to the trains, without doing previously considerable operations elsewhere. These extra services involved some additional hauling as well as the provision of standing accommodation; and for this he thought the Company were entitled to some payment. He agreed with the lucid argument of Mr. Simon, that the Railway Company were entitled to have the waggon or waggons tendered to them at the point of delivery in a condition to become part of one of their trains; and this being the duty of the freighter, he must pay for the service which the Railway Company performed for him. The Corporation next contended that the real terminal to Lawley Street was not rd., as stated by the defendants, but 3d. They founded this contention upon the fact, first, that the terminal on coke to Lawley Street was admittedly 3d., and that the station accommodation and services were the same with respect to coke and coal; and, secondly, that all articles in Class A were charged a terminal of 3d., and both coal and coke were in this class. Evidence was given of a truck of coal having been sent from a local station to Lawley Street, from which it was clear that 3d. was charged as the terminal at Lawley Street. These rates, however, were purely local rates, and were not comparable with the rates for the long-distance coal traffic which went to the gas-works. He did not think they could, against the express testimony of the Railway Company to the contrary, infer from these local rates, in which there was probably a station terminal, but which were much nearer the maximum than the long-distance coal rates, a terminal charge of 3d. in the coal rate to Lawley Street. An alternative contention was put forward during the hearing that the charge should be reckoned as 2d., by applying the principle of Pidcock's case; but the rule in Pidcock's case was not one of general application, and did not seem to him to be applicable to the facts of this particular case. He was of opinion, therefore, that the defendants had established that they performed substantial services at, or in connection with, their sidings; that they were equivalent to the services performed at Lawley Street; and that the sum charged was a reasonable one. Then the Corporation complained of a charge of 1s. 6d. per ton made by the Midland Company for conveyance of coke by that Company jointly with the Great Western Company from Saltley sidings to Small Heath. The Company admitted that this charge could not be justified, and reduced it to 1s. 3d., which included rd. for services at Saltley sidings; but on the ground that there were no such services, the applicants asked the Court to further reduce the charge to 1s. 2d. For the reasons he had already given, he thought the defendants were entitled to extra payment for services at these sidings; and therefore the maximum rate should not exceed 1s. 3d. In the application against the London and North-Western Company, the defendants admitted that charges for cartage had been included in several instances, and promised the Court that any errors of this kind should be adjusted, and proper allowance made for any overcharges that might be found. It did not therefore appear necessary to make any order in the matter. There was also a complaint against this Company similar to that against the Midland Company of excessive charges for the conveyance of coke outwards from the Nchells and Windsor Street works. In their answer, the Company denied the alleged overcharges; and by a disintegration of the rates made on Nov. 6, 1907, after charging the maximum for conveyance and 3d. for terminal services at the receiving end, they attributed the balance of the rate they were charging to services at Windsor Street Station and the gas sidings respectively. This artificial method of distributing the rate produced the curious result that the charge for the services at the forwarding end varied in a long table of instances from 1½d. to 8½d. per ton, though such services were practically in every case the same. The defendants, shortly before the hearing, put in a new and revised list of coke rates, showing considerable reductions on the former rates; but the conveyance rate in one or two instances appeared to be still above the maximum. In this list of revised rates rd. per ton, instead of the varying sums just mentioned, was uniformly charged for services at, or in connection with, the gas-works sidings. The applicants disputed these services; but he saw no reason to differentiate the case against this Company from that against the Midland in this respect. The services were similar, and substantial; and he thought rd. was a reasonable sum to allow. There was a further complaint that the London and North-Western Company charged the Corporation 6d. per ton for the use of trucks for the conveyance of coal

and coke for distances not exceeding 20 miles, in contravention of section 9 of the Company's Rates and Charges Order Confirmation Act, 1891, which provided for a charge not exceeding 4½d. per ton for such distance. The Company said the 6d. had only been charged when the journey was partly over their own system and partly over that of other companies; and their contention apparently was that they could charge the 4½d. for the distance under 20 miles on their own system, and such additional sum as the other companies were empowered to charge for the use of trucks over their system. He failed to see any ground for upholding this view; and therefore the applicants were entitled to the order they asked for. Against the Great Western Railway, the Corporation complained of the coal rates inwards and the coke rates outwards at Swan Village. Here extra payment was claimed for shunting and sorting coke trucks, and also for necessary haulage to West Bromwich and back, a distance of 2 miles. Some service was rendered for which payment should be made; and he thought that the charge of 1d. was a reasonable sum to allow. A new list of coke rates with reductions had been issued recently; and the Company admitted the applicants' claim to repayment of certain overcharges, the amount of which could be easily ascertained and agreed. The next matter in dispute had reference to an alleged overcharge by the Great Western Company with respect to the rate for the conveyance of bricks and retort materials between the Congreave sidings and the Saltley Gas-Works. The rate charged was 3s. 2d.; but two years after the filing of the application, it was reduced to 2s. 6d. The Corporation asked that it should be further lowered to 2s. 0½d., which they contended was the maximum charge for the mileage distance. The amount now in dispute turned upon the proper allowance to be made for services at the Congreave end and Saltley respectively. The Company had claimed sums varying from 1d. to 3d. for haulage and services at Congreave, and 3d. for the Saltley sidings. The applicants denied that anything was due for these services. He thought there were special services rendered at the Congreave siding as well as at Saltley, and that a fair inclusive rate to fix for this traffic would be 2s. 3d., instead of 2s. 6d. The Corporation were entitled to an order and declaration accordingly.

Sir ALFRED CRIPPS (for the defendants): I think on all substantial matters the applicants have failed; but the order will have to be drawn up carefully, and I ask that we have leave to apply.

Justice LAWRENCE: Yes.

Mr. M'CARDIE (for the Corporation): Certain admissions, if I remember rightly, were made by the Railway Companies in the course of the case. They are scattered through the evidence; and perhaps we could look into the matter and communicate with the Railway Companies what we think has been admitted, and then bring it all, if necessary, before your Lordship.

Justice LAWRENCE: Yes; certainly. At the hearing, it was understood that the learned Counsel on both sides would agree all these matters and submit them, if necessary, for an order to be drawn up in accordance with their agreement. If they cannot agree, of course we must deal with the matter.

Sir ALFRED CRIPPS: I do not think there is any reason to suppose they will not agree.

THE WELSBACH COMPANY'S TRADE MARK.

Clerkenwell Police Court.—Saturday, Oct. 30.

(Before Mr. BROS.)

To-day his Worship resumed the hearing of the summons taken out by the Wolfram (Tungsten) Metal Filament Lamps, Limited, against the Welsbach Incandescent Gaslight Company, Limited, for having sold goods to which, as they alleged, a false trade description had been applied. The initial proceedings were reported in the "JOURNAL" last week (p. 265).

Mr. RUFUS ISAACS, K.C., M.P., Mr. H. A. COLEFAX, and Mr. ERNEST LUNGE appeared for the prosecution; Mr. A. H. BODKIN and Mr. WALTER represented the defendants.

Frederick Hale, Assistant-Manager of the General Electric Company, Limited, produced a copy of the "Daily Telegraph" of Sept. 23, containing an advertisement of Welsbach electric lamps issued apparently by the defendants. On September 29, in compliance with instructions received from Mr. J. Y. Fletcher, the Manager of the electric light department of his Company, he went to the premises of the defendants in Gray's Inn Road, and asked a young lady attendant in the show-room to let him see a lamp as advertised in the daily papers. She showed him some samples, and he asked if they were Baron von Welsbach's lamps. She replied that they were. He ordered two, and went down into the warehouse to receive them. As they were being handed to him he asked: "Are these Baron von Welsbach's lamps?" and the salesman said "Yes." The lamps he bought were similar to the one produced.

The lamp was handed up to the Magistrate, who remarked it had "Made in Germany" and "Welsbach" and "Aur" upon it.

Continuing, witness said he again went to the defendant's premises on the 8th of October, and asked for some more lamps similar to the samples he had previously taken away. He inquired of the attendant in the warehouse if he could assure him that they were Baron von Welsbach's lamps, as the person who required them had made a special point of this. The attendant said they were. Witness replied: "Will you kindly put it on the invoice, to enable me to show my customer?" The man did so. The principal manufacturers of lamps made from this filament were the Auer Company of Berlin.

Cross-examined by Mr. WALTER, witness said that when he went to the defendants' premises he gave the name of Holloway, Bath Road, Hounslow, and produced a trade card with this name upon it. This card was given to him by Mr. Fletcher. He did not know whether or not there was such a person as Mr. Holloway. At the trade counter he did not say he was a member of the trade; he simply asked for the lamps he had ordered in the show-room. His instructions from Mr. Fletcher were to purchase the lamps, to ask if they were Baron von

Welsbach's, and to get something in writing to this effect. The only metal filament lamps his Company sold at the present time were Osrams, which he believed were made under Baron von Welsbach's process; but he did not know. The only metal filament lamps the Company had sold since he had been in the department (two years and a half) had been Osrams. He was not aware that the Auer Company were under contract not to use the words "Auer" or "Welsbach" in the United Kingdom. The only mention he had seen of the Company had been in private correspondence with his Company. He did not know that the trade-mark "Aur" was put on all goods sold by the Welsbach Company; nor did he know that "Aur" was their registered trade mark in this country.

The further hearing was adjourned for a week.

HIGH-PRESSURE WATER FOR A FIRE-HYDRANT.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Friday, Oct. 29.

(Before Justices DARLING and BUCKNILL.)

Metropolitan Water Board v. Mulholland.

This was an appeal from the decision of his Honour Judge Woodfall, at the Westminster County Court, who decided that the defendant was bound to pay one guinea for water supplied at high pressure to a fire-hydrant at the King's Theatre, Hammersmith. The proceedings in the Lower Court were reported in the "JOURNAL" for April 27 last (p. 239).

Mr. DRUCQUER, who appeared for the appellant, explained that at one time water was supplied under contract, which had been determined by notice given by the Water Board; and the defendant contended that he was only bound to pay for water actually supplied. The London County Council would not allow theatres to be opened unless hydrants were fixed; and the Board were willing to afford a supply by meter. The Council, however, would not allow a meter to be used, as it interfered with the pressure. He submitted that the Board's Charges Act of 1907, which created a uniform charge throughout London, put an end to all agreements, without any notice; and where no agreement existed, the Board could sue for water supplied. Defendant was willing to pay for water; but he objected to pay for fire-hydrants.

Justice DARLING: If you make an agreement, the Board will charge you one guinea as before.

Mr. DRUCQUER: We may have to make an agreement; but we want the Court to say what is a reasonable charge.

Justice DARLING: How can we say what is a reasonable charge?

Mr. DRUCQUER: Your Lordships may not have to do so to-day; but if you hold that the agreement is at an end, the Board must take whatever steps they please to recover the rate.

Justice DARLING: I understand the Board say, "If you use water we must make a charge; and our charge is a guinea per hydrant."

Mr. DRUCQUER pointed out that this was a test case, at the instance of various theatre managers, to obtain a decision as to what was a reasonable charge.

Mr. A. B. SHAW, who represented the Water Board, said the only point for decision was whether the contract had gone. Section 6 of the Charges Act did not abolish or repeal contracts, but merely repealed certain powers of charge and substituted others.

Justice DARLING said the appeal was against the decision of the County Court Judge with reference to a contract or agreement dated Nov. 4, 1902. The plaintiffs sued upon this agreement, and the defendant contended that it had been put an end to by notice. He (his Lordship) was of opinion that the notice referred to another agreement altogether; and therefore it was not necessary to go into the question of what was the effect of notice upon the agreement. It had been argued that the agreement was put an end to by section 6 of the Charges Act; but he was of opinion that the effect of this section, and indeed of the whole Statute, was not to put an end to the agreement. Even if the Statute had done this, which it had not, he thought the agreement was preserved by reason of section 35 of the Charges Act, which expressly provided that nothing in the Act should interfere with the operation of any agreement made under the Act of 1902. The agreement in question was in terms preserved by the Act; and, consequently, there being a good basis for the claim, the appeal must be dismissed, with costs.

Justice BUCKNILL concurred.

Leave to appeal was granted, provided notice was given within one month.

LIABILITY FOR WATER SUPPLIED TO A FLAT.

In the King's Bench Division of the High Court of Justice last Thursday, Justices Darling and Bucknill had before them the case of *Metropolitan Water Board v. Cannon*. It was an appeal from a decision given by his Honour Judge Woodfall, in the Westminster County Court, on the 22nd of April last, that the defendant was liable for two quarters' water-rate in respect of a flat at Cranworth Gardens, Brixton. The proceedings in the Lower Court were reported in the "JOURNAL" for the 27th of April (p. 239). Mr. GIVEN, who appeared for the appellant, said there was an agreement by his client with Mr. OWERS, the agent for the owner of the flats, that the water-rate should be included in the rent; and that if the Water Board preferred to claim the rent from the actual tenant, they were bound, under the Water Companies (Regulation of Powers) Act, 1887, known as Forrester-Fulton's Act, to give notice to the tenants which enabled him to deduct the amount of the rate from the rent due or accruing. This was not done. Mr. A. B. Shaw, for the respondent, urged that the Act cited had nothing to do with the case. It only applied, if the tenement was above the value of £10, where there was an agreement between the water company and the owner. In the present case there was originally an agreement, but it was determined by the Water Board by

notice given in December, 1907, that after April 1, 1908, they would only supply water on certain terms, which were appended to the notice. The agreement being thus determined, the Board were simply exercising the powers given to them by the Water-Works Clauses Act, 1847, which enabled them to sue either the owner or the occupier. Mr. Givcen read the judgment of Judge Woodfall, and pointed out that he had decided that the case did come within Forrest Fulton's Act. He urged, further, that the notice given by the Board was irregular; that it could not affect the quarter beginning March 25, the payment for which was due before the notice took effect; and that it did not determine the agreement between the Board and the owner, but only gave notice that the terms of supply would be revised. After some discussion, Mr. Justice Darling said the judgment was very unsatisfactory. There must be a new trial, and all the points raised properly dealt with.

In re Mid-Oxfordshire Gaslight and Coke Company.

In the Chancery Division of the High Court of Justice yesterday, Mr. Justice Parker had before him the case of *Grimsley and Another v. Freeman and Another*. It was a motion which came on as a short cause. The plaintiff, represented by Mr. Crossman, was the holder of 50 debentures in the Company; there being a trust deed under which the money had become due. There had been no statement of claim delivered, and no evidence filed; but Mr. Church appeared for the trustee, and Mr. Galbraith for the Company, and consented to the usual order being made. His Lordship said the order would go, on the production of an affidavit stating the facts.

In re English Gas-Mantle Company, Limited.

In the Chancery Division of the High Court of Justice last Saturday, the case of *Carmichael and Co. v. English Gas-Mantle Company, Limited*, came before Mr. Justice Swinfen Eady as a short cause, as against the Company and one defendant (Mr. M'Kean) in default of defence, and as against another (Mr. Callard) on admissions in his defence. Mr. Manning, who appeared for the plaintiff, said he was the sole holder of the first mortgage debentures to the amount of £14,000, which had become immediately payable under the terms of the debenture deed, by reason of the Company having, on the 3rd of July last, passed an extraordinary resolution for winding-up. He also had a specific mortgage on certain freehold land at Mitcham, the property of the Company, to secure repayment of the principal and interest to become due on the debentures. The two defendants named claimed to have a charge on the property. Mr. M'Kean had not put in any defence; and Mr. Callard admitted that his claim was subject to that of the plaintiff. Counsel asked for the ordinary judgment in a debenture holders' action. Mr. Howard Wright, who appeared for the Company and for Mr. Callard, did not raise any objection to the proposed minutes of order; and his Lordship accordingly sanctioned them.

Obtaining Gas with Tokens and Clock-Wheels.

At Enfield, a few days ago, William Saunders, of Lancaster Road, Enfield, was summoned for unlawfully abstracting gas belonging to the Enfield Gas Company. Mr. Windsor, who appeared for the Company, said defendant's meter was a penny-in-the-slot one, and he had put in seven coins or tokens instead of pennies. He had been warned before on the matter. The collector stated that when he called to clear the coin-box he found seven coins. On the previous occasion eleven coins were in the meter. Defendant said he had had the meter for three years, and had been in the habit of using the coins. He only did so as a convenience, because he had not a penny at the time. He always paid up the full amount afterwards. The Chairman of the Bench said defendant ought to have known better after having been cautioned. He was putting in things that were worthless, and would have to pay 10s., or go to prison for ten days. Alexander Kuhn, of Baker Street, Enfield, was summoned for a similar offence. Mr. Windsor explained that the defendant had abstracted gas unlawfully by inserting clock-wheels in his meter in place of shillings. A collector employed by the Company said he called at the house on the 9th of September to clear the coin-box of the meter, and found three shillings in cash and four clock-wheels. By putting these wheels into the box defendant had obtained 4s. worth of gas. Witness cautioned him in April last for putting no fewer than nine wheels into the meter. The Chairman said it was a most serious case, and defendant would have to pay 40s., or be imprisoned for a month.

Liability for Reinstatement of Pavement.

At the Bow Street Police Court last Thursday, Mr. Curtis Bennett heard an adjourned summons taken out against the Metropolitan Water Board by the Westminster City Council, who sought to claim £50 0s. 11d., expenses incurred by them in reinstating and making-up the pavement in Great Stanhope Street, which had been damaged by the bursting of a water-pipe. Mr. Morton Smith appeared for the Council; Mr. Courthope Munroe represented the Board. It was stated that the pipe in question burst in January last, and as a result water ran under the wood pavement, causing a considerable amount of damage to the road some distance away. The Council carried out the repairs, and charged the cost to the Board. About four months later the Board sent a letter in which they repudiated the claim, and afterwards gave as the reason that the Local Authority ought to have given them notice to do the work themselves. His Worship held that the Board were right. He said that where the work done was not such as was necessitated by opening up the road to reach the burst pipe, the Council must give the Board notice to do the work; and failing compliance with the notice, the Council could recover a penalty of £20 for every 48 hours in default. He did not make any order, and would not allow costs.

A letter from the Gas Company was read at the last meeting of the Launceston Town Council stating that they had obtained a small reduction in the price of coal, and were prepared to make a reduction in the contract for the public lighting to the extent of 9d., 8d., and 7d. per lamp, according to the portion of the town.

MISCELLANEOUS NEWS.

GAS COMPANIES' PROTECTION ASSOCIATION.

The Twelfth Annual Meeting of the Association was held last Thursday, at the Westminster Palace Hotel, Victoria Street. The CHAIRMAN (Mr. H. E. Jones) presided. The other members of the Committee present were: Mr. Thomas Berridge (Leamington), Mr. Charles E. Botley (Hastings), Mr. George Clarry (Cardiff), Mr. Douglas H. Helps (Reading), Mr. William King (Brentford), Mr. R. O. Pater-son (Cheltenham), Mr. A. G. Snelgrove (West Ham), Mr. George Andrews (Swansea), and Mr. Edward Allen (Liverpool). The following gentlemen were also present: Mr. H. W. Ashmole (Ilford), Mr. P. G. Winstanley (Wolverhampton), Mr. J. T. Jolliffe (Ipswich), Mr. Jas. Braddock (Radcliffe), Mr. W. E. Price (Hampton Court), Mr. W. N. Westlake (Exeter), Mr. F. Smallbone (Woodford), Mr. W. B. Farquhar (Ilford), Mr. T. H. Hazell (Newport, Mon.), Mr. Alfred W. Oke (Southampton), Mr. J. R. H. Jacobs (Southampton), Mr. W. A. Schultz (Ascot), Mr. Charles M. Obren (South Suburban), Mr. C. W. Braine (Wandsworth), Mr. Arthur Valon (Westgate), Mr. W. Belton (Sbrevs-bury), Mr. Thomas H. Duxbury (South Shields), Mr. R. W. Edwards (Aldershot), Mr. Stanley C. Sherrard (Kingston-on-Thames), and Mr. B. R. Green (Mitcham).

GENERAL BUSINESS.

The SECRETARY (Mr. Fred. E. Cooper) read the minutes of the last annual general meeting; and they were confirmed.

It was stated that apologies for absence had been received from Mr. Frank Bush, Mr. Alderman Hart, Mr. S. Y. Shcubridge, and Mr. Thomas May.

ANNUAL REPORT AND ACCOUNTS.

The SECRETARY next read the Committee's annual report and the accounts. The former was as follows:—

The Committee submit the revenue account and balance-sheet for the year ending October, 1909, together with a report of the proceedings of the Association during that period.

It will be seen from the revenue account that the receipts for the year were £565 5s., and the expenditure was £561 14s. 5d., which leaves a credit balance on the year's working of £3 10s. 7d.

As appears by the balance-sheet, the Association's assets now amount to £1928, which is represented by £1690 16s. 2d. 2½ per cent. consolidated stock at cost price—viz., £1522 11s. (including therein £175 17s. 2d. stock purchased since the last annual general meeting of the Association); balance at bank, £398 17s.; and cash in hand, £6 14s. 5d.

The Committee continued their active opposition to the Coal Mines (Eight Hours) Bill, and members of the Committee attended meetings which were held in opposition to the Bill at the offices of the Shipping Federation on Dec. 9, 1908, and at the Cannon Street Hotel on Dec. 14, 1908; and the Secretary sent out various circulars relating to the Bill and tickets of admission to the last-mentioned meeting to the members of the Association. They also subscribed £100 to the Coal Consumers' Defence League, and obtained special contributions from some members of the Association towards the League's expenses; the total amount received (including an amount of £75 received last year) being £275 2s., which was handed over to the League. The Committee also presented a petition to the House of Lords against the Bill, praying their Lordships not to pass the Bill into law, which was signed by Mr. Jones as Chairman of the Association. The Committee regret to say that, notwithstanding the active opposition offered by themselves and others to the Bill, it eventually passed into law.

The Committee, in conjunction with the Institution of Gas Engineers, proceeded with the Bill for making the "Metropolitan" argand burner No. 2 the standard burner for testing; and on Feb. 11, 1909, a deputation, comprising the members of this Committee who were appointed a Special Committee to deal with the Bill, Mr. C. C. Carpenter, and four members of the Parliamentary Committee of the Institution of Gas Engineers, was received by Mr. Tennant, the Parliamentary Secretary of the Board of Trade.

Mr. Jones, Mr. Corbet Woodall, Mr. Glover, and Mr. Hanbury Thomas addressed Mr. Tennant on the subject of the Bill, and Mr. Carpenter produced the new burner, and explained in detail its mode of working and the necessities for its adoption. Mr. Tennant, in reply, admitted the desirability of having a uniform system for testing, but pointed out difficulties which were in the way of the Board of Trade dealing with the matter as proposed by the deputation, and concluded by promising to give the matter his careful consideration, and to report to the President of the Board of Trade thereon. The Board of Trade have not since the date of the deputation given any official intimation of their intentions with regard to the Bill; but it is understood unofficially that the Board do not see their way to taking up the Bill.

The Committee have further considered the matter, and have decided to take steps for the promotion of a Bill in the ensuing session of Parliament on lines similar to the Gas Companies (Removal of Sulphur Restrictions) Bills, authorizing the gas companies who may join in such promotion to use the new burner in substitution for that now used by such companies. The Secretary was accordingly directed to send out a circular inviting gas companies to co-operate in the promotion of the Bill, and to attend a meeting on the subject to be held on the date of, and prior to, the annual general meeting; and the Chairman will report at the annual general meeting the result of that meeting. The Committee recommend the Association to vote a sum of £200 towards the expenses of promoting the Bill.

The Committee have had under consideration the recent circular issued by the Inland Revenue authorities with reference to the future disallowance of depreciation of gas plant for income-tax purposes. They are watching the progress of events on this point; but in the meanwhile they deem it advisable to advise the members not to accept the Inland Revenue Department's proposal.

The Committee are still directing their attention to the unfair manner in which local authorities owning electrical undertakings compete with gas companies by supplying energy at less than cost price, at the cost of the rates; and they would be glad if any members could give them any information which would strengthen them in dealing with the matter.

In accordance with the suggestion made by Mr. May at the last meeting,

the Committee have had prepared a panel of members of either House of Parliament interested in gas matters. Earl Wemyss has given notice of his intention to move from his place in the House of Lords a resolution empowering the important societies and organizations connected with the professions and trades of the United Kingdom to name three peers in each Parliament to speak and act on behalf of such societies on all questions in which they are interested; and his Lordship invited this Association's support in the matter. The Committee consider that the proposal is of benefit to the gas industry, and have so informed his Lordship.

The most important matters upon which the Secretary has been consulted during the last year are as follows: Disqualification of gas shareholders as parish or district councillors. Power of gas company to lay tramroad across public road without statutory authority. Liability of consumer for damage caused to meter by fire. Liability of consumer for money stolen from meter. Questions *re* income-tax assessment. Right of gas company to write off amount for depreciation of automatic supplies. Right of Surveyor of Taxes to demand production of gas company's accounts. Depth at which gas mains should be laid in roads. Liability of gas company for damage caused by explosion. Right of share or debenture holders to inspect register of share and debenture holders of a gas company. Right of rural district council to obtain Provisional Order for supplying gas and of gas company to supply such council with gas in bulk. Procedure of opposition to Bill by a gas company. Exemption from distress of fittings let out on hire. Right of a railway company to supply gas in a district already supplied by a gas company. Right of a corporation to supply electricity outside its limits of supply. Application of section 3 of the Gas-Works Clauses Act, 1871, to statutory companies authorized previous to the passing of the Act. Rating of gas-works. Right of a councillor, being a shareholder in a gas company, to vote on matters of public lighting. Right of consumer to demand special discount from company in certain cases. Necessity of stamping letters of allotment. Registration of letters of administration by administratrix. Responsibility of secretary as to stamp duty on transfers. Restrictions regarding laying of electric mains near gas-mains. Right of gas company to lay mains on private property abutting upon public thoroughfare. Allowance by income-tax authorities for wear and tear of plant and machinery. Right of local authority to require a gas company to submit plans of buildings to be erected. Company's right to refuse supply of gas to a consumer whose supply has been discontinued by reason of non-payment of outstanding account. Registration of shares transmitted by death of a shareholder in a gas company. Necessity of gas company to fill vacancy on board caused by the death of a director. Right of a gas company owning land on one side of a road to construct a viaduct over such road with consent of owner of land on opposite side. Right of a gas company to stop supply of gas to consumer who disputes accuracy of meter. Procedure of gas company in case of difference respecting tests of meters. Purchase of gas undertakings by local authorities. Stamp duty payable by a gas company on re-incorporation.

The number of members of the Association is now 110, of whom five joined during the last year.

The Committee record with much regret the death of Mr. Thornton Andrews, who was one of the founders of the Association, and was a member of the Committee from its inception up to the time of his death. In accordance with No. 9 of the Association's rules, the Committee appointed Mr. George Andrews a member of the Committee in place of Mr. Thornton Andrews.

The following gentlemen retire from the Committee in accordance with Rule 9: Mr. Edward Allen (Liverpool United Gas Company), Mr. George Andrews (Swansea Gaslight Company), Mr. Charles E. Botley (Hastings and St. Leonards Gas Company), Mr. George Clarry (Cardiff Gaslight and Coke Company), Mr. Douglas H. Helps (Reading Gas Company), Mr. R. O. Paterson (Cheltenham Gaslight and Coke Company), all of whom offer themselves for re-election. There is also a vacancy on the Committee in consequence of the resignation of Mr. E. W. H. Eady, who, owing to ill-health, has severed his connection with the Southampton Gaslight and Coke Company.

The Secretary has received from Mr. R. O. Paterson and Mr. C. E. Botley notice of their intention to propose Mr. Thomas May (Richmond Gas Company), and from Mr. Thomas Berridge similar notice to propose Mr. William Belton (Shrewsbury Gaslight Company), as members of the Committee.

THE LATE MR. THORNTON ANDREWS.

The CHAIRMAN said they had heard the report and accounts read; and at the outset of his remarks thereon, he would like to express what they would all feel—regret at the loss of their founder member, Mr. Thornton Andrews. He was sure they would wish conveyed to his family the sympathy they felt with them in the bereavement they had suffered. The Committee had made some effort to fill up this vacancy by the appointment of his son, Mr. George Andrews, whom he (the Chairman) was glad to welcome to the meeting. His father was a life-long friend of his (Mr. Jones's); and from what they all knew of Mr. George Andrews, they would feel convinced that the Association had been very much strengthened by his accession to the Committee.

THE ACCOUNTS.

Dealing with the accounts, he said it might be thought that the expenditure appeared somewhat heavy, because there were two large exceptional items of £100 each in connection with the Miners' Eight Hours Bill. They supported the Coal Consumers' Defence League with a subscription of £100, the payment of which was very much advocated by the late Sir George Livesey, and the Association were also made the means of transmitting £100, the special contributions of various companies, to the League. This latter sum, of course, appeared also on the receipts side, which cleared off £100. Practically, therefore, the outlay under this head was only £100. Then there was the expenditure in connection with the preparation of the Standard Burner Bill, which explained the amount of £62 under "Law and Parliamentary Charges," and no doubt helped to swell the petty cash item as well. They would all, he thought, agree that the chief charge—£262 10s., or 250 guineas, for the Secretary's salary, use of offices, clerical staff, &c.—was money well spent in an institution of this sort, which kept them well informed on all points that needed attention. He felt that there was no need of apology for the existence of the Association, in view of the records of past years. Before leaving the accounts, he would suggest that, there being a balance of £405, they might authorize the Committee to invest another £150 or £175 in the coming year. As would be seen from the report, the Committee desired authority to devote £200 to the prosecution of the Burner Bill; but this would still permit of the investment of some such sum as he had named.

THE MINES EIGHT HOURS ACT.

He had just said that they need not apologize for the existence of the Association. This would be admitted, if they considered the record of

the Removal of Sulphur Restrictions Bills three or four sessions ago, and the steps they had been taking all along to try and prevent the passing of the Miners Eight-Hours Bill. This latter measure, now it was law, appeared to have given as little satisfaction to the miners as to anybody else. (Hear, hear.) Disputes, it would be noticed, were continually taking place. It passed one's comprehension why it should have been thought necessary to limit in this way the hours of a body of men who already had two holidays a week, and who were so strongly combined in their Trade Unions that they could be depended upon to get for themselves anything they wanted.

DEPUTATION ON THE BURNER BILL.

The report dealt with the deputation to the Board of Trade on the Burner Bill. It was quite clear that they had called upon the Board to do a little more than they could do without at the same time bringing in a further measure for the rectification of the Gas-Works Clauses Act, which probably might not have suited the members. There were departmental difficulties. Mr. Tennant explained to him after the meeting that it would be quite an unusual course for the Department, unless they acted on some line of general public interest. This movement having resulted in nothing—for the Board of Trade had not since communicated with the Association—their active friend Mr. Botley had been very energetic in putting before them proposals for the promotion of a Bill themselves; and as such a measure would be quite innocuous, and could not hurt anybody, while bringing all those who joined in its promotion to a common basis, the Committee had started the Bill. As it was always somewhat difficult to be sure of support—especially in the case of the smaller companies—the Committee asked the members to authorize them to themselves spend £200 towards the possible expenses of the measure.

THE ASSOCIATION'S PROPOSED BILL.

With reference to the Bill which it was proposed that the Association should promote, he might mention that they had had a most satisfactory response to the circular they had issued suggesting that each company joining should pay (in addition to the Association's £200) a sum of £50, and a further amount based upon their annual make of gas. In some quarters, however, objection was raised by small companies to the fixed contribution of £50; and the Committee had now modified this, and made the standing charge £21. As a very considerable number of important companies had come in, it was quite clear that there would be a large amount of manufacture on which to make the subsequent *pro rata* charge; and therefore the £21 would be sufficient for the purpose. A response had been made by between twenty-five and thirty companies. They had actually had definite promises from some sixteen; and two more had come in since the meeting which was held earlier in the day.* This made a total of eighteen; and there was a group of seven companies controlled by one gentleman which would in every probability all come in directly the fixed sum to be contributed was reduced. Therefore the Committee calculated that they had twenty-five. From what had been heard from others in the room, he had little doubt that the alteration with regard to the preliminary expenses would bring in many more. Every step was being taken to ensure the greatest possible amount of support; and he hoped the number of companies might be increased to forty or fifty. A Committee had been appointed, and an early meeting had been arranged to consider the Bill before it was deposited; so that no time was being lost.

DEPRECIATION AND INCOME-TAX.

There were several matters in the public mind at the present moment with regard to gas supply which the Committee had been keeping their eyes upon, apart from the Miners' Bill and the test burner. Questions had arisen in various parts of the country as to the Inland Revenue authorities refusing to allow depreciation of gas plant for income-tax purposes. In this connection the Committee had had the advantage of the assistance of Mr. W. Cash (of the Bournemouth Gas and Water Company, and also a member of the firm of Messrs. Cash, Stone, and Co.), who was highly competent to deal with this question; and he had given them the result of his own experience of the difficulties that were being raised. He (Mr. Jones) himself had a great contest at Margate with the income-tax collector who claimed arrears, to a very considerable sum, for many years, which claim he afterwards abandoned. It was, however, most discouraging to find that one comparatively small company on the South Coast appeared to have jeopardized their dividend for a time by paying on claims which he thought they would have been better advised if they had resisted. It was a great pity that they did give way, because it was like bleeding a foxhound. The whole question turned on how far they could anticipate the renewal of their things by setting aside depreciation funds. The view of the Department was that they should not set aside funds, but actually charge year by year what would fall in that year, except gasholders and large things which they usually spread over several years. But apart from spreading over, depreciation had been recognized in the past, and would, he thought, continue to be recognized. Gasholders, it was true, would only fall in about every forty years; but when they did fall in, it often represented a third of the value of a small undertaking. The Committee would keep the members advised of any move in this matter; but he would urge them to resist these charges, and have them fully examined. If this were an Association with larger funds at disposal, he would go the length of saying that they should test the question for the members; but he was afraid they could not fight it without money. The testing of these questions was more or less a matter of private interest, as they touched the largest gas companies more than the smaller ones. The largest gas companies' transactions were in hundreds of thousands of pounds; and they could not afford to accept a principle which might ultimately very seriously interfere with their financial position. They should all keep their eyes on what happened in connection with the larger concerns, and themselves refuse to give way to a pressure which, as they all knew, even in a private capacity, was being made more and more unpleasant.

ELECTRICAL COMPETITION.

Another matter to which he wanted to refer was electrical competition. There was a Bill in existence now—it had not yet passed through

* A report of the proceedings at this meeting will be found on the next page.—Ed. J.G.L.

Parliament, and it probably would not pass until next year—giving facilities to electric lighting undertakings. At some stage during the passage of this Bill, he hoped they would have an opportunity of presenting evidence to Parliament so as to point out the hardships which arose where (as they knew took place constantly) an electricity supply was actually given to manufacturers and others at a price below the prime cost; the difference being made up from the rates. This was done largely by the districts in and around London, and the larger towns in the kingdom, by municipal authorities; and the matter had only to be brought well to the knowledge of Parliament, he was sure, to be stopped. It was one of the greatest hardships the gas industry suffered, that they should actually be rated to assist their competitor.

GAS-WORKS WATER SUPPLIES.

There was another matter not mentioned in the report, but which they would have noticed in the Technical Press. This was the question of the supply of water to gas-works in London, a case in regard to which had been fought by the South Suburban Gas Company. They claimed that gas-works were entitled to a supply of water on trade terms for drinking, cooking, lavatories, &c. The law had now been declared to be (and he thought it was understandable) that a gas company needed two supplies—one for slaking coke, washing gas, and feeding boilers; and another supply on a smaller scale for cooking, lavatories, drinking, &c., which must be paid for at the ordinary domestic rate. This would mean, not that they were to pay the rate upon the value of the mains, large buildings, and gasholders, but upon those buildings alone in which special apparatus for using the water was fixed—like the offices for the rental department, the latrines, and the baths of the stokers. He did not think they need be very fearful of anything that would come to them from that. He was, however, rather surprised that the Judge did not animadvert upon the system on which the Water Board strove to charge the Company. They desired to levy a rate on a percentage of the value of the works and the pipes in the streets.

CONCLUSION.

The Secretary had recited in the report the enormous number of useful points that he had to give hints and advice upon. A great many of the matters were such as probably most of them would hardly expect to find asked about. The record indicated the very useful services that were rendered by the Secretary and the Association generally to the smaller members; and he was glad that it should be so. He concluded by moving the adoption of the report and accounts.

Mr. W. BELTON (Shrewsbury) seconded the motion; and it was unanimously carried.

RE-ELECTIONS AND ELECTIONS.

The CHAIRMAN said the next business was the re-election of the members of the Committee who retired by rotation [see report of the Committee]. He should advise those present to re-elect these gentlemen *en bloc*. Nothing could possibly exceed the zeal and attention that were paid to the affairs of the Association by them.

Mr. J. T. JOLLIFFE (Ipswich) seconded the motion; and it was carried unanimously.

The CHAIRMAN said there was only one vacancy now on the Committee. Mr. C. E. Botley and Mr. R. O. Paterson had nominated Mr. T. May, of Richmond; and Mr. T. Berridge, and Mr. George Clarry had nominated Mr. W. Belton.

Mr. PATERSON (Cheltenham) said he rose with a little feeling of regret. At the last meeting, he proposed that Mr. Belton should be elected to the Committee; but it was found that it was not a propitious occasion. That day he was going to pass Mr. Belton; and he knew he would excuse him if he (Mr. Paterson) proposed Mr. May, with the hope that on the next occasion Mr. Belton would obtain a seat on the Committee. He proposed Mr. May now on account of his near residence to London; and while there was work in the next session of Parliament in anticipation, he thought it was exceedingly necessary to have a few more of the members on the Committee who were resident in the neighbourhood of London. Another thing was that Mr. May was not only Manager but Secretary of his Company; and on this account he thought the nomination a good one. He therefore proposed the appointment of Mr. May.

Mr. C. E. BOTLEY (Hastings) seconded the motion, remarking that he was sorry there were not two vacancies. He would like to see Mr. Belton on the Committee. He remembered that both Mr. May and Mr. Belton retired last year because there was someone else who they thought would be of great help to the Association.

Mr. T. BERRIDGE (Leamington) moved that Mr. Belton be elected. He was also sorry that there were not two vacancies, because all that Mr. Paterson had said about Mr. May applied to Mr. Belton. He was a Secretary as well as a Manager, and he had ample time to devote to the duties of a member of the Committee of the Association.

Mr. E. ALLEN (Liverpool), in the absence of Mr. Clarry, seconded the motion.

Mr. GEORGE ANDREWS (Swansea) remarked that he had not quite so much time to devote to the duties of a Committeeman; and he should be glad to withdraw in favour of Mr. Belton, if the meeting would consent.

The CHAIRMAN said the action became the son of his old friend Mr. Thornton Andrews; but he hoped at a future time Mr. Andrews would favour them by his presence again on the Committee as a member.

Thereupon both Mr. May and Mr. Belton were elected.

Proposed by Mr. W. A. SCHULTZ (Ascot), seconded by Mr. W. BELTON, Mr. S. Y. Shoubridge was re-appointed Auditor for the ensuing year.

On the proposition of Mr. BERRIDGE, seconded by Mr. SNELGROVE, a hearty vote of thanks was passed to the Chairman for his conduct in the chair.

The Chairman (Mr. J. A. Doran, J.P.) suggested to the Belfast Gas Committee that they should appoint an inspector to visit the houses of gas consumers to see whether cookers and heaters were being properly used. Consideration of the matter was, however, adjourned for the time being.

"METROPOLITAN" No. 2 TEST BURNER.

Intended Promotion of a Joint Bill.

Previous to the Annual General Meeting of the Gas Companies' Protection Association at the Westminster Palace Hotel last Thursday (the proceedings at which will be found reported on p. 333 of this number), there was a meeting of representatives of companies interested in a Bill which the Association proposed should be promoted to authorize the substitution of the "Metropolitan" argand burner No. 2 in place of the burners now used by the undertakings joining in such Bill. Mr. H. E. JONES, the Chairman of the Association, presided.

SUPPORT FOR THE BILL—REDUCTION OF THE FIXED CONTRIBUTION PER COMPANY.

The SECRETARY (Mr. Fred. E. Cooper), at the outset of the proceedings, said he had to report that the following Companies had definitely decided to join in the Bill: Bath, Bournemouth, Brentford, Croydon, Hampton Court, Hastings and St. Leonards, Ipswich, Liverpool, Reading, Scarborough, Shrewsbury, Swansea, Tunbridge Wells, and Wandsworth and Putney. This made fourteen. In addition, several other Companies had stated that they were willing to join if the basis of contribution were altered. In this category came Newmarket and Prescott. Then Mr. A. F. Phillips (who was, in consequence of a strike in Italy, too busy to be present at the meeting) represented a group of no less than seven companies; and he had said that, if they changed the basis of contribution, he would recommend the whole of these companies to come in, and though he would not pledge them all to do so some certainly would. The smaller companies urged that £50 was too much as a fixed contribution. Some suggested no fixed amount; while others thought the figure should be reduced. Newmarket and Prescott said that if the contribution were reduced, they would be satisfied; and Mr. Phillips remarked that if they made the fixed sum £21, and the balance *pro rata* with the annual output of gas, this would entirely meet his views. If the meeting decided, instead of £50, to make the fixed contribution only £21, he (the Secretary) thought they would have many more companies; and he did not anticipate that any of those who had already signified their intention of coming in on the former basis would drop out. In fact, they were principally big companies; and it would make no difference to them. In the circular which he had sent out to the members notifying the meeting, he said: "It is impossible for my Committee to say what the cost of a Bill will be, as that will depend to a very great extent upon the number of companies who join in its promotion; but I am to point out that the cost to each company will be much less than if a company promoted its own Bill or Order for a similar purpose. The basis of contribution by each company will be a fixed amount of £50, and a further sum based upon the contributing company's annual make of gas."

The CHAIRMAN said it was a pity they did not say the contribution "was proposed to be," because it was a matter that could not be decided by the Committee of the Association. He could not see the slightest objection to reducing the fixed amount to £21. The Association were contributing £200; and they had a right to expect that every company coming in should pay some sum as a fixed amount. He agreed that £21 would be a reasonable sum.

The SECRETARY said many companies had written to ask what were the advantages of the burner; and he had dealt with these inquiries to the best of his ability. In this, Mr. Botley had been good enough to give him assistance. One or two other companies had asked that, before they joined in the Bill, they should be informed of the total amount of cost they would be put to. It was, as pointed out in the circular, impossible to give any information as to that.

The CHAIRMAN suggested that the cost of the Removal of Sulphur Restrictions Bill might be some criterion.

The SECRETARY said that Bill cost £2145; but there was only one opponent—the Newcastle Corporation.

The CHAIRMAN remarked that it was a very severe opposition. If on the present occasion they got thirty companies, the cost to each would really amount to hardly anything at all.

The SECRETARY said one undertaking had raised a question as to whether, in the event of one company being opposed by their local authority, the cost of such opposition would be defrayed by the promoters of the Bill. He explained what was done in the case of the Sulphur Bill, and added that he thought the same would be done here.

The CHAIRMAN: It is a common cause.

The SECRETARY (continuing) said another company had raised a question as to whether they should not include in the Bill a provision reducing the illuminating power. (No, no.)

The CHAIRMAN: It is much too thorny.

The SECRETARY remarked that it was necessary for any company who intended to join in the Bill to give the earliest possible notification. Otherwise they might find they came too late for their name to be included in it. The latest date was impossible to state, because it depended on the last days for the first insertion of the Parliamentary Notice. It might possibly happen that some company's district had a paper published on Monday, in which case the latest date would be Nov. 15. The Parliamentary Agent must, however, be notified a day or two before that.

The CHAIRMAN remarked that it was really in connection with these advertisements that the chief part of the expense came in.

Mr. W. BELTON (Shrewsbury) proposed that the fixed contribution be reduced to £21, the remainder to be *pro rata* with the contributing company's annual make of gas.

Mr. C. E. BOTLEY (Hastings) seconded, remarking that, while he thought the basis of £50 was rather high for some of the smaller companies, on the other hand it seemed to him that they could not do away with a fixed contribution of some kind.

The resolution was carried.

Mr. J. E. HALL (Prescot) said he thought he could guarantee that his Directors would join in the Bill, now that the fixed contribution had been reduced.

Mr. T. H. HAZELL (Newport, Mon.) stated that his Company would also join in the promotion of the Bill.

The CHAIRMAN said that if any representative present knew of any circumstance in his particular case that might vary the course of the proceedings by raising special opposition, it would be useful to discuss it now, though he could not conceive from his knowledge of Acts of Parliament that there should be. All they were asking for was to be put on a common basis of testing, so that, whatever their illuminating power might be, it should have the same relation to other illuminating powers.

A short discussion then took place on suggestions made with regard to the Bill, in the course of which,

Mr. F. SMALLBONE asked whether it would not be well to include the 10-candle pentane standard.

The CHAIRMAN, in reply, indicated that there was some divergence of opinion on this point; and said it was perhaps well at this stage not to introduce anything controversial.

A COMMITTEE APPOINTED.

The CHAIRMAN remarked that the next thing to do was to appoint some representatives of the companies joining in the Bill to act, together with the Committee of the Association, as a Special Committee to deal with the Bill. He thought there was one gentleman who must be included, because he was the inventor of the burner, and would probably have to explain its use to the Parliamentary Committee. He referred, of course, to Mr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company.

Eventually the following gentlemen were chosen to act with the Committee of the Association: Mr. W. Belton (Sbrowsbury); Mr. Charles Carpenter; Mr. W. Cash (Messrs. Cash, Stone, and Co.); Mr. Andrew Dougall (Tunbridge Wells); Mr. T. H. Hazell (Newport, Mon.); Mr. J. W. Helps (Croydon); Mr. A. A. Johnston (Brentford); Mr. J. T. Jolliffe (Ipswich); Mr. A. F. Phillips; and Mr. Harold W. Woodall (Bournemouth).

The CHAIRMAN said there were here ten names, in addition to the Committee of the Association. He thought, however, that, as this was rather a hasty meeting, they might give the Committee as now constituted authority to co-opt other members whose assistance might, at any stage of the inquiry, appear likely to be of valuable service to them.

This was agreed to.

DATE FOR THE ASSEMBLING OF THE COMMITTEE.

The CHAIRMAN pointed out that an early date should be decided upon for the Committee to assemble, for the purpose of approving a draft of the Bill and considering any questions that might arise.

It was decided that this meeting should take place at the Westminster Palace Hotel at 1.30 next Thursday (the 4th inst.).

LOCAL AUTHORITIES AND THE BILL—OBJECT SET FORTH.

Mr. W. CASH thought that, before the present meeting adjourned, it would be an advantage if the Chairman would give them his views as to the procedure to be adopted by the companies joining in the Bill in approaching the local authorities. Should they approach them at once, and explain (with the hope of avoiding opposition to the Bill when it came before Parliament) that the proposal was not so serious and terrible a one as they might otherwise think?

The CHAIRMAN said his advice would be that they should lose no time whatever in approaching their local authorities. They should do it as soon as ever the notice of the Bill was out, or even beforehand. They should explain that the present condition of things was very unsatisfactory. The preamble of the Bill which was originally drafted and submitted to the Board of Trade contained the whole argument; and he thought no reasonable member of a local authority would fail to be convinced by it. Whether they happened to be a sliding-scale or a maximum-dividend company, it could also be explained that, directly any circumstance arose which increased the profit, the gain would be shared with the consumers. The great object of the Bill was to get at the truth. When they talked to each other about illuminating power, unless in each case it was ascertained by the same burner or one like it, they were quite at sea, and were not comparing the same things at all. Many remarks were made upon the good and bad conduct of gas undertakings upon figures which had in different cases been arrived at by different methods. It might be well to reproduce the preamble of the original Bill to which he had just referred.

The object of the Bill is to prescribe a standard burner which will afford a common basis of testing for illuminating power, so that the returns everywhere in the United Kingdom would be comparable, and so that all parties dealing with gas lighting questions from the Houses of Parliament down to the consumer of gas would have a definite standard of comparison.

At present, there is no general standard or system of testing the illuminating power of gas supplied by the numerous gas undertakings of the kingdom outside the system controlling the supply of the three Metropolitan Gas Companies known as the Gaslight and Coke Company, the South Metropolitan Gas Company, and the Commercial Gas Company. The gas supplied by those Companies has been for some time past tested by means of the "Metropolitan" argand (No. 2) burner, which was adopted by the London Gas Referees.

As the Gas-Works Clauses Act, 1871, leaves the burner to be prescribed by the Special Act, it has come about that there is a very great variety in the types of burners prescribed; and much confusion and inconvenience arise from the absence of uniformity.

Before 1868, the common definition of the burner to be used in the Acts of Parliament was simply that it be a 15-hole argand burner with a 7-inch chimney.

This definition contained no dimensions beyond the height of the chimney, and clearly covered an enormous variety of proportions by way of the holes admitting gas and the central hole admitting air, and also the space between the chimney and burner also admitting air; and as these burners were originally of corrodible metal, they all soon went out of order through rust or corrosion choking the gas-orifices.

Mr. William Sugg, as he proved before the Parliamentary Committee on London Gas, 1867, got rid of this choking by the invention of the steatite non-corrodible top; and having studied the efficiency of the burners, he made the internal hole for air somewhat larger for the richer qualities of gas than for the poorer kind.

Dr. Letheby, towards 1860, experimented, in conjunction with Mr. Sugg,

with a burner having 15 holes and a 7-inch chimney; but he ear-marked it as to its dimensions by the description of "The Sugg Letheby Standard Burner," which was suitable for burning gas of about 16 candles. This burner has been prescribed in a number of Special Acts.

The appointment of the Metropolitan Gas Referees by the Board of Trade under the City of London Gas Act, 1868, resulted in a distinct advance in the then knowledge of the question, and ultimately led to the adoption, after the necessary investigation, of a burner which was described as the "London" argand No. 1 burner, which was fitted according to the best knowledge of that time for burning exactly 5 feet of gas of 16½-candle power per hour.

That burner was found to be unsuitable for the gas when it varied in quality, and was therefore abandoned by the London Gas Referees in 1906 for the burner now used by them described as the "Metropolitan" argand No. 2, and a model of which has been deposited with the Warden of the Standards.

It has been proved that, owing to the adjustability of its air supply, the last-mentioned burner gives a fair and true result for all qualities of gas of from 10 to 20 candles, which range covers (apart from canal gas) the obligations of all gas companies, for all varieties and mixtures of various illuminating gases, and it brings the results within the requirement laid down by Parliament in 1868—namely, that the burner should be one which would obtain the greatest amount of light possible from the gas while being practicable for use by the consumer.

The object of this Bill is to enact that this last-mentioned burner shall be the standard burner for use throughout the country for testing for illuminating power under the Gas-Works Clauses Act, 1871, and that such burner shall be deemed the prescribed burner within the meaning of that Act.

The passing of this Bill would relieve the Board of Trade of much departmental work in connection with the granting of Provisional Orders under the Gas and Water-Works Facilities Act, 1870, as well as in relation to the giving of its approval of the adoption of the standard burner in lieu of that prescribed in any particular Special Act or Provisional Order.

Further, Committees sitting in Parliament on Gas Bills would be able to rely upon the returns given to them, and thus have greater confidence as to the effect of their decisions so far as the question of the test-burner is involved.

PRESENT USE OF THE BURNER.

Mr. D. H. HELPS (Reading) said it was most desirable that as many companies as possible should join in the promotion of this Bill; and it might be that some of the smaller concerns did not realize that fifty undertakings had already been granted the use of this burner.

The SECRETARY: Over fifty gas companies—apart from local authorities' undertakings.

Mr. HELPS (continuing) remarked that many of these undertakings were owned by municipalities; and in those towns, if any cheapening of the gas took place, the consumer might not get the benefit as he would in the case of concerns belonging to companies. It was a most important point that so many undertakings had already been granted the use of the burner.

The proceedings terminated with a vote of thanks to the Chairman for presiding—on the motion of Mr. CASH, seconded by Mr. BELTON.

AFFAIRS OF TICEHURST WATER AND GAS COMPANY.

Stormy Meeting of Dissatisfied Shareholders.

The Ordinary General Meeting of this Company was held last Tuesday, at the Institute of Chartered Accountants, Moorgate Place, E.C.—Mr. W. B. MARTIN (the Chairman of the Company) presiding.

The meeting was convened by public advertisements which appeared on the 5th of October. But in the interval an action had been commenced on behalf of some of the debenture holders for the appointment of a receiver, and, as reported in the "JOURNAL" last week, they were successful.

The CHAIRMAN, in submitting the report for the period from Jan. 1, 1905, to Dec. 31, 1908, expressed the regret of the Directors and himself at the delay in sending out the accounts, and pointed out that the present Board were not responsible for the whole of the period which had elapsed since the previous accounts were submitted. In 1907, the then Directors, with one exception, resigned, and the present Board were constituted. On going into the affairs of the Company, they were found to be in an extremely unsatisfactory condition; and on account of the absence of information and the manner in which the books of the Company had been kept during the previous two years, and of the delay in handing them over, a considerable time elapsed before the Directors were able to ascertain, even approximately, the position of the concern. Between Dec. 31, 1904, and Dec. 31, 1908, no regular accounts appear to have been kept; no invoices and receipts were to be found; and the income from the rentals was accounted for in such a haphazard manner that it was impossible to check it. On taking office in 1907, the present directorate devoted their attention to increasing revenue and effecting economies; and the result of their efforts, under the most adverse circumstances, had been to raise the Company's income from £2000 to £2700, and there was every prospect that the increase would continue. There had been obtained 115 new services for water and 65 for gas. With regard to the capital account, it appeared that the total amount payable under the contracts which were entered into for the acquisition of some of the works and construction of others, for equipping both works with machinery and plant, laying water and gas mains, and the construction of the pumping-station, reservoir, &c., came to £34,750. This amount, however, included all the costs of obtaining two Acts of Parliament, and also the issue of the Company's capital, and of sinking wells for obtaining a guaranteed supply of water; the quantity secured being more than sufficient for supplying the whole of the Company's district. Passing on to deal with the circular issued by one of the shareholders (Mr. C. S. Glover), to which reference was made last week, the Chairman described it as of a very unusual character, and containing a reference to a number of companies with which the Ticehurst Company had nothing whatever to do, and stating that no debenture interest had been paid since the new Board took office. This he (the Chairman) characterized as incorrect; and he asserted that since the Board's appointment in 1907 the Directors had obtained sums amounting in the aggregate to about £2700 for the purpose of discharging pressing liabilities incurred by the previous Board,

and for carrying on the works. The whole of this sum had been obtained without any security whatever other than the undertaking of the Directors to repay the money at a convenient date. In the absence of such financial assistance, the undertaking would, without question, have been in the hands of the Company's creditors some time ago. Moreover, the Secretary of the Company had written to Mr. Glover offering to meet a Committee of the shareholders. But the invitation was responded to only by Mr. Glover's solicitor and a gentleman described as Mr. Glover's book-keeper; and so the Directors decided to convene the present meeting, and place themselves and their resignations entirely in the hands of the shareholders.

Mr. GLOVER, the shareholder who had issued the circular, then addressed the meeting. He said he had come prepared with a report which, he contended, showed that the capital cost of the water and gas works was out of all proportion to their extent. The report was made by Mr. F. G. Anderson, an engineer who had been commissioned to examine the Company's properties. Mr. Glover stated that it would be necessary to spend between £600 and £800 upon the Ticehurst Gas-Works in order to put them on a profitable basis. Many improvements would have to be carried out on the Wadhurst works; and it was estimated that these alterations could not be made for less than £1000. The work done at the water-works was valued at £7930, at the Ticehurst works at £4013, and at the Wadhurst works at £3700. The report was dated the 21st of October last.

Mr. HOOPER, another shareholder, said they had been invited to hear the accounts of the Company from Jan. 1, 1905, to Dec. 31, 1908; and now, having met, they found no properly audited accounts, nor anything that could enlighten them as to where the Company stood and what had become of the shareholders' money. The Chairman had plenty to say about the enormities of Mr. Glover; but although the Directors had been in office since 1907, they could not produce for the inspection of shareholders a set of accounts signed and audited.

The CHAIRMAN interposed to say that the accounts, though not audited in the full sense of the term, had been signed.

Mr. HOOPER rejoined that there was no signature on the copy of the accounts which had been sent to him, nor had he been able to discover any shareholder who had received a signed statement. In these circumstances, he must continue to consider and to refer to the accounts as unsigned; and, according to the Chairman's own admissions, they had not been properly audited. The books and accounts were confessedly in a hopeless muddle, and the Chairman endeavoured to absolve himself and his colleagues by saying that they had not been on the directorate the whole of the period during which the accounts were permitted to get into this disgraceful condition. But the three gentlemen who now represented the Board had been among the original Directors; and so the attempted exculpation by the Chairman was a piece of barefaced audacity. All things considered, Mr. Glover's circular was neither out of place nor inaccurate. A disgraceful condition of affairs prevailed, for even the collections of revenue were not satisfactorily accounted for.

The CHAIRMAN again interposed, and denied having expressed dissatisfaction with the collection of the revenues or with the collector (Mr. A. W. Lunt), in whom the Board had every confidence.

Mr. HOOPER insisted that the absence of receipts and vouchers showed there was no absolute or accurate record of collections.

At this point, Mr. Lunt was asked to explain in detail how he dealt with collections. He stated that from day to day he paid the collections into his own private account, and at the end of each week sent on his cheque for the full amount to Mr. Preston. Asked why the cheque was sent to Mr. Preston rather than direct to the Secretary of the Company, he replied that he acted under instructions from the Chairman. On the latter being called upon to explain, he stated that Mr. Preston, who was among the original shareholders of the Company, was a creditor for upwards of £2000, for money advanced; and Mr. Lunt's cheque was sent to him as a sort of reassurance that the revenues of the Company were not diminishing. Asked what security Mr. Preston had for his loan, the Chairman replied that he held no security but the guarantee of the directorate; and he added that Mr. Preston was actuated solely by the desire of befriending the Company. This statement evoked derisive interruptions; one shareholder crying out: "All for pure love of doing good." The Chairman emphasized the fact that the cheque of the collector was made payable to the Company, and that in every case it was forwarded by Mr. Preston to the Secretary, and paid into the Company's banking account.

Mr. HOOPER continued his criticism of the action of the Board in respect to the accounts, and concluded by proposing a resolution that the report of Messrs. Archer and Capes, of Sept. 2, 1909, to the Directors and Shareholders of the Ticehurst and District Water and Gas Company, be handed over to the Receiver appointed on behalf of the debenture holders.

Mr. GLOVER seconded this motion, which, on a show of hands, was declared carried.

Mr. JERVIS, representing the debenture holders, questioned the Chairman as to an item of £8000 alleged to be owing to the Company by Mr. Eaton on a number of shares.

The CHAIRMAN replied that the money was due from Mr. Eaton; but he admitted that the Board had never taken any steps to collect it.

The remark provoked much disorder.

Mr. EATON thereupon rose and said that, notwithstanding the statement of the Chairman, he denied the debt. The shares had never been allocated to him, but were given as collateral security for money advanced to the Company; and he held a letter to that effect. He had returned the shares to the Company two years ago.

A search of the register then took place to discover if there had been any entry of the receipt of these shares; and the announcement was made that no entry could be found.

Amid a scene of some disorder, Mr. HOOPER moved that the meeting be adjourned to Tuesday, the 16th of November, at the same place, and that in the interval Messrs. Saker and Davis be employed on behalf of the shareholders to prepare a balance-sheet, and that the accounts submitted be not passed, nor the resignations of the Directors considered.

The motion was carried almost unanimously; and the proceedings, which lasted upwards of two hours, were brought to a close.

DANISH GAS COMPANY.

Transfer of the Randers Works to the Municipality—New Works at Flensburg—Investment of Reserve Moneys.

The Annual Meeting of the Company was held last Thursday, at the London Agency, Millbank House, Westminster, S.W.—Mr. CORBET WOODALL in the chair.

The LONDON AGENT (Mr. H. G. Warren) read the notice convening the meeting; and the Directors' report and accounts, already referred to in the "JOURNAL," were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said he thought they were, on the whole, very satisfactory. The expended capital had been increased in the year by £69,470, of which £33,618 was spent at Flensburg, in further construction of the new works; £16,000 at Aalborg and Randers upon the building of additional gasholders; £15,000 on mains and distribution plant; and the remainder was accounted for by sundry extensions at the various stations. On the other hand, the capital had been written down by £77,244, which represented the value of the Randers undertaking as it stood in the books of the Company in April last, when it was transferred to the Municipal Council. No allowance for depreciation of the Randers property had been made in the accounts. But, as the shareholders were aware, they had a reserve and depreciation fund which was intended to cover all possible depreciation of the contracts; and from this the sum necessary to balance the Randers capital had been transferred. He might say the amount taken from the reserve and depreciation account did not equal the proportion of the amount which had been set aside on account of Randers. The capital employed by the Company (which was £838,511 at the opening of the year) was carried forward at £830,737—the reduction being the difference between the amount which had been spent in extension of the works, and the amount he had referred to as having been written off on account of Randers. Acting upon the authority given to the Directors by the shareholders a year ago, 3500 of the shares held by the Company were cancelled; and the amount of their value (£35,000) transferred to reserve and redemption account. A like number of ordinary £10 shares were issued, and realized £44,327, of which £9327 was premium. This transaction left the capital account undisturbed, except by the introduction of the premiums named. The net profit was £66,228, and was practically the same as last year; there having been an increase of £37 only. Coal and oil had cost less; and more gas was sold by 40 million cubic feet. The price charged was, however, less under the sliding-scale operating in Denmark by an average of 2d. per 1000 cubic feet; and they had spent more upon maintenance and depreciation of works and plant, and also in wages. So that the saving in coal, and the increased revenue from the additional gas sold, had been balanced by these counter-charges. The loss on exchange had been £782 less than the previous year, owing to the smaller amount remitted from Denmark to London, and to the lower rate of exchange. The fire insurance account had been increased by the addition of £1000, plus interest on investments £266; and it now stood at £8891. The Directors had transferred £13,000 from profit and loss to the reserve and redemption account; being £2000 more than in the preceding year. The fund had also been increased by £3469 interest on investments, and by £7000 the dividend on the investment in the shares of the Company. The total amount of the fund was now £228,882. He might say that, in future, if the contribution to this fund was to be equal to what it had been in the past year, they would have to take £3500 more from the revenue account, because, instead of receiving £7000 (to which he had referred) on the shares invested, they would receive only £3500, seeing that £35,000 had been transferred to reserve and redemption account. The balance available for dividend was £80,257, less the interim dividend, costing £18,250, and paid in March last. Out of the £62,007 remaining, it was proposed to pay a final dividend of 2½ per cent. and 5 per cent. on the preference and ordinary shares respectively, as well as a bonus of 1 per cent. on the ordinary shares. These dividends would absorb £25,250, and leave £36,737 to be carried forward. This was slightly less than last year. The dividend this year was increased by £750 by reason of the preference shares, which were issued last year, and upon which they then only paid a quarter's dividend, while this year they had to pay for the whole year. The transfer of the Company's undertaking at Randers to the Municipality took place as from April 1 last. The value was settled by two capable Arbitrators; and although the amount was somewhat less than the Board anticipated, the award was unquestionably a fair and honest one. In addition to the valuation of the works in action, the purchasers took over at cost a new gasholder and tank and certain workshops, which had just been completed. They also paid the Company compensation for the profits which would have accrued between the date of purchase and the end of the year 1914, which was the date of completion of the contract. The sum which had had to be taken from the redemption account did not exhaust the amount which had been provided for Randers. It went without saying that the Directors regretted the loss of this station, where the Company had supplied gas for 54 years. They thought it probable that they could have offered terms to the town which would have been as advantageous to the citizens as the transfer. There was, however, a strong feeling in favour of taking over the property, due possibly, to some extent, to the fact that the Municipality already owned the electric lighting works. It was a matter of satisfaction to the Directors that, in leaving the town, they were leaving behind them a good name. The relations of the Company with the Municipality throughout had been of a very friendly character. It would interest the shareholders to know that the loss of the station, measured by the number of meters in use, had been more than made up by the growth of the Company's business elsewhere within the year—that was to say, in the one year they had issued more meters than were in use in the town of Randers. At Flensburg, although the new works were nearly completed, it had been decided not to light them up this winter. The delay had arisen chiefly from the construction of a bulwark along the Fjord—a work which was being done for the Company, and not by their own officers. The Magistrates of the town had agreed to the extension by one year of

the time within which the site of the old works had to be surrendered. The Directors were pleased with the new works, which, when completed, would be well worthy of the town. The delay in transferring the manufacture from the old works would enable them to get so much more duty out of the apparatus which would eventually have to be abandoned. To this extent there would be advantage to both parties. The Company would have no difficulty in supplying from the old works during the coming winter. Of the contract with Flensburg, only five years remained unexpired, so that when they got to work in the summer of next year at the new station, there would only be five years in front of the Company within which to earn their share of the cost of the new works.

Lieut.-Col. T. H. LEWIN seconded the motion.

Mr. A. BAIRD said at the last meeting he took the opportunity of making a few remarks regarding the financial position of the Company. Before calling attention to one or two items in the present report and balance-sheet, he was sure he should be expressing the feelings of all the shareholders present when he said that they had listened with very great interest and pleasure, as they always did, to the Chairman's remarks. His information was always satisfactory, instructive, and explanatory. Looking back on the Company's history for the last few years, the shareholders could not help being struck by the large capital outlay that had taken place, involving a correspondingly large increase in the issue of ordinary and preferred shares. The issued capital now stood at £125,000 higher than it did five years ago. In addition, there was an item of £30,000 to debit of capital account, and £16,000 overdraft at the bankers—making £170,000 altogether; and this was represented by the additional amounts expended on works, &c. It was very satisfactory to note that the increase in the consumption of gas had fully responded to this large outlay, and that this now amounted to nearly 30 per cent., he thought, during the period mentioned. But there had been practically no increase in the net profits during the last four years, which was not altogether satisfactory. The profits, however, were still large enough to give a satisfactory return to the ordinary shareholders; and he hoped the low price of coal which now prevailed would tend to improve the profits this year, notwithstanding the early hours which now appeared to be kept by the Danes. What he was particularly desirous of calling attention to was that, while this large increase of capital liabilities was going on, the amount of the reserve fund investment outside the business remained almost stationary. It was true that year by year a considerable amount was placed to the credit of the reserve and redemption account (and more this year than usual); and the item under the joint heading had now reached the respectable sum of £229,000. But when one came to ask the question, "Where is all this money gone to?" one found that only £105,000 had been invested; and the larger amount of £125,000 had disappeared in the business. He had always held that, in an industrial undertaking such as this, the only sound way of treating the reserve fund was to have it available for any emergency that might arise; and the proper way to deal with depreciation was to write off year by year a percentage of the amount standing to the debit of gas-works plant, machinery, and so on. He considered it a mistake (and he said this with great respect) lumping these two items together; and he should have thought it desirable to have kept them apart. He could not, therefore, regard as satisfactory the argument the Chairman used at the last meeting, that it was better to employ a considerable portion of the reserve fund in the business, because they thereby derived a larger return from it. To his mind, the object of a reserve fund was not to earn money, but to secure safety, and to have it in a form easy to call upon if required. It was altogether misleading to describe the £229,000 as a reserve and redemption fund, when only £105,000 was available if it should ever be wanted. As he had said before, the larger portion (£125,000) was merely a book entry, and not an amount of cash available for a possible emergency. He was afraid the arguments he had used did not commend themselves to the Board—at least, they did not appeal to them before. He hoped, however, they would give them further consideration, and perhaps modify the methods which had been adopted. He should like to add that he did not make these remarks in any hostile spirit to the Company; but only in order that their finances might be placed on a more satisfactory basis.

The CHAIRMAN said he could for his colleagues, as he did wholeheartedly for himself, say that they always listened to Mr. Baird's criticism of the finances with pleasure; and their thanks were due to him for the care with which he prepared them. This was the third time, he thought, that Mr. Baird had brought forward the question of the investment of the reserves. He would promise him again that the Board would take what he had said very carefully into consideration. But he thought it would be a little unworthy on his part if he did not say that the opinion he expressed on the last occasion remained his opinion that day; and that, so far as he knew, there was no difference between the members of the Board on the question. Mr. Baird had spoken of the £125,000 which was not invested out of the amount of the reserve fund as having disappeared, and as being merely a book entry. As a matter of fact, every penny of it was invested in the works, and was earning its full proportion of profits as though capital of the Company. If the Directors were to put the £125,000 by, then they would have to call up an equal amount of capital, which would cost about 6 per cent., in order that, having called it up at 6 per cent. they might invest it at 3½ per cent. He perfectly recognized the advantage of having money ready to call upon when required; but the Board had felt they had met this amply by investing £100,000 in securities outside the Company. And at present they had no intention of increasing this amount, except in so far as it automatically increased by the addition of the interest upon it from time to time. He did not think Mr. Baird quite appreciated the position of the Company. The Company had terminable contracts in several towns. The result was that their calls for capital would probably be less in the future than they had been in the past. They had as an illustration this year the loss of Randers. The Directors were sorry indeed to lose this station. They could not help it; it had to go. The contract terminated in 1914; and the Municipality were particularly anxious to take possession just now. The Board came to an arrangement which was quite satisfactory between the Municipality and the Company; and the Company were given a sum which capitalized the profits that would have been earned in the years that

intervened between now and when the transfer would, in the ordinary course, have taken place. What was the result of the transaction? Instead of wanting money from the reserve, they had increased the amount of the reserve by reason of the loss of Randers. Mr. Baird referred to the fact that the Company were £16,000 in debt to their bankers. This had been paid off from money received from Randers; and the amount of the investments had been increased. From 1906, the outside investments had gone up by £20,000, which was 25 per cent. on what they were in 1906. His difficulty was that he could not see the necessity for this large sum lying by. If they were a rapidly increasing Company, with new contracts to provide for, he could see it; but when they were having from time to time large sums of money coming in by reason of the termination of contracts, he must say he failed to see why they should be calling up capital in order to put it into reserve. There was nothing in the outlook in the nature of an emergency likely to call for large sums of money. As to writing-off depreciation, they were constantly doing so. The depreciations were carried out in the most liberal spirit; and they were upholding the undertaking in the best possible condition.

The motion was unanimously carried.

On the proposition of Lieut.-Col. DAVIDSON, seconded by the Hon. N. M. FARRER, the dividends mentioned in the Chairman's speech were declared.

Moved by the CHAIRMAN, and seconded by Mr. R. S. GARDINER, Mr. J. H. Birchenough, C.M.G., was re-elected a Director; and proposed by Mr. M. M. BIDDER, seconded by Mr. F. D. MARSHALL, the Auditors (Mr. Edwin Waterhouse, F.C.A., and Major E. A. Critchley) were re-appointed.

On the proposition of Mr. BAIRD, seconded by the Hon. N. M. FARRER, a hearty vote of thanks was passed to the Chairman and Directors and the officers and staffs at home and abroad.

CEARA GAS COMPANY, LIMITED.

A Satisfactory Report.

The Annual General Meeting of this Company was held last Friday, at the London Offices, No. 9, Queen Street Place, E.C.—Mr. F. A. WALLROTH in the chair.

The SECRETARY (Mr. George R. Guyatt) read the notice convening the meeting and the Auditor's certificate. The report and accounts were taken as read. The report was noticed last week, p. 272.

The CHAIRMAN said it was a pleasure for the Board to meet the shareholders and present the report and accounts, which they deemed very satisfactory. The net profit was not so much as last year, which was their record year; but with this exception, it was the largest they had had. It was £1240 less than last year; and this was entirely accounted for by the decrease in profit on products and fittings. As regarded the profit and loss account, taking it somewhat in detail, there was an increase in coals carbonized of £570, in maintenance of £754, and in salaries of £200. Bad debts were a little less. The Directors' fees were now £630, as they always used to be until the bad times of the drought, when they reduced them by £100 till these times passed away. The proprietors would remember that at the last meeting the Board thought that the time had come to revert to the old state of things. General charges were £160 more, and interest on debentures a little less. There was one holder desirous of being paid; and as the Company had the money in hand, the Directors were glad to do it—seeing that the money invested only brought in 3½ per cent., whereas they were paying 6 per cent. on the debentures. The debentures (of which there were £10,300 outstanding) would fall due at the end of 1910; and the Company had invested in trustee securities £12,000. There might be a little depreciation on this; but it was more than covered by the interest received on the investments. The loss on exchange was not so great by nearly £1000; but this was mainly due to less having been remitted last year. Commission was a little less. On the other side, gas supplied was £700 more; but the receipts from products and fittings were £1260 less—the result being a balance of £7490, or £1240 less than last year. They had a very large stock of coke; and there had been great difficulty in disposing of it. As the shareholders knew, coke would soon deteriorate; and as the Company were unable to sell it, they had not taken any credit for this item in the accounts, which largely explained the decrease he had mentioned. He was glad to say that lately they had been successful in finding a market for some of the coke; and he hoped this would continue. Therefore, though they had taken no credit for it this year, they trusted it might come in as a profit next year. In the balance-sheet, the only items he need allude to were the stocks and goods in transit, which showed an increase of nearly £3000. This was chiefly due to the increase in the stock of coal. Last spring, they were unfortunate in having a ship lost with 500 tons of coal. They were covered by insurance, so far as the cost went; but a loss like this was very inconvenient, such a long way as they were from Brazil. There was quite enough in stock to last until a fresh ship arrived; but the Directors took the opportunity to send out an extra amount, as they thought it desirable to be in an absolutely safe position—especially as at that time there was talk of a coal strike in this country. This, he was happy to say, did not occur; but the Company had now a large stock in store, which rendered them safe against all vicissitudes. They had invested £3000 in the past year—£2000 in Water Board stock, and £1000 in paying off this amount of debentures. The result of the year's working was that the accounts showed a profit of £7490, which, with the balance brought forward, gave a total of £12,153; and after deducting the interim dividend paid last April, there remained £10,465 available for division. Of this, the Board had placed £4000 to reserve, making the fund now £16,000; and they proposed to pay the usual dividend on the preference shares and a dividend of 5 per cent. on the ordinary shares (making 8 per cent. for the year), and to carry forward a satisfactory balance of £4180. He concluded by moving the adoption of the report and accounts.

Mr. F. W. BROTHERS seconded the motion.

Mr. CHARLES WEBB asked whether the Company were on very good terms with all the inhabitants out there, and whether there was any

competitor in the shape of electricity. He took it there was an Advisory Board in Ceará, as well as the London directorate.

The CHAIRMAN replied that there was no competitor in the form of the electric light; and the Company were on excellent terms with the citizens. Of course, Mr. Gandon managed the works; but the Company had a legal adviser in Ceará as well.

Mr. WEBB: Have you reduced the price of gas?

The CHAIRMAN: It is fixed by the concession.

Mr. WEBB: But there is nothing to prevent your reducing it, if you think proper?

The CHAIRMAN: I do not think such a course advisable.

The resolution was then carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. T. M'MAKING, dividends of 5 per cent. on the preference shares, less income-tax, and of 5 per cent. on the ordinary shares, free of tax, were declared for the six months to June 30. This made, with the interim dividend already paid, 10 per cent. on the preference shares, and 8 per cent. on the ordinary shares, for the year.

The retiring Directors (Mr. Wallroth and Mr. Thomas Guyatt) were re-elected, on the motion of Mr. BROTHERS, seconded by Mr. F. E. LINGING; and the Auditor (Mr. A. W. Cooper) was also re-appointed, on the proposition of Mr. WEBB, seconded by Mr. T. A. GUYATT.

The CHAIRMAN proposed a vote of thanks to the Engineer (Mr. Herbert Gandon) and staff in Ceará and the Secretary. This vote, he said, was well deserved, for all had done their very best during the past year, as the balance-sheet proved.

Mr. M'MAKING seconded the resolution, and it was heartily passed.

The SECRETARY briefly acknowledged the compliment.

The proceedings were brought to a close with a cordial vote of thanks to the Chairman and Directors, which was proposed by Mr. WEBB, and seconded by Mr. T. A. GUYATT.

COLONIAL GAS ASSOCIATION, LIMITED.

Annual Report and Accounts.

At the Annual Meeting of the Colonial Gas Association, Limited, to be held to-day, the Directors will report that, after writing off £1011 for depreciation of works, there remains a profit of £7071, to which has to be added the amount brought forward from last year—viz., £943—making an available balance of £8014. Deducting from this the amount paid for debenture interest, &c., and the interim dividend paid in April, at the rate of 4 per cent. per annum, amounting altogether to £3379, there remains a balance of £4635 available for distribution, which the Directors recommend should be appropriated as follows: To pay a final dividend at the rate of 7 per cent. per annum, free of income-tax, making 5½ per cent. for the year (against 5 per cent. last year), £2967; to place £600 to the reserve fund account, increasing it to £5968; and to carry forward £1068. The accounts show that the revenue from the sale of gas was £20,795 and from residual products £2251; the total receipts amounting to £23,165, compared with £21,071 in the year 1907-8. The expenditure (including the £1011 written off for depreciation) was £16,094, against £14,789 before. The Managing-Director (Hon. George Swinburne, Assoc.M.Inst.C.E.) reports that the works, plant, and machinery have been maintained in an efficient condition; several alterations and improvements having been made. There was a further expansion in the sale of gas in the twelve months; the average increase, as compared with the previous year, having been upwards of 14 per cent. Formal notice has been received from the Geraldton Corporation of their intention to exercise their right in March next to negotiate for the purchase by arbitration of the Company's gas-works at that place, in accordance with the terms of the concession; and the Directors are taking the necessary steps for the protection of the interests of the Association.

The Recent Sale of Portsmouth Water Company's Shares.—In the paragraph on this subject which appeared in the "JOURNAL" last week (p. 271), it should have been stated that the whole of the 2000 £5 shares offered by Messrs. King and King were sold at the prices named (£6 5s. to £6 7s. 6d. each); the total amount realized being £12,522 10s.

High-Pressure Gas Lighting for Rotherham Market Hall.—The Markets Sub-Committee of Rotherham Town Council have decided in favour of the substitution of incandescent burners (worked from the high-pressure plant) in lieu of the flat-flame burners at the Market Hall, at an estimated cost of £45. The Gas Department are to light and maintain the new system at 6d. per burner per month for twelve months.

A Strange Experience at Barnsley.—Referring, in the Barnsley Town Council, to the public lighting, Mr. Jones asked whether they were getting value for the money expended. He expressed the opinion that the lighting was most inefficient and unsatisfactory, and hoped the matter would be gone into closely. Alderman Wray, on behalf of the Lighting Committee, said they were now spending £3500 per year on street lighting. If they granted all the requests for further lighting facilities, they would have the rates up to 9s. in the pound. The cost of incandescent lamps, with the mantles, &c., had been found to be prohibitive; and they considered the best way was to go on extending the electric mains.

Louth (Lincs.) Gas Company.—At the annual general meeting of this Company on Monday last week, the Directors reported a net profit of £2701, and a disposable balance of £3423. Dividends were declared of 14½ per cent. on the original capital, 5 per cent. each on the "A" and "B" improvement stocks, and 11½ per cent. on the new ordinary stock (1877). These payments absorbed £1996. In addition, certain mortgages are to be paid off; and there will then be left £426 to be carried forward. More gas was made and sold than in the preceding year; and as coal cost 8d. per ton less, gas was put into the holders at a cheaper rate. The return from residuals, however, was not quite so satisfactory as it had been. The average make of gas per ton of coal carbonized was higher than before; and the unaccounted-for gas was less than 5 per cent. on the make.

DUBLIN GAS COMPANY AND THE CORPORATION.

Settlement of the Dispute.

The Lighting Committee of the Dublin Corporation prepared a report to be submitted at yesterday's meeting of the Council, recommending a settlement of the legal proceedings now pending between the Corporation and the Alliance and Dublin Gas Company.

The report, after going into the history of the matters in dispute, says: The Lighting Committee are pleased to report that they have secured the consent of the Directors of the Gas Company to the following arrangement—viz., that "If the Corporation agree to the conditions, the Gas Company will allow a discount of 10 per cent. to be deducted from the gas accounts furnished monthly for public lighting, the said discount to include the added areas, and to commence from Jan. 1 next. The discount will also be allowed on the arrears due for gas for the added areas." This arrangement removes all risk of withdrawal of the discount at any time by making it independent of the rates charged to other consumers. The Company and the Committee further agreed that, if this settlement be approved by the Municipal Council, the respective actions and counterclaims shall be withdrawn, each party bearing its own costs. The Lighting Committee accordingly recommend that the settlement arrived at be approved; and that the Law Agent be instructed to prepare any consent or agreement necessary to carry out the same. The Committee further recommend that the Town Clerk and Law Agent be empowered to take all necessary steps as to the completion of such agreement or agreements as may be necessary in connection with the settlement, including the affixing of the City seal to same.

EDINBURGH AND LEITH GAS COMMISSIONERS.

New General Offices—Quality of the Gas.

Last Wednesday afternoon, a company of about sixty gentlemen in the public service in Edinburgh and Leith assembled at No. 25, Waterloo Place, Edinburgh, to inspect the new offices which have been erected there for the Edinburgh and Leith Gas Commissioners. The necessity for the reorganization and concentration of the administration of the various outdoor departments of the Commissioners had for some years been fully recognized, and several probable buildings and sites had from time to time been examined with the view of providing the accommodation necessary for the efficient and economical discharge of the multifarious duties appertaining to these departments. In nearly every case, however, the accommodation offered proved to be either insufficient in character or too expensive to acquire. The final closing of the in-town manufacturing stations, however, rendered immediate action necessary; and, in order to accomplish the object in view, steps were ultimately taken to purchase some tenement properties at Calton Hill, immediately at the back of the Waterloo Place block. These properties, which in themselves were useless for the purpose in view, were valuable so far as the ground on which they stood was concerned. They were ultimately purchased for the sum of £3958 18s. 4d., and consisted of three blocks of tenement property. The adjoining block of buildings belonging to the Prison Commissioners was negotiated for, but its purchase could not be accomplished. The office staff and those employed in the outdoor departments of the Commissioners involve an outlay for wages alone annually of £37,621, which is equal in extent to the entire wages spent for performing the whole of the operations at the manufacturing station at Granton.

The scheme consisted of three separate divisions. The first was the reconstruction of the Waterloo Place offices, which have been increased in available floor area by 36 per cent., and the lighting, ventilation, and sanitary arrangements thoroughly renovated and brought up to date. This work has primarily consisted in dispensing with useless staircases and partitions, with a slight extension of a portion of the back elevation, affording additional show-room and office accommodation. The second stage consisted of the construction of a four-floored warehouse block immediately to the back of No. 25, Waterloo Place, and communicating therewith by means of a bridge, which affords accommodation for the main and service laying, meter, and fittings departments. The ground floor is set apart for the clerical staff connected with these departments, and accommodation for setting out the materials required by the workmen on the following day. The first floor is the workshop for the repair of meters, stoves, and fittings, where mechanical appliances have been introduced for doing as much of the work as can be performed by such means. The second and third floors afford storage accommodation for all the appliances used in connection with the undertaking, so far as the outdoor departments are concerned—meters, fittings, piping, &c. The third feature was the construction of a block of offices communicating at the back with the two previous blocks for the accommodation of the staff of the Chief Engineer and General Manager (Mr. W. R. Herring, M.Inst.C.E.), and comprises four floors of commodious and conveniently arranged offices. The estimated cost of the new buildings was £15,980 10s. 4d.; and their construction has been carried out for approximately £15,000, though the final figures have not yet been made up.

After the inspection, tea was served in the coffee-room.

Lord Provost GIBSON, who presided, said the inspection had been of the greatest benefit to them, because they had seen the latest development of the gas undertaking. He thought they would give credit to Judge Bryson, the Works Committee, and Mr. Herring, who had had the arrangement of the premises. The necessity for the new offices showed the enormous expansion of the concern.

Judge BRYSON expressed pleasure at seeing the assembled company. He said the new buildings reflected the greatest credit on Mr. Herring, who was the architect of them and superintended their erection.

Bailie DOUGLAS complimented the Committee and Mr. Herring, who was, he believed, the most able man in Edinburgh. He did not agree with him in everything; but Mr. Herring was a foeman worthy of the steel of any of them. He (the speaker) was perhaps the oldest

Gas Commissioner; and he had no hesitation in saying that the Commission was carried on upon business lines, and that the community need have no fear with respect to anything supplied to them. When they had everything adjusted, particularly the burners, matters would be all right.

Mr. HERRING thanked the gentlemen who had spoken for their kind remarks. He said it was quite true that the work had been carried through by himself, but he had had considerable help from the Committee appointed to look after the matter. He had no interest to serve except that of the gas undertaking—in other words, the gas-consuming public, numbering about 100,000 householders in Edinburgh and Leith. He acknowledged, as Bailie Douglas had remarked, that adjustments were necessary. The position of matters was that they had given up using a very expensive coal—a coal which was fast being wrought-out in Scotland, and was advancing in price beyond all bounds; and they were now using what might be termed a common gas coal, of which there was abundance. They were making the best quality of gas they could from this coal; and, so far as he knew, there was no proposition to reduce the illuminating power of the gas below what it had been for the past six months. This quality was the same as was supplied all over England; and it must be admitted that English towns, in illumination, in the houses and in the streets, were reasonably well supplied. What was good enough in these towns must also be suitable for Edinburgh and Leith, so long as they gave the consumers the right kind of burner for using it. This was what they were doing. They were endeavouring to adjust the burners as fast as they could, and they were also testing some burners which Bailie Douglas had brought forward, to see whether they would give the same, or better, results; and as these burners cost only about 10s. a gross, he was quite sure it would be the Commissioners' interest to complete the inquiry they were making. The majority of the people now used incandescent burners; and the change that had taken place in the quality of the gas had not affected the light given by them. He hoped that by the time they had passed through the coming winter the transference would be accomplished. The Commissioners would then be in a position to control the lighting; and he believed that the public would be satisfied.

DEVONPORT GAS-WORKS DISPUTE.

The dispute over the management of the gas-works continued to occupy a leading position in the Devonport municipal elections until the close of the contest. Both the present and the late Chairman of the Gas Committee took part in it.

Alderman Hornbrook, the late Chairman, in one of his speeches, gave an emphatic denial to the assertion that a considerable saving had been effected as the result of the recent inquiry into the work of the Gas Committee; and he challenged Alderman Tozer, the present Chairman, to a discussion of the subject. He also said that the con-

tract which a former Gas Committee made with Messrs. Willey and Co., respecting slot installations, was a splendid contract—better than that which the Plymouth Gas Company at the same time had with the same firm. As to the saving of £800 which the present Gas Committee claimed to have made in the conduct of the business since last November, Alderman Hornbrook said this was not due to the action of the Committee, but was the result of more favourable markets. There had been a suggestion that a Local Government Board inquiry should be held. He wished an Inspector had been sent down; for there were one or two things he could point out which would make someone "sit up."

Alderman Tozer, replying at another meeting, repeated the history of the contract with Messrs. Willey and Co., and said that the rate-payers were saved several thousands of pounds by the readjustment of the contract. It was easy for Alderman Hornbrook to say that he disputed this; but the reduced amounts paid for installations were 17 per cent. less than they paid in the first five years of the contract. It meant an average saving of 14s. per installation; and they had fixed 340 installations since July last. Beyond this, the charge of 4s. 8d. per installation for maintenance had been waived, and the amount had been saved. Alderman Tozer added that he took care not to act alone, but saw that everything of importance was done by the whole Committee.

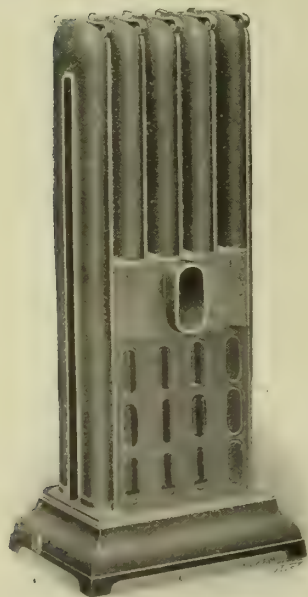
MANAGEMENT OF THE COLWYN BAY GAS-WORKS.

In consequence of the unsatisfactory results attending the working of the gas undertaking of the Colwyn Bay Urban District Council, Messrs. Thomas Newbigging and Son were called in a few months ago to inspect the works and district and inquire generally into the management of the concern. Their report was presented early in September, and was briefly noticed in the "JOURNAL" for the 28th of that month. Copies have since been issued, with a reply by the Manager (Mr. J. W. C. Pennington), made at the request of the Council; and we give below the principal portions of each document.

Messrs. Thomas Newbigging and Son's Report.

Before dealing in detail with the points contained in the Council's letter of instruction, Messrs. Newbigging briefly record the impression their investigation has made on their minds. They say: "You have a good gas-works, well equipped and well situated, and capable of producing gas economically and of the required quality. The district of supply is a most excellent one, with paying classes of consumers, as is proved by the consumption per consumer. All that is necessary to make the undertaking a success is good administration and capable management. We are reluctantly compelled to say that these essentials have been wanting. The undertaking has drifted (we say it advisedly) into

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a somewhat critical state; and only good guidance will bring it into a sound position. The Council acted wisely in acquiring the gas undertaking, and they acquired it at a reasonable price. In support of this statement, we draw attention to the figures of profit made during the first years, 1902 and 1903-4 (fifteen months) of the Council's ownership of the undertaking—viz., £486 2s. 6d. and £1947 18s. 5d. respectively. But experience was lacking in dealing with a growing gas supply in a growing district; and it would have been well had the Gas Committee occasionally obtained advice from those competent to give it. The history of the undertaking since the transfer points to the absence of a strong guiding hand—your most pressing need. Since the date of the transfer, the sum actually expended on the gas-works, including the railway siding but exclusive of the distribution plant, amounts to £282 per million cubic feet of gas sold, or much less than the amount which would have been necessary had it not been for the fact that at the time of the transfer the site and works were of a capacity in excess of the then requirements. Had this not been the case, you would have been under the necessity of spending a much larger sum per million cubic feet to provide the land, works, and siding. So far as the recent expenditure is concerned, the railway siding, on which £3280 has been spent and a small sum has still to be paid, provides for future growth; and it was a wise expenditure to incur, irrespective of the question of direct economy, as it removed some objectionable traffic from the roads. The works, however, as regards the principal plant—the retort-house, the purifiers, and the gasholders—are now working nearly up to their full capacity. Very considerable expenditure will be necessary in the works almost immediately if the growth in the consumption continues. Any scheme of extension should be carefully considered, and wise foresight exercised in its adoption."

Proceeding to deal with the working results, Messrs. Newbigging say the Council have not bought their coal to the best advantage as regards either price or quality. They note, however, that the purchases for the current year are a distinct improvement; but they say there is room for more. The make of gas last year—10,530 cubic feet per ton—compared unfavourably with the 11,244 cubic feet of 1906. They consider there is no reason why the latter figure should not again be reached and maintained. The Council have the quality of coal and the plant to do it; and it should be done. The explanation offered by the Manager for the fall in the make of gas was that the works were in an upset state owing to the construction of the siding. But Messrs. Newbigging say "this should not have affected the make. In any case, however, the siding is complete now, and there is no longer any reason for last year's figures." They also consider that there might be a reduction in the labour employed on the works.

Referring to the repairs on works, mains, and services, Messrs. Newbigging say the amount spent on repairs of works for the past year (£941) was "much too high;" while the expenditure on mains and service repairs (£66) was too low. They consider that there is no reason why the expenditure on the works should not be very materially reduced, and the works still maintained in a satisfactory state. With regard to the salaries of the officials concerned, they point out that the

Manager is paid £300 a year, with house, coal, gas, and rates free, and a bonus in addition; that the Chief Clerk is paid £130 and the Assistant Clerk £97 10s. per annum; while the apportionment of the Town Clerk's, Treasurer's, and other expenses amounts to a further £100—making a total in that department of £627 10s. per annum. They recommend that the receipt of money be transferred from the gas office to the Council's collector, which would enable the Council to dispense with one clerk's services. So far as the amount apportioned to the Town Clerk, the Treasurer, the Accountant, and the collecting department is concerned, they are of opinion that this cost should be borne by the Finance Committee, and that "it is not legal to charge even an apportioned amount against the Gas Department." While they are not prepared to cavil at the remuneration paid to the Manager, though it is high for the size of the works, as they consider a good manager should be well paid, they advise the discontinuance of the bonus system on increased output, which they say "is wrong in principle in the case of a gas undertaking, and should be abolished."

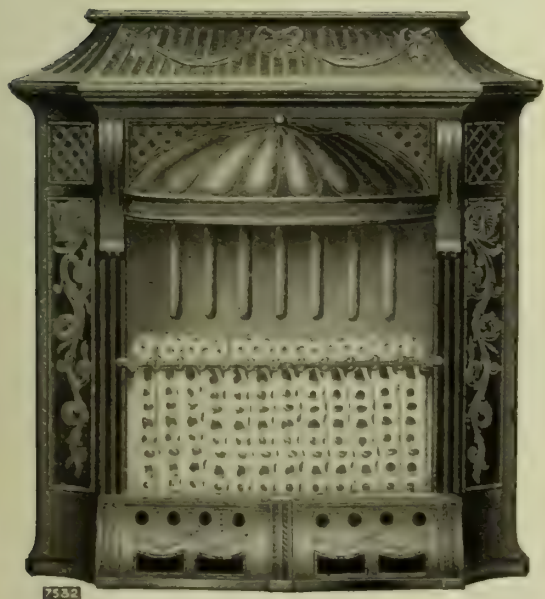
After a few observations on the stationery, printing, assessment, and general charges, Messrs. Newbigging proceed to deal with the distributing plant. As regards the mains and services, a capital sum of £11,787 has been spent upon them since the undertaking was acquired. Calculated on 26½ million cubic feet of additional gas sold, this amounts to £445 per million; and the reporters consider that "only great and certain confidence in the growth of the number of gas consumers could justify such an expenditure. Would-be consumers at long distances from the mains should have been so charged as that the extension would not have entailed a loss on the undertaking." Services have been put in free of charge, at an estimated average cost of £1 15s. 6d. each. This is characterized as, under the circumstances, a "wrong concession, which should receive early consideration with a view to a change being made." On cooking-stoves, £4737 was spent; and here it is thought "there is room for great economy." Messrs. Newbigging conclude this portion of their report by expressing the opinion that "in the distributing department there has not been exercised the thought and economy so necessary if the undertaking is to be a financial success."

With regard to the question of unaccounted-for gas, Messrs. Newbigging say this has increased from 10·82 per cent. of the total gas made in 1902 to 14·17 per cent. in 1909. They add: "The percentage method of reckoning is not, however, the best way of showing the loss incurred; it is better to state the loss of gas per mile of main. The loss of gas per mile of main in 1902 amounted to 280,964 cubic feet, which has increased to 366,553 cubic feet in 1909. This is very much in excess of what it might be under careful supervision." The very high leakage is attributed by the Manager to three causes: (1) Excessive consumption of gas by the pilot-lights of street-lamps; (2) non-registration of meters where single pilot-lights are used in houses and shops; and (3) subsidence of mains and the drawing of services by sewerage operations. Commenting on these points, Messrs. Newbigging say: "The consumption of gas by the pilot-lights of street-lamps is excessive; and we recommend that these lights should be

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done away with. There is no real need for them, as, in actual practice, it is found as easy to light by torch as by pilot-light. The second cause is possible; but, from experience, it is found that where pilot-lights are used there are, generally speaking, more than one light, and consequently the gas is registered. Similar conditions as to pilot-lights prevail in other towns where the unaccounted-for gas is normal. Sewerage operations causing subsidence are a common reason given for loss of gas. Inasmuch, however, as gas, even if it escapes into a sewer, finds its way out into the open air, it is soon reported to the gas office. The offer of a small reward for notification of gas escapes might be beneficial." Messrs. Newbigging found in the course of their investigation that there was no systematic inspection of meters; and they say it is highly desirable that one should be instituted.

The last matter dealt with is the price of gas. In 1906, and again in 1907, reductions were made; and Messrs. Newbigging find it difficult to see why this was done in face of the small balance of profit in 1905, and the knowledge of the capital cost that would have to be incurred to provide for the growth that always follows even a small reduction. They say by this action the Council "courted a certain deficit," for they charged 3s. 4d. per 1000 cubic feet for gas which cost them 3s. 5'29d. Again, taking the price charged for gas supplied to the public lamps—viz., 2s. per 1000 cubic feet—the presumption is that the Gas Committee, in fixing this figure, thought it proper to charge the bare cost of the gas, without including interest and sinking fund charges. But Messrs. Newbigging point out that even without these charges the cost came to 2s. 1'08d. They say the moral to be drawn from these observations is that the Council should increase the price charged for gas until such time as they can see their way, by improved working results, to revert to the lower figure.

Messrs. Newbigging summarize as follows the chief points on which they have touched: (1) Much room for improvement in the quality and price of coal. (2) Wages too high, and a reduction possible. (3) Repairs to works too heavy, and could be reduced. (4) Production of gas per ton too low, and should be brought up considerably. (5) Capital expenditure on distribution too high as regards mains, services, and cookers. (6) Expenditure on distribution out of revenue too low; and more attention should be paid to leakages and to the testing of meters. (7) Unaccounted-for gas too high. (8) Price charged for gas to other departments of Council below cost, and should be increased. (9) Selling price of gas reduced when it should not have been. Finally, Messrs. Newbigging say the undertaking is burdened for the time being; but they have no fear for its future, "under careful administration and management."

The Manager's Reply.

With reference to Messrs. Newbigging's comments regarding the reduction in the make of gas in 1908-9 compared with 1905-6, Mr. Pennington says the difference was due to the fact that the coal used in the latter year was screened, while in the former it was unscreened. He denies that the make per ton was bad; and points out that for the past seven years his average was 10,812 cubic feet, whereas from the

statistics for 69 municipal undertakings for 1907-8 it would be found that not 33 of them reached the same figure. He also points out that the Colwyn Bay gas is 17-candle power, and remarks that if the Committee will reduce the standard he could increase the make.

As to the expenditure on works and mains, the Manager says the costs were bound to be excessive last year in consequence of the alterations at the works. But now that these have been carried out the charges will be reduced. He disagrees with the reporters' views regarding the bonus system, and points out that many large corporations and companies have recently adopted it.

Coming to the question of unaccounted-for gas, Mr. Pennington says: "It will be very difficult for the Committee to understand that leakage depends on the mileage of mains and on the number and length of services and the pressure at which the gas is supplied. Owing to the distance of our distributing mains from the works, and also to the fact that in the centre of the town most of the streets are supplied by 2-inch mains, it is necessary to keep on a pressure of 35-10ths, for part of the day even 40-10ths, and never less than 20-10ths on the Rhos main; the least pressure on the two during the night being 15-10ths. Some works I know of never have more than 20-10ths pressure on the mains at any time. Our leakage per mile of main, in spite of these high pressures, is 366,552 cubic feet, or 40 cubic feet per mile per hour, which is rather less than the average figure of all works. . . . If we doubled our consumption without extending the mains, our leakage would be reduced from 14 to 7 per cent."

The Manager states that the price charged for public lighting is not sufficient; and he says that the amounts of money which have been taken out of the profit and loss account and placed to the district fund should be repaid. He adds: "If sums are taken from the gas profits in this way, it will be bound to necessitate an increase in the price of gas to make up for it."

In a concluding paragraph, Mr. Pennington remarks: "I am convinced that if we take every possible step to obtain consumers on the line of the 28 miles of main we now have, and so increase the consumption, the profits will very speedily show improvement. In our endeavours to meet the desires of the town, we have, perhaps, laid mains in too freely. . . . Expenditure has been incurred, and we have not yet reaped the benefit of it."

At the meeting of the Holborn Borough Council on Wednesday, the Works and General Purposes Committee reported that, in order that they might form an opinion as to the most suitable manner of lighting the new street from Torrington Square to Montague Place, they had given directions for several lamps to be erected on trial. The Gaslight and Coke Company had informed the Committee that they were not able to apply the high-pressure system of lighting to this street; but that, in consequence of the improvement which had been made in incandescent mantles, it would be possible to obtain as good a light with gas at ordinary pressure.

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LEEDS METER-STORES BURNT.

Late last Friday night, fire was discovered to have broken out at the Leeds Corporation gas-meter stores and stoves department in Meadow Lane. Apparently the fire broke out near the top of the building, which consisted of three floors, for in a very short space of time, the whole of the roof was blazing. During the progress of the conflagration, Mr. R. H. Townsley, the Engineer and General Manager of the Gas Department, arrived, and assisted in coping with the outbreak. In addition to the building, a quantity of meters and stoves were, of course, destroyed; but in an interview with a local reporter, Mr. Townsley said it was impossible to state what the damage would be, except that it would be some thousands of pounds—the stock not only being valuable in itself, but the building being a large and costly one. Fortunately, stocks were at the time low, as it had been intended very shortly to transfer the workshops to more commodious premises in Sovereign Street. The loss is said to be covered by insurance. During the fire, the tram service along the Beeston and Dewsbury Road routes was completely suspended; and a long line of cars speedily gathered on either side of the front of the burning building. A large and orderly crowd gathered and watched the progress of the fire, which was accelerated by numerous escapes of gas. Difficulty was experienced in coping with these escapes; and it was decided to reach the service-pipe from the main lying beneath the pavement. While this was being done, the escaping gas continued to blaze at various points of the building. The retort-houses are situated some distance away from the scene of the fire, and were never in any jeopardy from the burning building.

GAS v. ELECTRICITY FOR HEATING AND COOKING.

A recent issue of the "Pall Mall Gazette" contained the first of a series of articles on "The Art of Heating and Cooking." In the course of it, the writer made the following remarks on gas and electricity.

Gas now plays an important part in any scheme of heating; and the highest medical and scientific authorities assure us that, given a properly-fitted stove with adequate ventilation, gas heating is quite as satisfactory from the hygienic aspect as the older methods. It is certainly true that too little attention is paid to this question of ventilation; and cases are not infrequent—especially in offices and in the halls of private buildings—where no ventilation whatsoever is provided. What would be the effect of a coal-fire under similar conditions, assuming, of course, that the smoke could be disposed of? Gas as an adjunct to, if not entirely a substitute for, heating by coal-fires, is indispensable in the modern house. For living-rooms no doubt many people still prefer open coal or wood fires for their more companionable, and, one may almost say, more romantic, attributes. For reception-rooms only occasionally used, for billiard-rooms, dining-rooms, studies, and last, but by

no means least, for bedrooms, however, there is nothing better than a gas-fire. It is cleanly, readily lighted, quick in its heating effects, and may be turned off at any desired moment. In a house with many bedrooms but a comparatively small staff of servants, or in one where the one maid is a true maid-of-all-work (and no play), coal-fires in the bedrooms are prohibitive; and it is here that the gas-fire scores every time. No one who has experienced the difference between a coal-fire and a gas-fire while lying ill in bed would ever willingly be without a gas-fire in the bedroom. Electricity has been adopted to a limited extent for heating; but its undoubtedly high cost, and the fact that it affords none of the ventilating advantages attending the use of coal, wood, or gas fires, are bound to restrict the use of current for heating within a small limit.

NOTES FROM SCOTLAND.

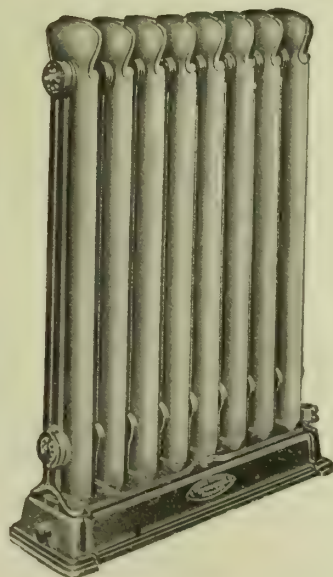
From Our Own Correspondent.

Saturday.

At the monthly meeting of the Edinburgh and Leith Gas Commissioners on Monday, the Engineer reported a make of gas during September of 141,529,000 cubic feet—an increase over the same month of last year of 9,592,000 feet. The increase in the make since May 15 has amounted to 23,882,000 cubic feet. As this was the last occasion on which Lord Provost Gibson would preside at a meeting of the Commissioners, Provost Smith, of Leith, in eulogistic terms, expressed his own and the Commissioners' appreciation of his Lordship's services to the Commission during the past three years. The Lord Provost, in returning thanks, said he had the privilege of being a member of the Commission, as a representative of the Corporation, before the appointment of Mr. Herring, their Engineer, and the acquisition of the Granton property and erection of the extensive works there. It was a Trust in which he was exceedingly interested; and he gained some very valuable experience in the development of it under these conditions. He thought the Commissioners could quite well take credit for the far-seeing policy which they initiated, because they knew, as a Commission, that the result financially had been of the most economical nature. A pleasing thing to them was that, notwithstanding the wonderful development and keen competition of the Electrical Departments of the Corporations of both Edinburgh and Leith, the business of the Gas Commission had gone on increasing, with the enormous advantages of the new works and under the care and admirable administration of Mr. Herring. He would leave the Commission with a considerable feeling of regret.

Next day, Lord Provost Gibson bade farewell to the Town Council of Edinburgh. In the course of a valedictory address dealing with the work of the Council since he entered it seventeen years ago, he said that the purchase completed of the ground at Granton for the erection of the new gas-works cost £812,000 for ground and buildings. The net result of the scheme had been the provision of land for all reasonable

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LUTON.

future requirements, the construction of new and modern works far removed from the centres of habitation, and a cheaper price for gas than would have been possible under the old conditions of working. Financially, the scheme had resulted in an increase of the gross profits from £38,000 in 1896 to £112,000 in 1909, with commercial conditions as to price of coal rather against the undertaking, rates of wages higher, and a lower price for gas.

The inspection of the extended and new offices of the Edinburgh and Leith Gas Commission on Wednesday may be regarded as marking the period of the closing of the capital account of the Commission. The concentration of their manufacturing works at Granton, and the resultant abandonment of the works in Edinburgh, Leith, and Portobello, led necessarily to a concentration of office work. It has been evident for years that the old office in Waterloo Place was altogether inadequate for the accommodation of the staff, and that additional accommodation would require to be provided. This has been done. Everything administrative is now to all intents and purposes under one roof, and so is the show-room and the stores of fittings. Mr. Herring has, since his arrival in Scotland, revolutionized the manufacturing department of the Edinburgh and Leith Gas Commission, and concentrated the administrative department. It does not seem as if there were much else for him to accomplish; but his tireless energy will doubtless find some outlet yet, which will be for the benefit of his adopted compatriots.

In the Edinburgh Town Council on Tuesday, the recommendation of the Cleaning and Lighting Committee that the offer of the Gas Commission to take control of the stair lighting of the city, referred to in last week's "Notes," came up for consideration. Approval of the recommendation was moved by Mr. Lyon, the Convener of the Committee and a Gas Commissioner, and was seconded by Treasurer Harrison. Councillor Leishman, who was one of the leading opponents of the Provisional Order obtained by the Gas Commission in 1908, moved for delay. He would like to know if the Electric Lighting Committee had examined the question of the lighting of stairs, and the possibility in that direction. It was a serious matter that the Corporation should hand over the common stairs, some 12,000 in number, to the Gas Commission, in which case electric lighting would have very little chance of ever getting there at all. Mr. Herring had said that he would supply gas for lighting purposes at 2s. 4d. per 1000 cubic feet. He was told that it cost 3s. per 1000 cubic feet to manufacture gas, and so the Commission were going to sell gas at under cost price. He asked for delay in order that the whole position might be examined from the point of view of the electric light undertaking, and from their own point of view. The recommendation of the Committee was approved by 27 votes to 16. For the purpose of avoiding a delay of about six weeks in obtaining a final reading of the minutes of the Town Council, Mr. Lyon moved that the Standing Orders be suspended, and that the work be proceeded with at once. This was agreed to by 35 votes to 10. Subsequently notice of motion was given of a remit to the Cleaning and Lighting Committee to consider the advisability of introducing electric light into stairs of high tenements in central parts of the city.

The Eastern District of the Scottish Junior Gas Association, as noticed elsewhere, paid a visit to the works of the Pumpherson Oil Company, Limited, this afternoon.

Recently the Gas Committee of the Glasgow Corporation received a letter from the County Council for the Lower Ward of Lanarkshire, stating that at a meeting of the inhabitants of Muirhead and Chryston it had been resolved to apply for a supply of gas to that district; also that it be formed into a lighting area, and that a supply of gas be given for street-lamps. The Gas Committee agreed that the price to be charged, both to private consumers and for public lamps, should be the same as in the Milngavie district—namely, 1s. per 1000 cubic feet above the city rate. At a meeting of the Gas Committee yesterday, a letter was read from the County Council stating that they will hold a meeting on Monday; and it is expected that they will then give their sanction to the formation of a lighting area. Mr. A. Wilson, the Gas Engineer, was authorized by the Committee to proceed with the work as soon as the requisite permission is given by the County Council.

The Cowdenbeath Gas Company, having obtained the lighting of the village of Crossgates, this week held an exhibition of gas appliances in the Public Hall. The goods on view were cookers and heaters of Messrs. John Wright and Co., Limited, and lighting appliances of Messrs. Falk, Stadelmann, and Co., Limited. At the opening ceremony on Tuesday evening, Mr. F. Hutton, of Edinburgh, the Chairman of the Cowdenbeath Gas Company, said that his Company had had their eye on Crossgates for years; and he did not think that Crossgates need regret having a supply of gas from them. Gas would be supplied at a much cheaper rate than if gas-works had been erected in the village itself. The exhibition was declared open by the Rev. John Clarke. Mrs. Middleton gave lectures and cooking demonstrations daily.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

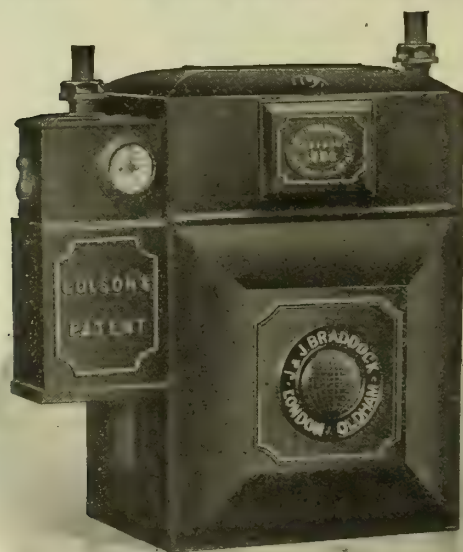
LIVERPOOL, Oct. 30.

October requirements all being filled, the tone has been dull the whole of the week, and some decline in values has to be recorded. The closing quotations are £11 2s. 6d. per ton f.o.b. Hull, £11 3s. 9d. per ton f.o.b. Liverpool, and £11 5s. per ton f.o.b. Leith, while the tendency is towards still lower prices. Encouraged no doubt by the weakness of the spot market, dealers have been more bold in offering forward delivery, and business is reported as having been done well into next year at practically to-day's figure. Makers, however, are still asking a premium for the more distant months.

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This article is slow of sale, but quotations are maintained at 9s. 3d. per cwt. for 95 per cent. quality, and 9s. 6d. for refined, on spot.

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Tar Products.

LONDON, Nov. 1.

Markets for tar products have been quiet throughout the past week. Pitch has been easy, and a fair amount of business is reported on the east coast at 26s.; but it is doubtful whether makers could secure this price for any considerable quantity, though manufacturers are still practically out of the market. On the west coast, makers appear to be fairly well sold. Creosote is quiet. London oil is said to have been sold at 2½d., though it is believed that this was for one of the smaller makes. In the Midlands, manufacturers seem to be fairly easy in their position; and in the North, there are reports that business has been done at very low figures. Benzol is steady. London makers appear to be decidedly short of this article; but in the North, business continues to be done at 5½d., delivery to the end of the year. Fifty-ninety per cent. benzol is quiet, but chiefly owing to the fact that there is very little obtainable as there is a fair demand for it. Toluol is steady, and in the North there appear still to be buyers. Solvent naphtha is firm. London makes in particular are scarce, and are commanding good figures. Carbolic acid is quiet, and Continental consumers decline to offer more than 10½d. for 60's on the east coast; but English consumers seem to be paying better prices than this. Refined naphthalene is dull, though there is no alteration in price. Salts are in fair demand.

The average values during the week were: Tar, 13s. to 17s., *ex* works. Pitch, London, 26s. to 26s. 3d.; east coast, 25s. 6d. to 26s.; west coast, 24s. 6d. to 25s. 6d. f.a.s. Mersey ports, 25s. f.o.b. others. Benzol, 90 per cent., casks included, London, 6½d. to 6¾d.; North, 5½d. to 6d.; 50-90 per cent., casks included, London, 7½d.; North, 6¾d. to 7d. Toluol, casks included, London, 9d. to 9½d.; North, 9d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 1s. to 1s. 3½d.; North, 11¼d. to 11½d.; heavy naphtha, casks included, London, 10½d. to 11¼d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east coast, 10½d. to 10¾d.; west coast, 10½d. to 11d. Refined naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market has been quiet during the past week, and it closed decidedly easier. In London, the principal Gas Companies still quote £11 7s. 6d. for prompt and £11 10s. for forward, but cannot obtain these figures; and outside makes can be secured on Beckton terms at £10 18s. 9d. to £11, while f.a.s. London terms are little better than these. In Hull, one of the best makes has been sold at £11 5s.; and outside makes are certainly not worth more than £11 to £11 2s. 6d. In Liverpool, the value is £11 2s. 6d. to £11 3s. 9d.; and in Leith, makers are asking £11 5s. to £11 6s. 3d., but cannot secure these prices. For prompt delivery, they are quoting £11 10s.

COAL TRADE REPORTS.

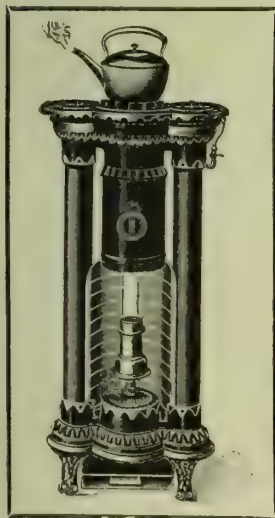
Northern Coal Trade.

There is still the weakness in the steam coal trade which is not unusual at this season of the year, when the Baltic demand is decreasing. Best Northumbrian steams are about 10s. 3d. per ton f.o.b., second-class steams are 9s., and steam smalls from 5s. to 6s. The demand is fair for this season; but shipment has been in a few cases interfered with by the stormy weather, and this has had its effect on prices. On the other hand, gas coals have naturally a heavier sale, both for home use and for export; and the deliveries are approaching the period of fullest use. Durham gas coals vary from 10s. 3d. to 11s. per ton f.o.b., according to quality, for the usual classes; while for "Wear specials" the quotation is up to 11s. 9d. Among the heavy contracts that are reported are some for best gas coals—for about 200,000 tons. These sales have been made to merchants; and the price agreed upon is said to work out at nearly 11s. 3d. per ton f.o.b. A contract for the supply of coal for Königsberg is also named—some 60,000 tons of fair Durham gas coal, which is said to be at 14s. per ton, delivered at that port. Other contracts are in course of negotiation; so that the gas coal trade is active. Coke is firm; and though gas coke is more plentiful, the price is fairly well maintained. Good gas coke is from 12s. 6d. per ton f.o.b.

Scotch Coal Trade.

Trade is stiff, the condition still holding that contracts for forward delivery are being entered into at advanced prices. Current sales are barely sufficient to take up the coal coming into the market. The prices now quoted are: Ell 9s. to 10s. 6d. per ton f.o.b. Glasgow, splint 10s. to 10s. 3d., and steam 9s. to 9s. 3d. The shipments for the week amounted to 344,306 tons—an increase of 17,822 tons upon the previous week, and of 40,738 tons upon the corresponding week of last year. For the year to date, the total shipments have been 12,490,755 tons—an increase of 613,259 tons upon the corresponding period.

New Water Supply for Lincoln.—Last Wednesday, the Mayor of Lincoln (Mr. W. S. White) laid at Burton Lane End the first pipe of the rising main which is to convey the new water supply from Elkesley to Lincoln. Addressing the company, he said the total cost of the work was £190,000. Of this sum, the pipes had cost £50,000, the laying of them £16,000, the bridge over the Trent £8,000, the engines £30,000, the buildings £12,000, four boreholes £7,000, the water-tower £13,000, electrical connection £2,000, the trunk mains in the city £12,000, and the reservoir £25,000. The Water Engineer (Mr. Niel M'K. Barron) presented the Mayor with a silver facsimile of the pipe, with a copy of the inscription engraved thereon. After the ceremony, the company proceeded to the site of the new reservoir at Bracebridge Heath, and inspected the work in progress there.



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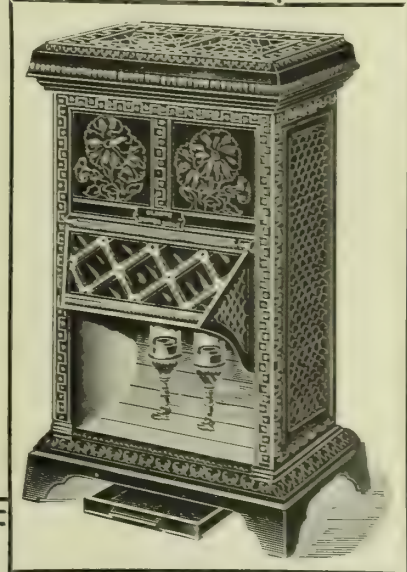
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&c., &c.

Sales of Stocks and Shares.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards obtained excellent prices for two new issues of capital which they had received instructions from Directors to offer for sale. The first lots consisted of £5000 of "C" consolidated stock of the Aldershot Gas, Water, and District Lighting Company, ranking for a maximum dividend of 5 per cent., and entitled, in view of past dividends, to receive this rate. It was all placed at £104 10s. to £105 per £100 of stock. Following this came an issue of a like nominal amount of 4 per cent. consolidated preference stock, which fetched from £95 to £99 10s. per £100. A new issue of "B" shares of £5 each in the Pinner Gas Company, Limited, ranking for a standard dividend of 7 per cent., subject to the sliding-scale (the last dividend on similar shares having been at the rate of £8 8s. per cent.), was next offered; and they were sold at £8 10s. to £8 12s. 6d. each. A few second perpetual £100 debentures in the Company, bearing interest at 5 per cent., fetched £110 to £110 10s. apiece. The last lots consisted of fully-paid £10 ordinary shares in the Gas-Meter Company, Limited; and they realized £12 15s. per share. At Leeds, Messrs. Hollis and Webb sold by auction some new 7 per cent. stock in the Castleford and Whitwood Gas Company, at prices ranging from £164 to £177 per £100. On the same occasion, fifteen £10 new shares in the Wakefield Gas Company were disposed of at £18 10s. 6d. each; and twelve £1 shares in the Grassington Water Company realized £1 16s. each. At the Griffin Hotel, Amersham, recently, Messrs. Hamnett, Raffety, and Co. offered for sale 3000 shares and 20 debenture bonds in the Amersham, Beaconsfield, and District Water-Works Company, Limited. The amount realized by the sale was £5700.

Gas Testing in London.—At the meeting of the London County Council last Tuesday, the report of the Public Control Committee on this subject, given in the "JOURNAL" for the 26th ult. (p. 266), was received without comment.

The New Gas Supply for Hailsham.—In the last number of the "JOURNAL," we recorded the inauguration of the new gas supply for Hailsham, which is being furnished by the Eastbourne Gas Company. The event is referred to by the "Eastbourne Chronicle" as follows: "Hailsham has been flooded with the cheap and brilliant article dispensed by the Eastbourne Gas Company; and the streets and houses, equally with the inhabitants themselves, are radiant. A twist of the magic lever by the venerable Chairman of the Company (Dr. Jeffery), and the trick was done. The residents and traders are to be congratulated on their good fortune; and though it be from the shrewd business enterprise of an outside Company that their new-found advantages are derived, they will none the less fully appreciate the change, and none the less readily wish well to their plucky deliverers. Any lingering sentiment of regret at parting from an old local undertaking must soon vanish before the cheering effulgence of the Eastbourne illuminant, and the still more potent influence of reduced gas bills."

Universal Gas Methane and Buisson Hella Company.

The Company announce that an extraordinary general meeting will be held on Thursday, at the registered offices, No. 54, Cheapside, when a resolution will be submitted: "That the Company be wound up voluntarily, and that Robertson Lawson, of No. 34, Old Broad Street, in the City of London, England, Chartered Accountant, and Georges Lemarquis, one of the Judicial Administrators of the Civil Tribunal of the Seine, be, and they are hereby, appointed Joint Liquidators." It is stated by the "Financial Times" that the meeting is to take place under order of the High Court of Justice, to consider a scheme of arrangement under which the Company will go into voluntary liquidation, and the creditors of the Company and all expenses of the liquidation are to be paid in full out of the assets other than the participating shares series "A" and series "B" in the French Company called the Société Industrielle du Gaz Methane; and if the assets shall be insufficient for the purpose, the balance to be provided to the satisfaction of the said Liquidators without any right to recoupment out of the said participating shares. The said participating shares are to be divided among the shareholders as follows: Holders of the 300,000 preference shares shall receive one participating share series "A" for every five preference shares, and one participating share series "B" for every ten preference shares held; and holders of the 600,000 ordinary shares will receive one participating share series "A" for every ten ordinary shares, and one participating share series "B" for every five ordinary shares held by him.

Twineham Water Supply.—Mr. F. H. Tulloch, M.Inst.C.E., on behalf of the Local Government Board, recently held an inquiry into an application by the Cuckfield Rural District Council to borrow £1300 for the purposes of water supply in the parish of Twineham. Mr. C. H. Waugh, the Clerk to the Council, informed the Inspector that the estimated population of the parish, which was the smallest in the Cuckfield Union, was 309; and water was greatly needed for domestic purposes. The present supply was derived from shallow wells. Terms had been agreed upon with the Burgess Hill Water Company to supply water in bulk at 1s. 6d. per 1000 gallons for thirty years.

The Eight Hours Act and Decreased Coal Shipments.—At the last monthly meeting of the Cardiff Chamber of Commerce, the President (Mr. A. J. Griffiths) said the net decrease in the shipment of coal from the South Wales ports for the month of September was 22,989 tons. Cardiff still showed an increase of 368,000 tons. But it was being rapidly brought down; and if the present state of affairs continued, the increase would by the end of the year be nearly all wiped out. They had not very far to look for the cause. It was obvious that the falling-off of the output was attributable to the working of the Eight Hours Act; and it looked as if they would have to put up with a permanent decrease of 10 per cent. in the output owing to the introduction of this unfortunate measure.



20 in. wide by 25½ in. high.

Our Latest Design.

THE

"GAINSBOROUGH"

Shallow Fire, 10 inches wide.

Single row Main's New Fuel.

Gas and Air Adjuster.

Economical in Gas Consumption.

Efficient in Radiation.

R. & A. MAIN, Ltd.,

Gothic Works, EDMONTON, LONDON, N., and Gothic Works, FALKIRK.

The Charges of the Metropolitan Water Board.

The following letter on this subject appeared in "The Times" last Wednesday: "I think it would be interesting if one of your legal correspondents would explain how the decision of Mr. Justice Neville in the case of the South Suburban Gas Company [*ante*, p. 191] can be reconciled with that of the Brighton and South Coast Railway, decided in the Westminster County Court. In the earlier case, the Judge decided that the words 'railway purposes' included a supply of water for lavatories, &c., which are referred to in section 25 as domestic. In the later case, the Judge decides that 'trade purposes' do not include such supplies. Both sets of words are taken from section 16 of the Charges Act, and that section appears to refer to 'trade' and 'railway' purposes in identical terms." A correspondent writing under the *nom de plume* of "Inner Temple," replied to this letter as follows: "The answer to your correspondent is that in all probability the two decisions cannot be reconciled, and that Mr. Justice Neville's judgment overrules the decision of the County Court Judge, which was referred to in the argument of the South Suburban Gas Company's case. The test in all cases is the use to which the water is put. If this is a domestic use, such as lavatories, &c., the supply, to whomsoever provided, is a supply for domestic purposes, and chargeable at the domestic rates, subject to the modifications set out in section 9 and other sections of the Act."

Fire Caused by Flood.—Owing to the heavy rains last week, Folkestone and Dover suffered very severely from flood; and at the house of Major Anderson, in Folkestone Road, Dover, floating furniture came into contact with a lighted gas-jet and was set on fire. The police, who were with their fire-engine pumping out the water from adjoining premises, were called, and they soon extinguished the fire.

Suicide of an Electrical Engineer.—Last Tuesday morning, Mr. Francis Hastings Medhurst, a consulting electrical engineer, and the Unionist candidate for Stafford, committed suicide by shooting himself in a hotel at Croydon. At the inquest on Thursday, the father of the deceased said he believed his son's mind had become unbinged by political and financial worries. The jury returned a verdict of "Suicide during temporary insanity." Mr. Medhurst will be remembered by some of our readers, as he read a paper on "Electricity Supply from Town Gas" at the meeting of the Gas Institute in Edinburgh in 1895.

Two Children Suffocated by Gas.—A girl twelve years old and her brother five years of age, the children of a toolmaker named Micklewright, were suffocated by gas at their home in Erdington on Monday night of last week. They were in a bedroom 10 feet square, which had a window and ventilator, but no chimney. On Tuesday morning, the father noticed a smell of gas, and found the children dead in bed, with the gas-tap turned full on. His idea was that the little girl, in turning out the light, might have accidentally moved the tap on again. The mother said she went into the children's room before going to bed. The gas was turned off, and she did not detect any smell of gas. The jury returned a verdict of "Accidental death."

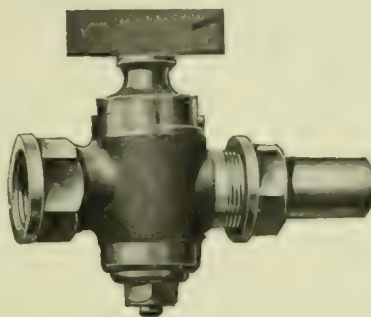
New Joint-Stock Companies.—Tar Paving, Limited, has been registered with a capital of £1000, in £1 shares, to acquire any rights or interests in respect of slag at Frodingham, Lincolnshire. Porhydrometer, Limited, is the title of a Company formed with a capital of £860,000, in £1 shares, to carry on the business of ironfounders, engineers, manufacturers of and dealers in porhydrometers, weighing appliances and other machinery, &c. [The porhydrometer was described in the "JOURNAL" for the 3rd of August last.] It has already been mentioned that among the new limited liability undertakings recently registered was Clark's Syphon Stove Company. It has been formed, with a capital of £8000, in £1 shares, to take over the business of gas syphon stove manufacturers carried on by the Richmond Gas Stove and Meter Company, Limited, at Highbury, N., as S. Clark and Co. The first Directors are Messrs. T. Derryhouse, H. M. Thornton, J. Coxon, J. A. Ransome, J. F. Atkin, and J. W. Glover; and the Secretary is Mr. J. W. Slack, of Warrington.

Quality of Pontypool Water.—At the monthly meeting of the Pontypool Urban District Council last Wednesday, a letter was received from the Secretary of the Pontypool Gas and Water Company (Mr. T. B. Pearson), in reply to a communication from the Council, calling attention to adverse reports in regard to the Company's water supply by Mr. G. R. Thompson, the County Analyst. Mr. Pearson stated that samples of the water had been submitted to Dr. Thresh, who assured the Company that the *B. coli* was absent in both samples submitted to him. The Company had taken steps to effectually filter all the water supplied by them, and were further increasing their filtration plant. The Council should, in their opinion, replace the old ball type of hydrants by new valve hydrants, as the former might prove a source of danger whenever it was necessary to turn off the water to effect any repairs. Dr. Thresh stated that "both waters are of good quality, and well fitted for domestic purposes." After some discussion, the matter was referred to the Sanitary Committee.

Shrewsbury Water Supply.—With a view to improving the water supply from the River Severn, the Shrewsbury Corporation have just erected a mechanical pressure filter house; and this was formally opened last Thursday. It was explained by Alderman Morris, the Chairman of the Water Committee, that by the installation of the pressure filters the Council could fairly claim to have solved the water problem of the town, perhaps not to the satisfaction of theorists or faddists, but in a manner which must satisfy practical people. Time worked wonders. On one hand, it had provided them with these pressure filters, which were little thought of over here some years ago. He wished to make it clear that they did not put forward the filtered Severn water for drinking. Fortunately, Shrewsbury was happy in having a separate drinking water supply. He concluded by asking the Mayor to accept as a small memento of the occasion a goblet, which had been purchased by the members of the Water Committee, to show their appreciation of the good work Mr. Blower had done. Mr. Peter Bell (of the firm of Messrs. Bell Bros.) also presented a gold key to his Worship. Both the gifts bore suitable inscriptions; and the Mayor briefly acknowledged them—remarking that he had not anticipated anything of the kind. The Mayor then proceeded to the filter-house, and formally opened it.

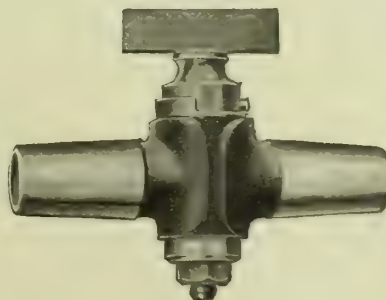
MAIN TAPS

No. 119.



ROUND GASWAY.

No. 64.



OBLONG GASWAY.

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PRICES
AND SAMPLES.

SAWER & PURVES,
MANCHESTER & NOTTINGHAM.

Agent for Scotland:

J. D. GIBSON, 2, CAUSEY SIDE STREET, PAISLEY.

Electricity Supply Losses at Kingston.—The 15th annual report on the subject of the Kingston-on-Thames municipal electricity undertaking has just been published. Mr. J. E. Edgcome, the Borough Electrical Engineer, shows an increase of 82 consumers and 5734 lamps, &c., of 8-candle power, which, he says, is "the largest increase in any one year since the beginning of the undertaking." But, in spite of this increase, the deficit on the year's working is £1251 13s. 8d., compared with £884 15s. 11d. last year. The total capital outlay now stands at £103,429, of which £29,453 has been repaid; and there are 1106 consumers with connections equal to 50,963 lamps of 8-candle power—the electricity supplied to them being 568,749 units. During the fifteen years the undertaking has been run by the Corporation, the net loss to the ratepayers has amounted to £12,378.

An Eyesore in the City.—Under this heading the following letter, signed "M. D.," appeared in "The Times" last Wednesday: "Although I have been a wayfarer in the City for many years, I never till lately took note of the two gas-standards which are placed on the steps of the west front of St. Paul's Cathedral. When one realizes the hideous unseemliness of these, and considers how such structures would certainly be rendered objects of grace and beauty in a corresponding position in any great ecclesiastical building on the Continent, one is ashamed, and almost stupefied, to believe that we in London have so long endured anything so mean and unworthy. May I venture to suggest that the Lord Mayor should signalize his departure from the Mansion House by bringing this matter before his fellow-citizens, and securing a few hundred pounds wherewith to replace these unsightly objects with something artistic and appropriate in bronze?"

At a meeting of the Hoyland Urban Council, it has been decided to make the Elsecar Gas Company an offer for the purchase of their gas-works.

At a meeting of the Bedale Urban District Council, a communication was read from the Local Government Board declining to grant leave to borrow a sum for a water-works scheme for a period of longer than 28 years. The Council originally asked for 50 years; and it has now been agreed to apply to the Board for a period of 35 years in which to repay the loan.

At the inquest, at Cardiff, on the body of a postman's wife who had died through inhaling gas, her stepfather stated that she used to go to see fortune-tellers frequently. The previous week she said that a fortune-teller told her she had a mother very ill, and a little stepsister who would have nothing to do with her. The deceased also said: "When she asked me to look in the crystal, I saw myself in a chair deliberately committing suicide with gas." The Jury found that deceased committed suicide while of unsound mind and suffering from delusions.

The "West Ham Express" informs its readers that Mr. Will Thorne, M.P., has been busy at Leeds among the Corporation workmen who have been demanding certain improvements of wages and conditions. As a result of his efforts as chief officer of the Gas Workers and General Labourers' Union, a strike of about 1000 men has been averted. An advance of 1s. per week has been obtained for about 188 ashpit men, 80 horse drivers, and 143 channellers, amounting in all to about £1060 per annum. The question of the practicability of a 48 hours' week has been left to the Sanitary Committee.

We have received a small pamphlet which the Carron Company have just issued in connection with their new season's gas-fires. It is a very neat production in an attractive wrapper. A special feature is a group of various canopies, having chaste brass decorations, any of which can be fitted to certain stoves of which particulars and an illustration are given on the facing page. At the end of the pamphlet the Company's gas-heated steam-radiators are shown in plain and ornamental patterns, and also their patent hygienic induction condensing gas-stove, which is constructed according to the requirements laid down by the "Lancet" Special Analytical Commission.

After dealing last week in their City Notes with the proposal to grant a pension to the retiring President of the Grand Trunk Railway, the "Pall Mall Gazette" proceeded to make the following general remarks (which, it is pointed out, do not refer to Sir C. Rivers-Wilson): "There is, we fear, a far too free and easy method of regarding the relative positions of directors and shareholders, especially when it is a case of using the money of the latter to pay the former. In fact, the whole joint-stock system is being too frequently used as a mere excuse for affording the idle and the incompetent, but, happily for them, the influentially placed, a comfortable livelihood. Nobody who knows anything at all about joint-stock companies—and many officials could tell a tale, were they not tongue-bound—can doubt this fact. On many boards we have the mere adventurer or the useless hanger-on, whose only real capacity is to draw fees or attend meetings to sign cheques, transfers, and such-like routine. Not too often do we find on any board more than a member or two who get much beyond this stage, or are of any real use. It is the sickening feature of joint-stock enterprise. Take, for instance, a gas company of some standing. We understand that on the particular board referred to there is not a single director who really thoroughly understands the practical gas work. That does not so much matter. One of them is a capable business man, of good general knowledge, and a fair idea of the gas work, and is quite capable of looking after the officials who do understand it thoroughly. So this gentleman is the busy man of the board, and another is a mere financier. But here, again, he is very useful as representing important City interests. But what of the rest? There are several of them; and, from all we hear, there is not one whose capacity is far above drawing fees or signing cheques. And these gentlemen draw quite a respectable sum per annum between them for work which a junior clerk could do at 30s. a week. When one of the really active directors retires, we have a demand for a pension for doing his duty, perhaps in mere spare time—services for which he is paid handsomely. And if by chance the business is sold, quite likely the directors secure a big bonus for themselves and handsome allowances for the leading officials. Would this be done in the case of a private business? The real owner (the shareholders in the case of a company) might of his grace grant something to his servants. But with joint-stock enterprise it is too often a case of a very liberal dole to the people who have really little absolute right to it."



The "ONYX."

13-inch Fire Opening.

NOTE

The Wide Fire Opening,
Intense Pillar Fuel, and
Oval Fire Front,

as introduced by us last Season.

RESULTS OBTAINED ARE
UNEXCELLED FOR EFFICIENCY
AND ECONOMY.

ALL SINGLE ROW FUEL FIRES
ARE SUPPLIED WHEN REQUIRED
WITH THESE IMPROVEMENTS.

The "AGATE."

15-inch Fire Opening.



The Parkinson Stove Company, Ltd.
(Incorporating Maughan's Patent Geyser Co.),

BIRMINGHAM:

Stour Street.

LONDON:

Office and Show-Rooms:

129, High Holborn, W.C.

In order to cope with the great increase of their business, the Bland Light Syndicate, Limited, have taken additional premises at No. 15, Little Trinity Lane, E.C.

To prevent any repetition of the recent scene at the baths of the Worthing Corporation, when, owing to the failure of the electric light, swimmers had to grope their way out of the water and spectators their way from the building by the light of matches and a bicycle lamp or two, gas-jets are to be fixed for use in case of emergency.

In addition to the gas companies named in the "JOURNAL" for the 19th ult., the Meldrum breeze furnace has been supplied to the Corporations of Birmingham, Coventry, Dumfries, Hamilton, Liverpool (for the Fazakerley Gas-Works), and Port Glasgow; to the Barry, Mountain Ash, Sowerby Bridge, and Teignmouth Urban District Councils; and to the Great Yarmouth Water Company.

The Directors of Meters Limited have declared interim dividends to the 30th of September at the rates of 5½ and 4 per cent. per annum on the preference and ordinary shares respectively.

A special meeting of the Bideford Town Council was held last Thursday to consider an application from the Gas Company for a special supply of 500,000 gallons of water to fill a new gasholder tank. It was stated that water was now coming in freely, and that the reservoirs contained 12 million gallons, and there was a prospect that they would be overflowing before Christmas. The members were of opinion that the water could be supplied without any risk to the domestic supply. It was said that there was another source from which the Company could obtain the water by pumping if the Corporation did not supply it. The Council decided to offer the quantity required for £35 and out-of-pocket expenses.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations, &c., Vacant.

FITTERS (REPAIRING COOKERS, &c.). No. 5149.
WORKING MANAGER. South Brent Gas-Works.

Situations, &c., Wanted.

REPRESENTATIVE OR FOREMAN (METER, &c., WORKS).
No. 5148.
SUPERINTENDENT OF INCANDESCENT STREET LIGHT
ING, &c. J. W. Coates, Bradford.

William Lindley Bequest Scholarship.

Applications by Nov. 30.

Plant, &c. (Second-Hand), for Sale.

EXHAUSTER, CONDENSERS, TANK, WASHERS, PURIFIERS, COAL BREAKER AND ELEVATOR. Walker and Wallend Gas Company.
LOW-PRESSURE LIFT. West Bromwich Gas-Works.

Plant, &c. (Second-Hand), Wanted.

PURIFIER. F. A. Greene, 3, Miles Lane, E.C.

Meeting.

ORIENTAL GAS COMPANY. London Offices. Nov. 17.
Twelve o'clock.

Stocks and Shares.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.
Nov. 23.
BOGNOR WATER COMPANY. Nov. 23.
LITTLEHAMPTON GAS COMPANY. Nov. 17.
SOUTHEAST GAS COMPANY. Nov. 16.
TENDRING HUNDRED WATER COMPANY. Nov. 16.
WORTHING GAS COMPANY. Nov. 23.

TENDERS FOR

Exhausting Plant, &c.

CLEATOR MOOR GAS DEPARTMENT. Tenders by
Nov. 19.

Gasholder, &c.

BUDAPEST CORPORATION. Tenders by Nov. 30.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 303.

Issue	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
500,000	10	Oct '4	10	Alliance & Dublin 10 p.c.	17-18	-½	5 11 1	195,242	Stk.	Aug. 26	5	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
298,955	10	"	7	Do. 7 p.c.	12½-13	..	5 7 8	561,000	Stk.	"	10	Liverpool United A	223-225	..	4 5 11
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	718,100	"	"	7	Do. B	166-168	..	4 3 4
200,000	5	Oct. 28	6½	Bombay, Ltd.	52-6*	..	5 8 4	306,083	"	June 25	4	Do. Deb. Stk.	104-106	..	3 15 6
40,000	5	"	6½	Do. New, £4 paid.	4½-4¾	..	5 9 1	75,000	5	June 11	6	Malta & Mediterranean	48-51	..	5 17 1
50,000	10	Aug. 26	5	Bourne 10 p.c.	28-28½	..	5 5 3	560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	59-102	..	4 18 0
311,810	10	"	7	mouth Gas B 7 p.c.	16½-16¾	..	4 3 7	250,000	100	"	4½	Melbourne 4½ p.c. I e.	100-102	..	4 8 3
75,000	10	"	6	and Water Pref. 6 p.c.	15½-15¾	..	3 16 2	541,920	20	May 27	3½	Monte Video, Ltd.	2½-13½	..	5 5 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	254-257	..	4 17 3	1,775,892	Stk.	July 29	4½	Newcastle & G't sh'd Con	100-100	..	4 3 4
300,000	"	"	5½	Do. New	100-102	..	4 19 0	518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	93-94	..	3 14 6
50,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13-13½	..	5 3 8
206,250	"	June 11	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	300,000	Stk.	Apr. 29	8	Oriental, Ltd.	139-141	..	5 13 6
228,000	Stk.	Sep. 10	1	Brighton & Hove Orig.	208-213	..	5 3 3	60,000	5	Sep. 10	8	Ottoman, Ltd.	68-68	..	5 5 6
246,320	"	"	8	Do. A Ord. Stk.	150-152	..	5 5 3	31,800	53	Aug. 26	13	Portsea Island A	137-139	..	4 19 0
460,000	20	Oct. 14	0	British	42-43	..	4 13 0	60,000	50	"	12	Do. B	129-131	..	4 19 3
109,000	Stk.	Aug. 26	6	Bromley A 5 p.c.	118-120	..	5 0 0	100,000	50	"	12	Do. C	120-123	..	4 17 7
165,700	"	"	4½	Do. B 3½ p.c.	88-90	..	5 0 0	114,800	50	"	10	Do. D and E	101-103	..	4 27 1
82,278	"	"	5½	Do. C 5 p.c.	106-108	..	5 1 10	398,490	5	Oct. 28	7	Primitiva Ord.	6½-7½	..	4 18 4
5,000	"	June 25	3½	Do. 3½ p.c. Deb.	88-90	..	3 17 9	796,680	5	July 29	5	Do. 5 p.c. Pref.	5½-5½	..	4 10 11
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	13½-14	..	5 0 0	488,902	100	June 1	4	Do. 4 p.c. Deb.	95-97	..	4 2 6
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	96-98	..	4 1 8	1,000,000	10	Oct. 14	8	River Plate Ord.	16½-16½	..	4 15 7
100,000	13	"	—	Cape Town & Dis., Ltd.	4-5	..	—	312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	96-98	..	4 1 8
100,000	10	"	—	Do. 4½ p.c. Pref.	5½-5½	..	—	250,000	10	Sep. 29	8	San Paulo, Ltd.	14½-14½	..	5 8 6
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48½-49½	..	6 1 3	62,500	10	"	11	Do. 6 p.c. Pref.	11½-12½	..	4 16 0
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82-84	..	5 7 2	125,000	50	July 1	5	Do. 5 p.c. Deb.	51-52	..	4 16 2
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	106½-108½	..	4 12 2	135,000	Stk.	Sep. 10	10	Sheffield A	230-232	..	4 6 2
1,493,280	Stk.	Aug. 26	10	Commercial 4 p.c. Stk.	109-111	..	4 13 8	209,984	"	"	10	Do. B	230-232	..	4 6 2
560,000	"	"	10	Do. 3½ p.c. do.	104-106	..	4 14 4	523,500	"	"	10	Do. C	230-232	..	4 6 2
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	70,000	10	Oct. 14	10	South African	12½-12½	..	7 16 11
800,000	Stk.	"	5	Continental Union, Ltd.	97-99	..	5 1 0	6,429,895	Stk.	Aug. 12	5½	South Met. 4 p.c. Ord.	120-122	..	4 7 4
200,000	"	"	7	Do. 7 p.c. Pref.	138-140	..	5 0 0	1,895,445	Stk.	July 13	3	Do. 3 p.c. Deb.	85-87	..	3 8 11
491,270	Stk.	"	5	Derby Con. Stk.	121-123	..	4 1 4	209,823	Stk.	Aug. 26	8	South Shields Con. Stk.	154-156	..	5 2 7
55,000	"	"	4	Do. Deb. Stk.	103-105	..	3 16 2	605,000	Stk.	Aug. 12	5½	S'th Suburban Ord. 5 p.c.	119-121	..	4 10 11
143,995	"	Oct. 2	5	East Hull 5 p.c. Ord.	97-99	..	5 1 1	60,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
486,000	10	July 14	12	European, Ltd.	24½-25	..	4 16 0	117,028	Stk.	July 14	5	Do. 5 p.c. Deb. Stk.	122-124	..	4 8 8
354,060	10	"	12	Do. £7 ros. paid.	18½-19	..	4 14 9	502,310	Stk.	May 13	5	Southampton Ord.	111-115	..	4 8 6
15,141,545	Stk.	Aug. 12	4½	Gas 4 p.c. Ord.	104-105	-1	4 8 10	120,000	Stk.	Aug. 12	6½	Tottenham A 5 p.c.	133-135	..	5 1 9
2,600,000	"	"	3½	light 3½ p.c. max.	88-90	..	3 17 9	453,940	"	"	58	and B 3½ p.c.	111-113	..	4 15 3
3,799,735	"	"	4	and 4 p.c. Con. Pref.	104-105	..	3 16 2	149,470	"	June 25	4	Edmonton 4 p.c. Deb.	100-102	..	3 18 5
4,193,975	"	June 11	3	Coke 3 p.c. Con. Deb.	85-87	..	3 8 11	182,380	10	June 11	8	Tuscan, Ltd.	9-9½	..	8 8 6
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	92-94	..	5 6 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
62,500	"	"	6½	Do. do. 5 p.c.	117-119	..	5 9 3	236,476	Stk.	Aug. 14	5	Tyne mouth, 5 p.c. max.	109-111	..	4 10 1
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	17½-17½	..	6 4 0	255,636	Stk.	Aug. 26	6½	Wands 3 p.c. p.c.	139-141	..	4 14 0
131,070	Stk.	Sep. 10	6½	Ilford A and C	138-140	..	4 12 10	79,416	"	June 25	3	Do. 3 p.c. Deb. Stk.	73-75	..	4 0 0
65,783	"	"	5	Do. B	105-107	..	4 13 6	895,872	"	Aug. 12	58	West Ham 5 p.c. Ord.	124-126	..	4 5 4
65,500	"	June 25	4	Do. 4 p.c. Deb.	102-104	..	3 16 11	210,000	"	"	5	Do. 5 p.c. Pref.	127-129	..	3 17 6
4,940,000	Stk.	May 13	8	Imperial Continental	180-182	..	4 7 11	253,300	"	June 25	4	Do. 4 p.c. Deb. Stk.	112-114	..	3 10 8
1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	95-97	..	3 12 2								

Prices marked * are "Ex div."

OXIDE OF IRON.**O'NEILL'S OXIDE**

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S**"VOLCANIC" FIRE CEMENT.**

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old
Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEEDS.
Correspondence invited.

LUX'S GAS PURIFYING MASS.

See Advertisement on p. 352.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

AMMONIACAL Liquor wanted.

CHANCE AND HUNT, LTD., Chemical Manufacturers,
OLDBURY, WORCS.
Telegrams: "CHEMICALS."

TAR WANTED.

National Telephone 7002. Telegrams: "UPRIGHT."

Apply, THOMAS HORROCKS

Albert Chemical Works, BRADFORD,
MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent
Naphtha, Sulphate of Ammonia.

R. & G. HISLOP,

GAS ENGINEERS, RETORT BUILDERS,
CONTRACTORS, &c.

RETORT SETTINGS, COAL-TESTING PLANT,
BOILER FIRING.

UNDERWOOD HOUSE, PAISLEY.

METER INDICES

WITH AND WITHOUT DIALS.

A. ROUX & CO., Limited,

9, SOUTHAMPTON STREET, HOLBORN, W.C.

MOVEMENTS FOR CLOCKS, PHOTOMETERS AND
BAROGRAPHS, WHEELS, PINIONS, AND WORMS.
WORKS, HANDSWORTH, BIRMINGHAM.

J. E. C. LORD, Ship Canal Tar Works,

Waste, Manchester. Pitch, Creosote, Benzols,
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
Carbolic Acid, Sulphate of Ammonia, &c.

AMMONIA.

Consumers in any form are invited to correspond
with CHANCE AND HUNT, LTD., Chemical Manufacturers,
OLDBURY, WORCS.

APPLY TO THE

CHAIN BELT ENGINEERING CO.

DERBY, ENGLAND,

FOR REALLY RELIABLE

ELEVATORS AND CONVEYORS

ALSO

DRIVING AND CONVEYOR CHAINS.

SULPHURIC ACID for Sale, specially

suitable for making Sulphate of Ammonia.

BROTHERTON AND CO., LTD., Chemical Manufacturers,
WORKS: BIRMINGHAM, LEEDS, WAKEFIELD, and SUNDER-
LAND.

GAS PLANT for Sale—We can always

offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gas-holders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.

FIFTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

J. & J. BRADDOCK (Branch of Meters

Limited), Globe Meter Works, OLDHAM, and
54 & 47, Westminster Bridge Road, LONDON, S.E.

WET AND DRY GAS-METERS, PREPAYMENT

METERS, STATION METERS, AND GOVERNORS.

REPAIRS RECEIVE PROMPT ATTENTION.

Telephones: 815 Oldham, and 2412 Hop, London.

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"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

DONALD M'INTOSH,

110, CANNON STREET, LONDON.

BENZOL

AND

CARBURINE FOR GAS ENRICHING.

ALSO

THE MAXIM PATENT CARBURETTOR.

For Prices, &c., apply to

THE GAS LIGHTING IMPROVEMENT CO., LTD.,

7, BISHOPSGATE STREET WITHOUT,

LONDON, E.C.

Telegraphic Address: "Carburine, London."

AMMONIACAL Liquor wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers.
WORKS: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
WAKEFIELD, AND SUNDERLAND.

KRAMERS AND AARTS WATER-**GAS PLANT.**

K. & A. WATER-GAS COMPANY, LTD.

89, VICTORIA STREET, S.W.

HYDRATED OXIDE OF IRON.**PREPARED from Pure Iron.**

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

"GAZINE" (Registered in England and

Abroad). A radical Solvent and Preventative
of Naphthalene Deposits, and for the Automatic
Cleaning of Mains and Services.

It is also used for the enrichment of Gas.

Manufactured and supplied by G. BOURNE, West
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Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-
TYNE.

Telegrams: "DORIC," Newcastle-on-Tyne. National
Telephone No. 2497.

D. ANDERSON AND COMPANY,

GAS LIGHTING ENGINEERS AND

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18 & 20, FARRINGDON ROAD, LONDON, E.C.

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ROBERT B. FITZMAURICE,

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LEADENHALL STREET, LONDON.

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"FITZMAURICE, LONDON," No. 11,113 CENTRAL.

Established 1887.

Advertiser, who is Shipping Agent to several Gas
Companies, Municipalities, and Gas Material Makers,
would be glad to undertake SHIPMENT OF GOODS
ordered by Colonial Gas-Works or Others.

GEO. NEWTON, Limited,

Wires: "AUTOMATIC, MANCHESTER."

40 YEARS' REPUTATION.

WET, DRY, ORDINARY AND PREPAYMENT,
STATION METERS, &c.

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**BRISTOL RECORDING GAUGES
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J. W. & C. J. PHILLIPS, 23, COLLEGE HILL,
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PUBLICATIONS, "MERCHANDISE MARKS
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MEWBURN, ELLIS, & PRYOR, Chartered Patent
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-
grams: "Patent London," Telephone: No. 243 Holborn.

OXIDE OF IRON.

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SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manu-
facture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.,

with which is amalgamated Wm. PEARCE & SONS, LTD.,

86, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 341 AVENUE.

"V.S.C." PAINT FOR GAS-

WORKS PLANT.

JOHN E. WILLIAMS AND CO.,

LOWER MOSS LANE,

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Telegrams: "ENAMEL," National Telephone 1759.

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers.
WORKS: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
WAKEFIELD, AND SUNDERLAND.

SULPHURIC ACID.**S**PECIALLY prepared for Sulphate of

AMMONIA Makers by

CHANCE AND HUNT, LIMITED,

WORKS: OLDBURY, WEDNESBURY, AND STAFFORD.

Address Correspondence and Inquiries to OLDBURY,
WORCS.

Telegrams: "CHEMICALS, OLDBURY."

FIDDES-ALDRIDGE**SIMULTANEOUS Discharging-Charger.**

The one Machine which Discharges and Charges
at One Stroke.

See Advertisement, Oct. 12, p. III. of Centre.

ALDRIDGE AND RANKEN,

39, VICTORIA STREET, WESTMINSTER, S.W.

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"MOTORPATHY, LONDON,"

5118 WESTMINSTER.

SULPHATE OF AMMONIA

SATURATORS and all LEAD and TIMBER
WORK in Connection with Sulphate Plants.

We guarantee promptness, with efficiency for Re-

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JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS,

BOLTON. Telegrams: SATURATORS, BOLTON. Telephone 0248.

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Hammersmith.

GAS APPARATUS MANUFACTURER
AND CONTRACTOR.

Telegrams:

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"GASOSO LONDON."

14 HAMMERSMITH.

APPLICATIONS for Appointments

arranged effectively. Greatly appreciated by
Recipients. Numerous unsolicited Testimonials. Write
Now for Particulars.

HERBERT GREATOR, Upper Hackney, MATLOCK.

YOUNG Man, Practical Meter Maker,

well up in all Gas Appliances (Late Foreman to
Leading Firm of Meter Makers and Gas Engineers in
Scotland), is desirous of securing SITUATION as
REPRESENTATIVE or FOREMAN, or any Position
of Trust in Similar Establishment.

Address No. 5148, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

YOUNG Gentleman (Age 37) wishes to

offer his Services to some large City as SUPER-
INTENDENT OF INCANDESCENT STREET
LIGHTING. Has thorough knowledge of giving the
best results possible for the Public, also for Corporations
Financially. No additional cost whatever. Really a
Re-arrangement in the Fitting. No flickering of the
Light or dying out. Weather no object. Advertiser
has also a few small Inventions, arrangements for
using which will be made with employers.

Address J. W. COATES, 28, Stephenson Street, Great
Horton, Bradford, YORKSHIRE.

FITTERS wanted by a large Company.

Experience in Repairing Cookers, Fires, and
Radiators essential. Permanent Positions to good
men.

Apply, by letter, to No. 5149, care of Mr. King, 11,
Bolt Court, FLEET STREET, E.C.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
and ELEVATING and CONVEYING PLANT, ROSE
MOUNT IRON-WORKS, ELLAND.

WANTED, at once, a Working-
MANAGER for the South Brent Gas-Works.
Make 1,500,000 Cubic Feet. Must be a good Carbonizer
and used to Small Generator Settings, and fully capable
of carrying out the usual routine of a Small Gas-Works
single handed.

Apply, stating Wages required (no House), and en-
closing Copies of Testimonials, to B. L. TAYLOR, Gas-
Works, MORETONHAMSTEAD.

**"WILLIAM LINDLEY BEQUEST"
SCHOLARSHIP.**

APPLICATIONS are invited for this
SCHOLARSHIP, which is in the Administration
of the Committee of Management of the Benevolent
Fund of The Institution of Civil Engineers, is tenable
for three years, and is of the value of £40 per Annum.

The main conditions are that the holder shall be the
son of a Corporate Member, or of an Associate of The
Institution, between 16 and 20 years of age, who is
desirous of entering the Civil Engineering profession,
but whose means are inadequate to defray the incidental
expenses. In the event of there being more than
one suitable Applicant preference will be given to any
Candidate whose father's career has been devoted to the
Sewerage and Water Supply of Towns, or whose
inclination tends towards taking up that branch of the
Profession.

The Scholarship will be vacant on the 1st of January,
1910; and Applications should be addressed to the
Honorary Secretaries of the Fund, No. 25, Great
George Street, S.W., not later than the 30th of Novem-
ber next.

Nov. 1, 1909.

GASHOLDERS—Splendid, 45 feet dia-
meter, and New STEEL TANK fixed complete,
to Plan and Specification. Also 50 feet Single-Lift
and 50 feet Double-Lift. Cheap, with STEEL TANKS.
Can be seen temporarily erected.
FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

WANTED, a Second-Hand Purifier,
about 5 feet Square.
Particulars to F. A. GREENE, 3, Miles Lane, LONDON,
E.C.

FOR SALE—Second Hand Low Pressure
LIFT, with Regulating Valve Complete. Stroke
20 feet. To lift load of 30 cwt.
Apply to HAROLD E. COPP, Engineer, Albion Gas-
Works, WEST BROMWICH.

FOR SALE—the following Second-Hand
GAS-PLANT—

One Bryan Donkin EXHAUSTER, combined on
One Bedplate with Horizontal Steam-Engine,
complete with Inlet and Outlet Valves. Capacity,
30,000 Cubic Feet of Gas per Hour.

One ANNULAR CONDENSER, with Four Vertical
Tubes 30 ft. high, Inner Tube 2 ft 8 in. diameter,
Outer Tube 3 ft. 6 in. diameter, with Two 15-inch
diameter Disc Valves, and 4-inch Tar Run-Off
with Seal Pots.

One PIPE CONDENSER, 25 ft. high, with Twelve
12-inch diameter Pipes, Two 15-inch Disc Valves,
and 6-inch Tar Run-Off and Seal Pots.

One CAST-IRON TANK, 18 ft. 4 in. by 14 ft. by 5 ft.
deep, Machine Faced Joints, Plates ½-inch
thick.

Two Livesey WASHERS, to pass 500,000 Cubic Feet
of Gas per Twenty-Four Hours.

Four PURIFIERS, 18 ft. square by 5 ft. deep, with
Water Lute Covers, Connections, and Four-
Way Valves, also Lifting Gear with Girder.

One COAL BREAKER and ELEVATOR capable
of handling 20 Tons of Coal per Hour.

Apply to the WALKER and WALLSEND UNION GAS
COMPANY, Neptune Road, WALLSEND-ON-TYNE.

CLEATOR MOOR URBAN DISTRICT COUNCIL.

TENDERS are invited by the above

Council for the work of DUPLICATING the
EXHAUSTING PLANT at their Gas-Works on a new
site.

A copy of the Drawings and Specifications may be
obtained from the undersigned on payment of £1 ls.,
which will be returned on receipt of a bona-fide Tender.

Sealed Tenders, endorsed "Exhauster," and addressed
to the undersigned, to be delivered, at the Public
Offices, Cleator Moor, not later than Friday, the 19th
day of November, 1909.

The Council do not bind themselves to accept the
lowest or any Tender.

HENRY ROTHERY,
Clerk to the Council.

Public Offices, Cleator Moor,
Oct. 19, 1909.

ORIENTAL GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that an
ORDINARY GENERAL MEETING of this
Company will be held at the Company's Office, Fins-
bury House, Blomfield Street, London, E.C., on Wed-
nesday, the 17th day of November, 1909, at Twelve
o'clock noon precisely, for the following purposes: To
receive the Directors' Report and the Accounts of the
Company for the Year ended the 30th of June, 1909,
to declare a Dividend, and to elect a Director and
Auditors in the place of those retiring.

The TRANSFER BOOKS WILL BE CLOSED from
the 3rd to the 25th of November, both days inclusive.

By order of the Board,

H. J. LUFF,
Secretary.

Finsbury House, Blomfield Street,
London, E.C., Oct. 27, 1909.

No. 90,088/1909. 11.

TENDERS invited for the Construction
of a THREE-STORIED, 45,000 m³
IRON-TANK TELESCOPIC GAS
HOLDER, to be built on the Plots
No. 1317-1318/4,5,6,7, Tutaj-Utca,
Budapest.

THE Municipality of Budapest invites TENDERS for
a Three-Storied IRON-TANK GASHOLDER con-
taining 45,000 cubic meters of Gas delivered with all
Accessories on the spot, completely fitted up and set
working.

Ground Plan and Design of the proposed Gasholder,
terms of Building and of Delivery, and Schedules of
Tenders and of Contract, may be inspected and ob-
tained against payment of 40 Crowns at the Public
Works Office of the Metropolitan-City of Budapest,
(Budapest, Central-Townhall, 2nd floor No. 256).

The written Tenders are to be drawn up on the
Schedules for Tenders and Contracts at disposal; and
these, as well as any enclosures, should be in Hungarian
language, and put in a Sealed, intact Envelope, which
will have to be delivered either directly to Town
Councillor Charles Vosits, Director of the 2nd Section
of the Council of the Metropolitan-City of Budapest, or
to his substitute (Budapest Central-Townhall 2nd floor
No. 256), or to be forwarded by Mail in such a manner
that the Tender should reach at the appointed time
hereafter named.

The Envelope to bear the following address: To the
Municipality of the Metropolitan-City of Budapest.

"Tender for the construction of the Gasholder ad-
vertised under No. 90,088/1909."

The Tenders Drawn up and Signed in due order,
should be put in a Sealed Envelope and submitted
until noon of Tuesday the 30th of November, 1909, each
sheet of the Tender to bear a 1/- Crown Stamp.

In the Estimate to be submitted in connection with
the Tender, the Tenderer will have to state clearly, in
numerals, at what Unit Prices he is undertaking each
kind of work, he being obliged to indicate the unit prices
of each single item of the estimate, to calculate the
single amounts on basis of the unit prices, and to state
the final amount in letters and figures.

The Tenderer to Sign by his own hand not only the
Tender itself, but also every Enclosure—namely the
Estimate bearing the Unit Prices and final Amounts,
the Plans, the Calculations of Weight and of Stability,
&c.

Tenderers are bound to make a Deposit of 30,000
Crowns.

The Deposit to be made either in Cash or in Securities
(Bonds) admissible according to the rules in force, latest
until midday of the day before the submission, at the
Central Treasury of the Metropolitan-City, or at any
district Treasury, against Deposit-receipt.

Should the Tender be accepted, then the Deposit will
be retained as Guarantee for the true fulfilment of the
Contract, without having to be supplemented according
to the General Terms relating to Tenders.

The Deposit may be made—always with reference to
the No. of the Advertisement—also by Mail, but in this
case it should be posted latest the day before the sub-
mission.

The Securities will be accepted at 90 per cent. of the
latest buying rate quoted by the Stock Exchange of
Budapest, but in no case above their nominal value. An
exception will be made with the Bonds of the Capital,
which, up to their nominal value, will be accepted at
the latest rate of Exchange.

No cash, or Saving Bank's Books, nor Securities can
be enclosed to the Tender itself as Deposit.

The Deposit Receipt or a copy of same, certified by a
Notary Public, or the Post-Office Receipt to be attached
to the Tender.

The Tenderer is bound to declare in his Tender that
he will deliver the Gasholder completely fitted up and
in working order by the 1st of October, 1910, and that
accordingly he will commence the construction at latest
by the 1st of April, 1910.

The Tenders arrived until the term above named will
be Unsealed at midday of the 30th of November, 1909, at
the Hall for Public Works, Central-Townhall No. 266,
at which proceeding the Tenderers, or their legalized
Representatives, may be present.

The final decision regarding the Tenders submitted
will be taken latest until the 31st of December, 1909.
The Tenders to remain in force until the final decision
is taken.

The Council of the Metropolitan-City of Budapest
reserve themselves the right of accepting any Tender
they choose.

THE TOWN COUNCIL OF METROPOLITAN-
CITY OF BUDAPEST.

Budapest, Oct. 22, 1909.

BOOKS AND LEAFLETS

TO BE OBTAINED OF

WALTER KING,
11, BOLT COURT, FLEET STREET, E.C.

GAS ENGINEERS' POCKET BOOK.—By H.
O'CONNOR. Price 10s. 6d.

GAS MANUFACTURE FOR STUDENTS.—By J.
HORNBY. Price 5s.

HANDBOOK OF PRACTICAL GAS-FITTING.—
Second Edition. By W. GRAFTON. Price 7s. 6d.

PRACTICAL GAS FITTING.—By PAUL N. HASLUCK.
With 120 Illustrations. Price 2s. 3d., post free.

TREATISE ON THE MANUFACTURE OF SUL-
PHURIC ACID.—By GEORGE LUNGE, Ph.D. Third
Edition, Vol. I. in Two Parts. Price 52s. 6d.

THORPE'S DICTIONARY OF APPLIED CHEMIS-
TRY, Vol. 2. Articles on Gas recommended for
Students by City and Guilds Institute. Price 42s.

GAS LIGHTING.—By CHARLES HUNT. Price 18s.

CALORIMETRY OF PRODUCER AND ILLUMI-
NATING GASES.—By JOHN F. SIMMANCE, Assoc.
M.Inst.C.E., M.Inst.Mech.E. Price 2s.

Other Books supplied (Post Free) at Published Prices.

**SALES BY AUCTION OF GAS AND WATER
STOCKS AND SHARES.**

MESSRS. A. & W. RICHARDS beg to
notify that their SALES BY AUCTION OF NEW
CAPITAL ISSUED UNDER PARLIAMENTARY
POWERS, and of STOCKS and SHARES belonging to
EXECUTORS and other PRIVATE OWNERS in LON-
DON, SUBURBAN, and PROVINCIAL GAS and
WATER COMPANIES, take place PERIODICALLY
at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including
other Gas and Water Stocks and Shares in these Periodi-
cal Sales, will be forwarded on Application to Messrs.
A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND GAS COMPANY.

NEW ISSUE OF £21,500 NEW ORDINARY "B"
STOCK
AND
£3500 FOUR PER CENT. PERPETUAL
DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Nov. 16, at Two o'clock, in
Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
**TENDRING HUNDRED WATER-WORKS
COMPANY.**

(Supplying Harwich, Parkeston, Dovercourt, Walton-
on-Naze, Frinton-on-Sea, and adjacent places.)

NEW ISSUE OF 400 £10 "B" SHARES.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Nov. 16, at Two o'clock, in
Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
WORTHING GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £4085 CONSOLIDATED
ORDINARY STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Nov. 23, at Two o'clock, in
Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
BOGNOR WATER COMPANY.

NEW ISSUE OF 250 £10 ORDINARY SHARES.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Nov. 23, at Two o'clock, in
Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
**ALLIANCE AND DUBLIN CONSUMERS' GAS
COMPANY.**

NEW ISSUE OF £32,000 FOUR PER CENT.
PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Nov. 23, at Two o'clock, in
Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

LITTLEHAMPTON GAS COMPANY.

SPARK AND SON are favoured with
Instructions to SELL BY AUCTION, at their
Sale Room, 25, High Street, Littlehampton, on Wednes-
day, the 17th day of November, 1909, at 3.30 p.m.,
precisely.

400 £5 "C" ORDINARY SHARES

in the Littlehampton Gas Company, in Lots of Four
Shares each.

Full Particulars and Conditions of Sale may be
obtained of Mr. WILLIAM BEDLAM, the Company's
Secretary, LITTLEHAMPTON, or at the Offices of the
AUCTIONEERS, at LITTLEHAMPTON or ARUNDEL.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE, LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE
FURNACE & BLAST-FURNACE BRICKS, LUMPS,
TILES, and every description of FIRE-BRICKS.

Special Lumps, Tiles, and Bricks for Regenerative
and Furnace Work.

SHIPMENTS PROMPTLY and CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN & Co.,
LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

CASES FOR BINDING
QUARTERLY
VOLUMES OF THE "JOURNAL."
 (GREEN CLOTH, GILT LETTERED.)
Price 2s. each.

MIRFIELD GAS COAL.
UNEQUALLED.

Sperm Value 878.85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the
MIRFIELD COLLIERY COMPANY,
RAYENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.

LUX'S
Gas Purifying Material

is now used in many Gas-
 Works throughout Scotland
 with gratifying success.

FRIEDRICH LUX
Ludwigshafen-am-Rhein

Sole Agent for Scotland:

DANIEL MACFIE
 1, North Saint Andrew Street, EDINBURGH
 Telegrams: "GASLUX, EDINBURGH"

Descriptive Pamphlet on Application.

MUNICH
INCLINED CHAMBERS.

*Sole Agents and Licensees for Great Britain
 and Colonies:*

The Coke Ovens & By-Products Co.,
Palace Chambers, LTD.,
Westminster, LONDON, S.W.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
 LIMITED,
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,

AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works
 (also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches
 in diameter, and make and erect to order
 RETORTS, PURIFIERS, and TANKS, with
 or without planed joints, COLUMNS,
 GIRDERS, SPECIAL CASTINGS, &c., re-
 quired by Gas, Water, Railway, Telegraph,
 Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS.
 These are cast in one piece, without Chap-
 lets; doing away with Bolts, Nuts, and Covers,
 and rendering Leakage impossible.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
 Best Gas Coal and Cannel, giving High Illu-
 minating Power, Large Yield per ton, and
 reasonable in Price.
 Telegrams: "DARWINIAN, MANCHESTER."
 Telephone 1806.

JOHN HALL & CO. OF STOURBRIDGE,
 LIMITED,
STOURBRIDGE,
 Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
 And every description of Fire-Clay Goods.
 RETORTS CAREFULLY PACKED
 FOR SHIPMENT.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
 MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
 SCREW STOCKS, TAPS AND DIES,
 SPANNERS, RATCHET BRACES, LIFTING JACKS
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 AND ENGINEERS' TOOLS GENERALLY.
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G.I.C. 10 YEARS' REPUTATION.

THE HOUSE FOR MAINTENANCE SUPPLIES AT COMPETITIVE PRICES.

G.I.C. Mantles for "C," Kern, Inverted, and Graetzin Burners.
 "Natty" and "Paragon" Inverted Burner.
 Graetzin Lamps; all patterns in Stock.
 All kinds of Lighting Glassware.

GENERAL INCANDESCENT CO., LTD.,
52, Great Eastern Street,
London, E.C.
W. J. MOORE, Managing-Director.

Rheinische Chamotte-und Dinas-Werke, Cologne on Rhine.

Construction of

Entire Gas-Works & Coke Oven Plants,
Retort Furnaces,

Furnaces for Chamber Settings **New Coke Ovens**
 (Patent), (Patent),

With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia
 Works, and Cyanogen Extraction Plants.

HEATHCOTE GAS COAL

from the

GRASSMOOR COLLIERIES, CHESTERFIELD.

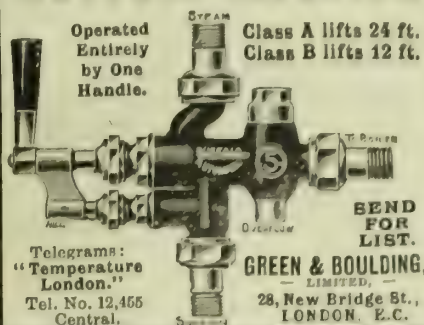
Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality
of Coke.
Maintains a High Standard in Residuals.

ARMSTRONG'S PATENT CANDLE SAFETY LAMPS.



No. 1. No. 2. No. 3.
43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

'BUFFALO' INJECTOR



"COALEXLD."

The growing popularity of the Manufacture of Coalexld is **proved** by the absence of Stocks of Coke, and the **increased** number of Gas-Works now making it.

**COALEXLD LIMITED,
LANCASTER.**

AN EPOCH IN GAS MANUFACTURE.

THE VERTICAL GAS RETORT SYNDICATE,

(DESSAU SYSTEM), LTD.,

17, VICTORIA STREET,
WESTMINSTER, S.W.

See Full Page Advertisement, p. III., Oct. 5.

HANNA, DONALD & WILSON, PAISLEY, ENGINEERS & CONTRACTORS.						
LARGE CAST IRON OR STEEL OIL, LIQUOR OR WATER TANK.	CONDENSERS VARIOUS TYPES.	GAS AND WATER VALVES.	ROOFING STRUCTURAL WORK, M.S. & C.I. PURIFIERS.	GAS EXHAUSTER & GAS ENGINE COMBINED.	ROTARY GAS EXHAUSTER.	GASOMETER AND C.I. OR STEEL TANKS.

NEWTON, CHAMBERS, & CO., LIMITED.

THORNCLIFFE IRON-WORKS, near SHEFFIELD.

— Established 1790 —
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GAS ENGINEERS, IRONFOUNDERS, and CONTRACTORS.

MANUFACTURERS OF EVERY DESCRIPTION OF

PLANT, APPARATUS, AND MACHINERY FOR GAS AND CHEMICAL WORKS.
RETORTS AND FITTINGS, MOUTHPIECES WITH SELF-SEALING LIDS.
IMPROVED COAL AND COKE HANDLING PLANT, CONVEYORS, AND ELEVATORS.
CONDENSERS, SCRUBBERS, AND WASHERS.

PURIFIERS with Planed Joints a Speciality.

PATENT CENTRE-VALVES, RACK AND SCREW VALVES, WOOD GRIDS AND
SCRUBBER-BOARDS, CAST-IRON MAINS, AND SPECIALS.
STRUCTURAL WORK, COLUMNS, GIRDERS, AND ROOFING.
GASHOLDERS, CAST-IRON OR STEEL TANKS.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (special quality) for Engine Cylinders.

GAS COAL famous for its Unrivalled excellence.

Aug. Klönne
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Chamber-Furnaces
HORIZONTAL, VERTICAL, INCLINED
FOR GAS AND COKE

SO FAR 97 CHAMBERS BUILT AND
BUILDING FOR A DAILY PRODUCTION
4 322 500 CFeet.

IN POINT OF EFFICIENCY, COST OF
PRODUCTION AND RESULTS
BEST FURNACES IN THE WORLD.
2000 WORKMEN.

ENQUIRIES AT ONCE ATTENDED TO.



Laying Mannesmann Weldless Steel Tubes in the Bed of the Tidal River Teign.

(Teignmouth Water Scheme, comprising 14 miles of Mannesmann Tubes.)

THE
BRITISH MANNESMANN TUBE CO.,
LTD.,
Salisbury House,
LONDON WALL, LONDON, E.C.

Makers of Weldless Steel Spigot and Faucet, Flanged, Screwed and Socketted, &c., Tubes, Tubular Lamp Posts, Drums, Standards, &c., &c.

Works: LANDORE, S. WALES. Telegrams: "TUBULOUS, LONDON."

GAS MAIN THERMOMETERS.



SOME POINTS ABOUT
THEM ARE:—



Their robust design ensures a long life.

The Scale is clear, open, and easy to read.

Permanent accuracy is secured by care in the selection and annealing of the Glass Tubes.

The Special Bulb Chamber and separable Socket make the Thermometers very quick in action.

THE CAMBRIDGE
SCIENTIFIC INSTRUMENT CO.,
Ltd.
(Hohmann & Maurer Dept.),
CAMBRIDGE.

MAKERS OF THE FÉRY SPIRAL PYROMETER.

CLEANING COOKERS AND LANTERN REFLECTORS

Undoubtedly the Finest and Best Preparation on the Market for **quickly** removing Burnt Grease from the Enamelled Lining of Cookers and Cleaning Lantern Reflectors is

Clarks
"GASCOLITE."

(Registered Trade Mark.)

Can either be applied with a Brush, allowed to stand, Cold, for a few hours, or with Heat for about Half-an-Hour, when Liners and Reflectors can be washed off with Hot or Cold Water and will appear as **new**, or, **put into Tanks with Boiling Water**, when Liners and Reflectors will be cleaned in about 20 Minutes.

In cases where a **steam pipe** is connected to bottom of tank, stoves or liners can be **perfectly cleaned** in 5 to 10 minutes.

This Result can only be obtained at **lightning speed** by using "**Gascolite.**"

Now being used successfully by Gas Companies throughout the United Kingdom and Abroad.

For Trade Prices apply—

CLARKS
LEAD & COLOUR WORKS CO.

Gas Company
Specialists,

READING.

Established 1832.

GRAETZIN LIGHT

Important Improvements.



BURNERS.

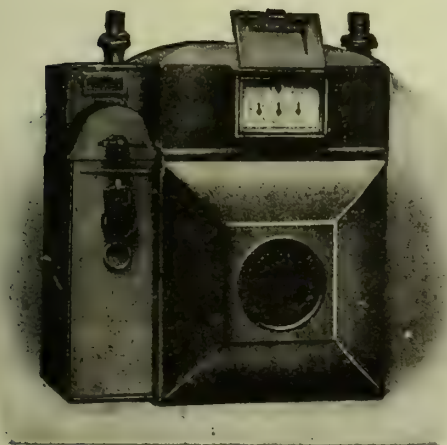
1. 20-Candle Power more light without increase in the consumption of gas.
2. Patent Gas Adjuster; cannot get out of order.
3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. Accurate Regulation of the Air Supply.
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

R. LAIDLAW & SON (EDINBURGH), LTD.

GAS METER MAKERS.



**Prepayment
Dry Meters in
Tinsplate Cases.**

Thousands of our
Meters in use by the
largest Gas Companies
and Corporations and
giving

**COMPLETE
SATISFACTION.**

**Prepayment
Wet Meters in
Cast-Iron Cases.**



DRAWINGS AND FULL PARTICULARS ON APPLICATION,

**Simon Square Works, EDINBURGH.
6, Little Bush Lane, LONDON, E.C.**

SPLENDID CARBONIZING RESULTS.

HIGHEST RESULTS in GAS MADE and COKE SOLD per Ton of Coal Carbonized, obtained where improved Klönne Retort Settings, constructed by us, are in operation.

Reference can be given to several Works where Regenerators are still working after a life of 10 to 15 Years.

THOMAS VALE & SONS, LTD., CONTRACTORS, STOURPORT.

KLÖNNE SETTINGS A SPECIALITY. High-Class Work only.

GASHOLDER TANKS. MAINLAYING. BUILDINGS.

THE BOYS CALORIMETER

As Used for the Gas Light and Coke Co.'s Tests

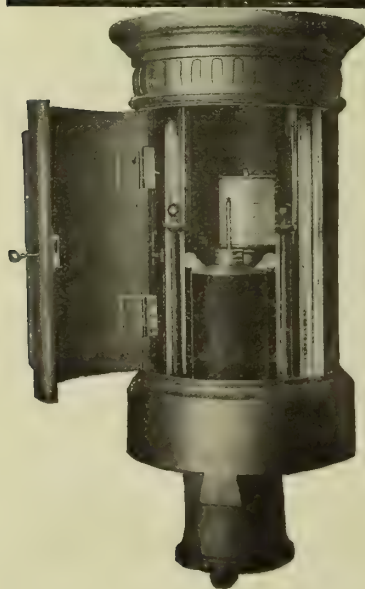
In the London Testing Stations,

Is made and supplied by us at a
MUCH LOWER PRICE THAN ANY OTHER MAKER.

CAN BE CERTIFIED IF DESIRED.

ALEXANDER WRIGHT & CO., LTD.,

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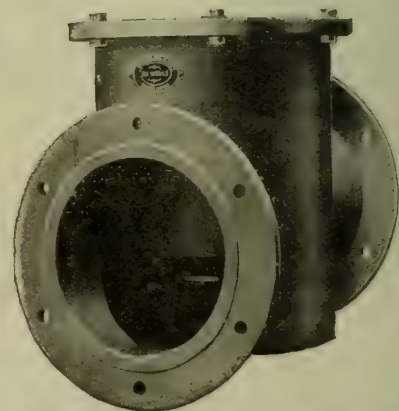
PEEBLES & CO., LTD.,

Tay Works, EDINBURGH.

**PATENT
DISTRICT GOVERNOR**

**FOR
Ordinary or High Pressure.**

PILLAR BOX contains Air-Pressure Holder for Loading the Governor from a distance also Recording Gauge and Inlet and Outlet Pressure Gauges.



LARGE MERCURIAL GOVERNOR.

From a Photo. of 24 in. Size.

May be Loaded by Weights or Air Pressure from a Distance.

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GRAHAM,
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MORTON
& CO.,
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Telegrams:
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Inclined and
Horizontal Retort
Benches.

CONTRACTORS TO

The Vertical Retort
Syndicate, Ltd., London,

FOR ALL THE

BRICKWORK

IN THE

DESSAU

VERTICAL RETORT
INSTALLATIONS.

COAL CONVEYING
PLANTS

COMPLETE WITH

ELEVATORS,

CONVEYORS,

BREAKERS, &c.

THOMAS PIGGOTT & CO., L^D.,
BIRMINGHAM.



LAPWELDED AND RIVETED STEEL PIPES.

HUMPHREYS & GLASGOW'S
CARBURETTED WATER-GAS PLANTS.

Aggregate Capacity of Plants supplied
227,800,000 cubic feet Daily.

ALL PREVIOUS RECORDS BROKEN (See below)

SPENCER'S PATENT HURDLE GRID

The very best Patent Grid on the Market for Holding Oxide Lightly.

IT IS THE FIRST AND THE ORIGINAL DEEP GRID INVENTED.



It is acknowledged by all the leading Gas Managers, that breaking up the Material, and suspending same in the Purifier as it were is the most practical of any system yet made use of.

These Grids are being more extensively used and more successful than ever, not only in this Country, but we are sending a good many Orders abroad. Also we have installed at a certain Works 20 Sets, 5 repeat Orders of 4 Sets each, and at several other places 3 and 4 repeat Orders of 4 Sets each.

And the price of Hurdle Grids is very little more than Flat Grids, and do Three times the work, besides reducing back pressure on the Purifiers more than half.

The Hurdle Grids save their cost in less than 3 Years, and they can be fitted to any kind of Purifier.

The first of a Set of Six Purifiers, 20 feet square, fitted with Spencer's Patent Hurdle Grids. Started Feb. 7, 1906, and run until May 27 1907, having passed 149,266,000 feet. The Oxide was quite loose and easy to empty. Also over 600 Purifiers have been fitted with these Grids in less than Three-and-a-Half Years. Hundreds of References can be had on Application. Send for Catalogue to—

WALTER SPENCER, GRID WORKS, ELLAND.

PATENT
"FLUXITE"
 FIRE
CEMENT

Makers: JOHN E. WILLIAMS & CO., *Lower Moss Lane,* MANCHESTER, S.W.

For
 STOPPING CRACKS
 IN GAS RETORTS.

WATER SUPPLIES.

ARTESIAN BORED TUBE WELLS,

Norton's Patent "Abyssinian" Tube Wells.
 Deep Well Pumps and Patent Air Lift Pumps.

LE GRAND & SUTCLIFF,

Artesian Well and Waterworks Engineers,
 MAGDALA WORKS, 125, BUNHILL ROW, LONDON, E.C.

ARROL-FOULIS

Stoking Machinery

HYDRAULIC COKE PUSHERS

(HUNTER and BARNETT'S PATENT).

WILL DISCHARGE A RETORT IN ONE OPERATION
 LARGE NUMBERS IN USE.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,
GLASGOW.

[See Illustrated Advertisement, Oct. 19, p. 154.]



**OUR DISCOUNT SYSTEM GAINS
 GROUND DAY BY DAY.**

Greatly increases Sale of Gas.

*Particulars and fullest description on
 application.*

T. G. MARSH,
 28, Deansgate, MANCHESTER.

GAS COAL AND CANNEL.

WILSON CARTER & PEARSON, LIMITED,

Gas, Steam, and other Fuel for Home and Export.
GAS COKE CONTRACTORS.

CHIEF OFFICES:

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S. S. STOTT & CO.,
ENGINEERS,
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LIME & OXIDE ELEVATORS & CONVEYORS.

COAL AND COKE STORAGE PLANTS.

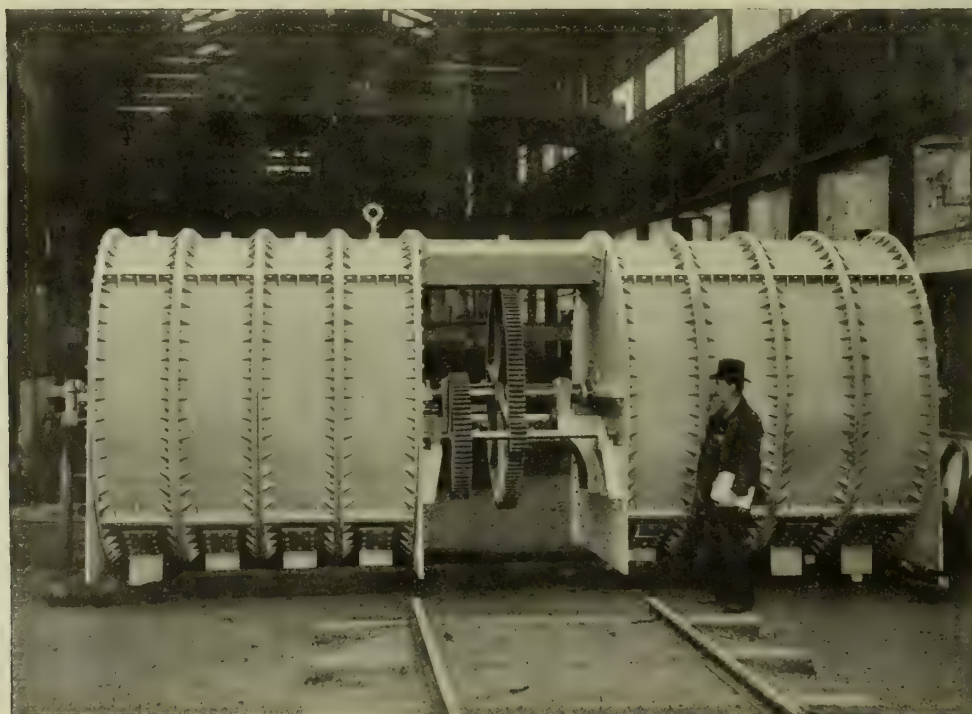
Coal and Coke Elevators and Conveyors.
 STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.

DETACHABLE CHAINS AND SPROCKET WHEELS.

HIGH-CLASS STEAM ENGINES. BEAM PUMPING-ENGINES, &c.

THE WHESOE FOUNDRY CO., LTD.

Works: DARLINGTON.



"Whessoe" Rotary Washer-Scrubber, with Central Driving arrangement, Patent No. 27,158, 1904,
 as supplied to The Stourbridge Gas Company.

London Office: 106, CANNON STREET, E.C.

Welsbach

LIGHT

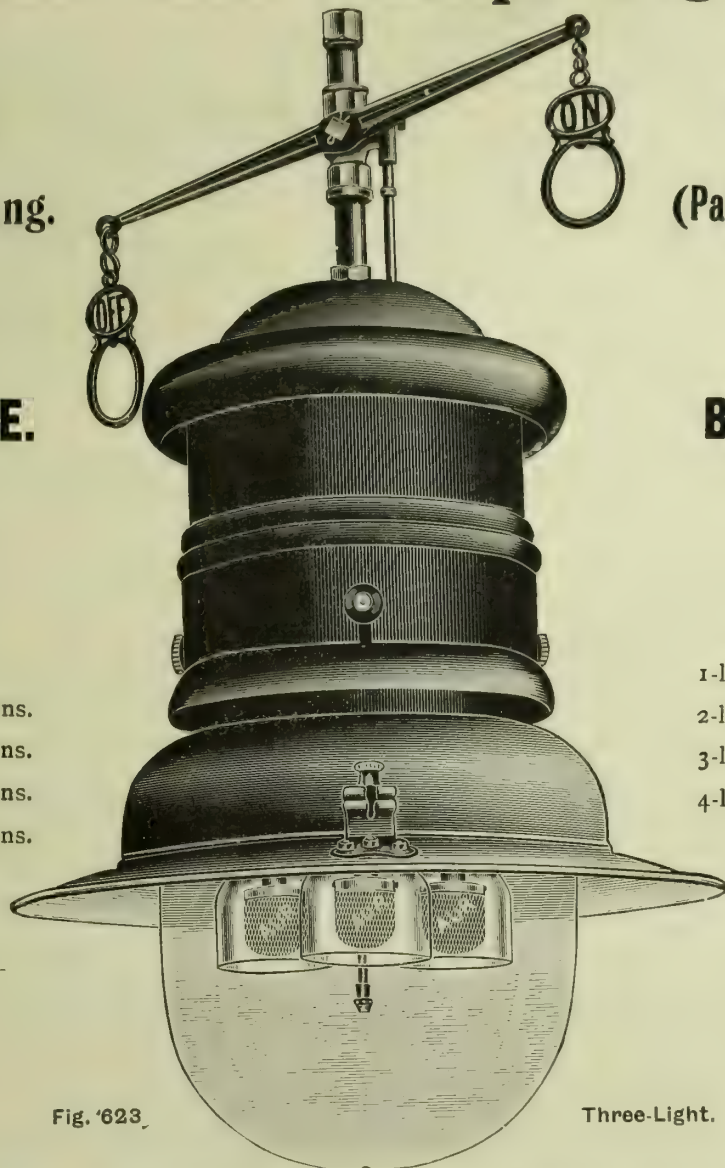
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

Fig. '623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52 6	6/- extra.
2-light	8 feet	260	47 6	6/- extra.	4-light	16 feet	550	72 6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	29 36
" " " In Case lots per dozen.	19 6	57 9	57 9	93/-	Parabolic Reflector, extra	"	36 6/-	7 6	Not made
Case contains . . .	80	18	18	12	Welsbach Mantles, each	6d.	subject as usual.		

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD..

Welsbach House, 344-354, Gray's Inn Road, London, W.C.

Telegrams and Cables: "WELSBACH LONDON."

Telephone 2410 NORTH.

THE WIGAN COAL & IRON CO., LIM^{TD.}

Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.

Telegraphic Address: "WIGAN, BIRMINGHAM."

Telephone: No. 200.

LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

Telegraphic Address: "PARKER, LONDON."

Workmanship and Materials
of the Highest
Quality.

PECKETT'S LOCOMOTIVES.

Built to any
Specification or Gauge.

PECKETT & SONS,
ATLAS LOCOMOTIVE WORKS, BRISTOL

GEO. R. LOVE'S INCLINES AT 45 DEGREES.

CARBONIZATION MADE EASY.

A Few Recommendations for this System:—

Simplicity of Design.
No Machinery to get out of order.

Carbonizing charges 40 per cent. less than with Horizontals.

No skilled Stokers necessary.
Yield of Gas per ton guaranteed about 1000 cubic feet more than under present conditions, of guaranteed candle power.

Heats under absolute control throughout the whole length of the Retorts.

Saleable value of Coke greatly increased.

25 per cent. greater yield of Ammonia.

More liquid Tar.

Stopped Pipes unknown.

Naphthalene always in solution.
45 per cent. less ground space required.

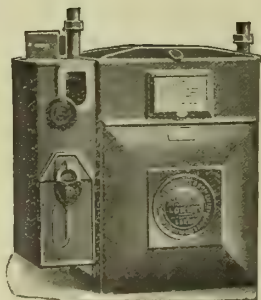
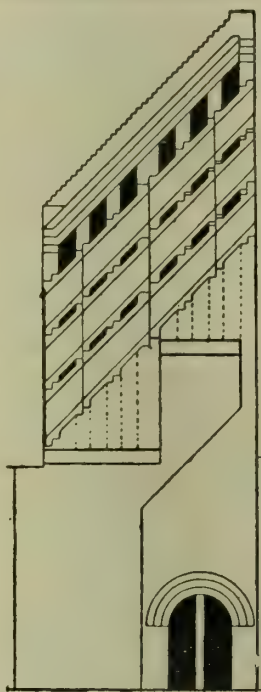
Constructional cost per Ton carbonized considerably less than with Horizontal or Ordinary Inclined Retorts.

Several Installations in course of construction or completed.

FULLEST ENQUIRIES INVITED.

Sole Agents:

WINSTANLEY & CO., MURDOCH WORKS,
KING'S NORTON.



SLOT METER.

SLOT METERS

STATION METERS,

GOVERNORS, &c.



DRY METER.

JAMES MILNE & SON, LTD.,

EDINBURGH. LONDON. GLASGOW. LEEDS.

S. CUTLER & SONS, MILLWALL, LONDON.

And at 39, Victoria St., Westminster, S.W.

GASHOLDERS & STEEL TANKS **Carburetted Water Gas Plant.** **DESSAU VERTICAL RETORTS.**

Messrs. S. CUTLER & SONS are Contractors to the Vertical Gas Retort Syndicate, Ltd., for all Constructional Steel Work, Operating Gears, Fittings, &c., &c.

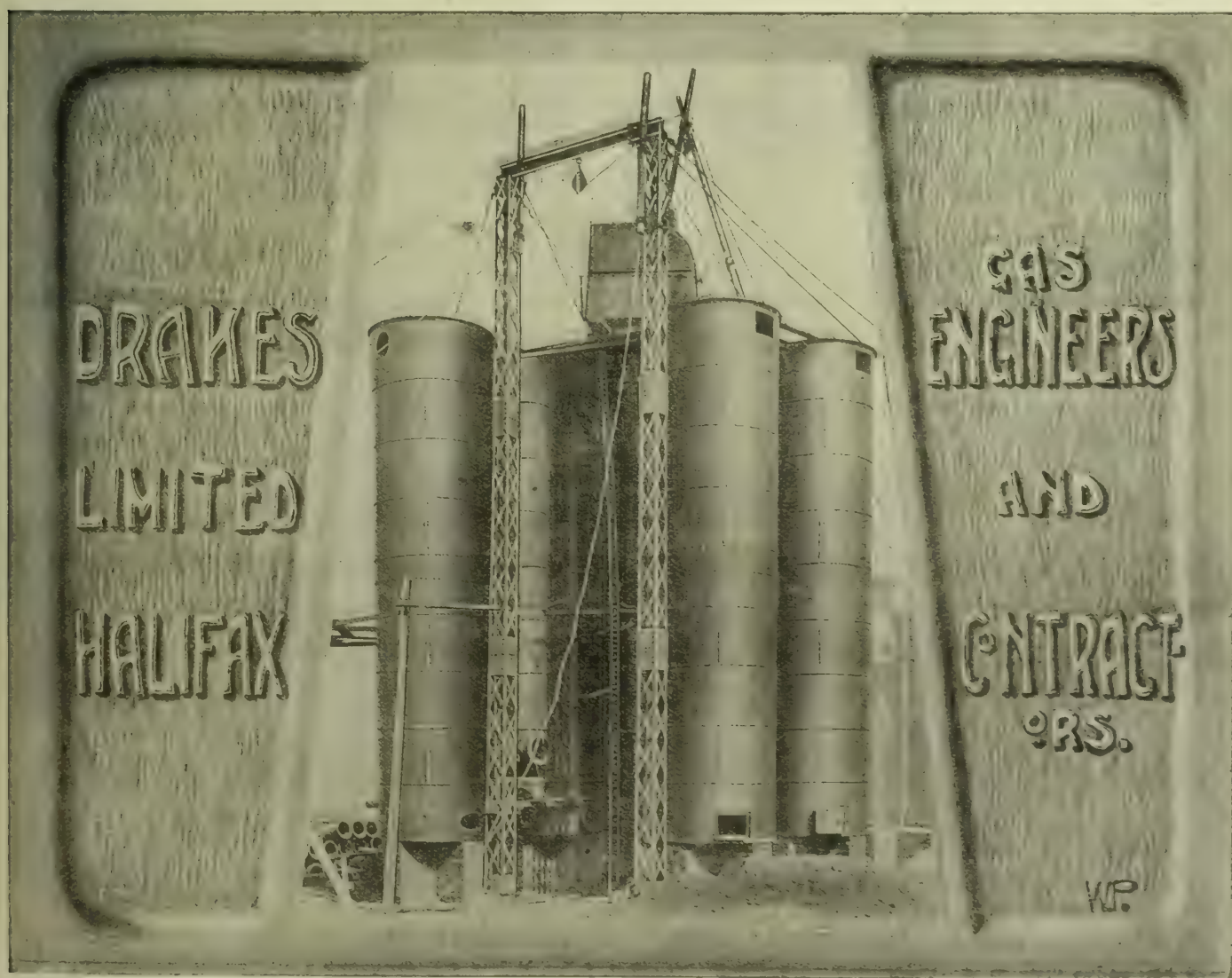
The DESSAU System has been adopted at 45 Gas-Works and up to the present date 3882 Retorts have been ordered.

WATER TUBE CONDENSERS. PURIFIERS.

OIL TANKS. ROOFS. GIRDERS.

Every Requirement for Gas-Works Supplied.

No. 252.



CONTINUOUS CARBONIZATION

IN

GLOVER-WEST PATENTS.

Extracts from Tests made by

Dr. HAROLD G. COLMAN

at the St. Helens Gas-Works.

DURHAM (THORNLEY) COAL.

Gas made per Ton	13,102	cubic feet.
Fuel Consumption	12·3	lbs. per cent.
Illuminating Power	15·56	No. 2 Met. Burner.
Calorific Value	573·6	B.Th.U. (Gross).

YORKSHIRE (SILKSTONE), BARROW COLLIERY.

Gas made per Ton	12,435	cubic feet.
Fuel Consumption	13·4	lbs. per cent.
Illuminating Power	16·19	No. 2 Met. Burner.
Calorific Value	584·9	B.Th.U. (Gross).

LANCASHIRE, WIGAN (ARLEY MINE).

Gas made per Ton	12,145	cubic feet.
Fuel Consumption	12·2	lbs. per cent.
Illuminating Power	15·22	No. 2 Met. Burner.
Calorific Value	576·2	B.Th.U. (Gross).

See "JOURNAL OF GAS LIGHTING," June 8 & July 20, 1909, for description and results.

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THE JOURNAL OF GAS LIGHTING

WATER SUPPLY & SANITARY IMPROVEMENT

Vol. CVIII. No. 2426.]

LONDON, NOVEMBER 9, 1909.

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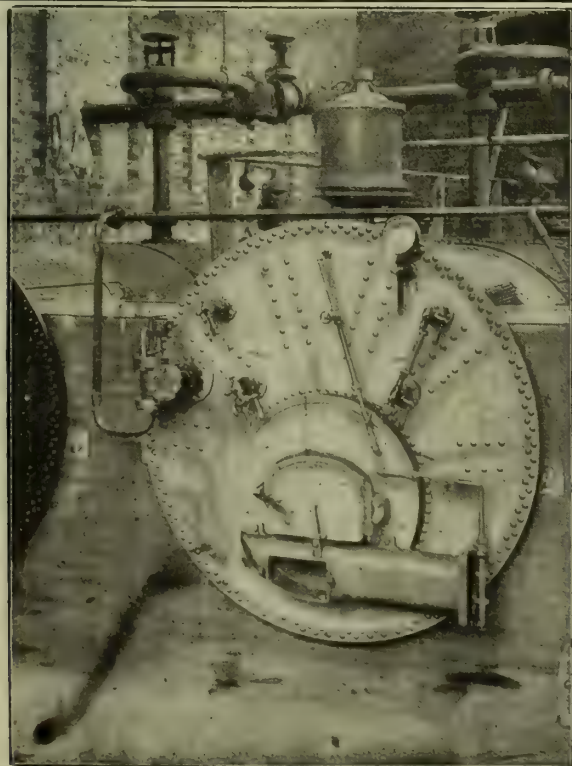
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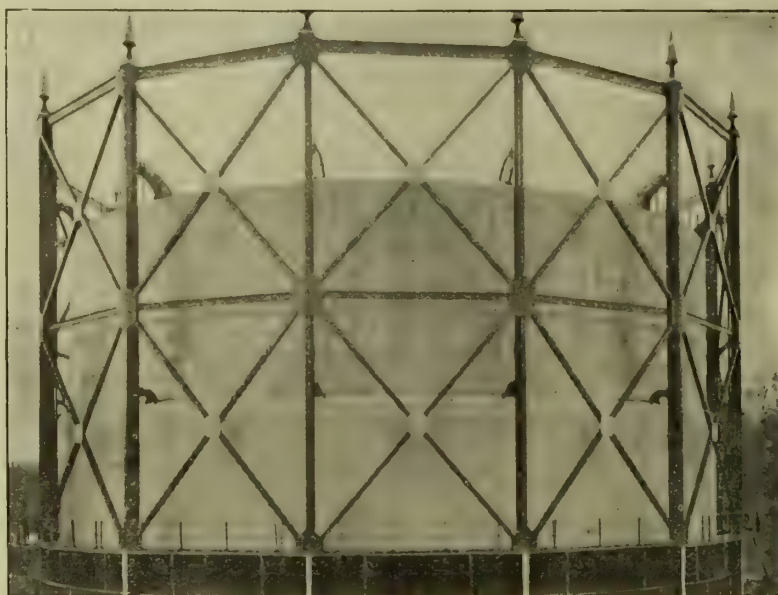
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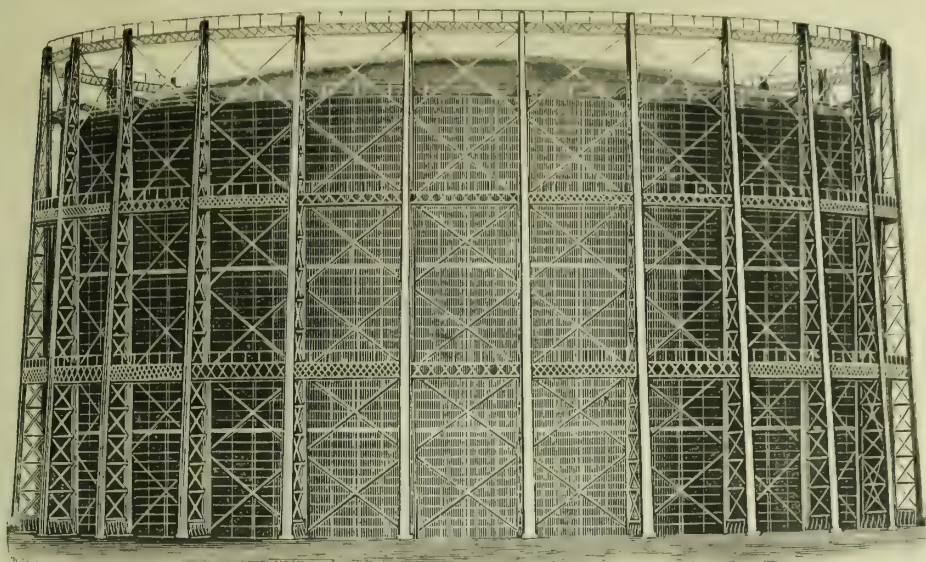
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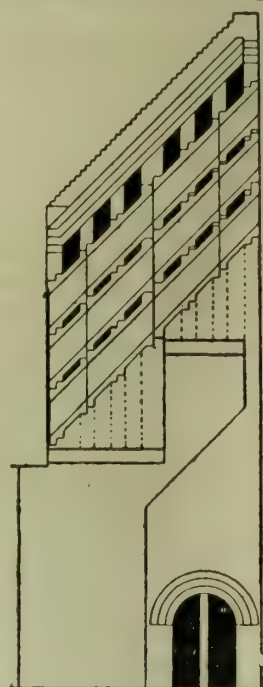
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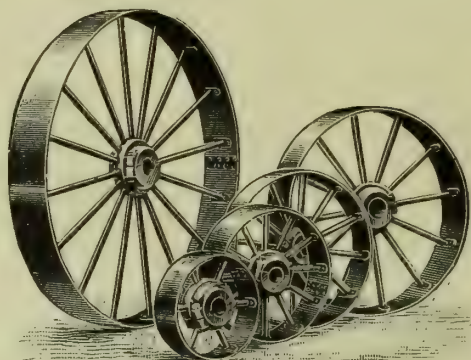
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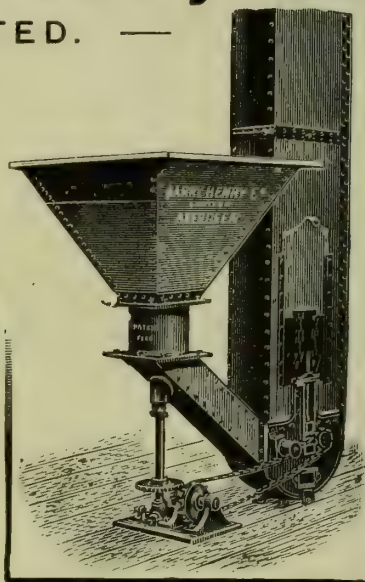
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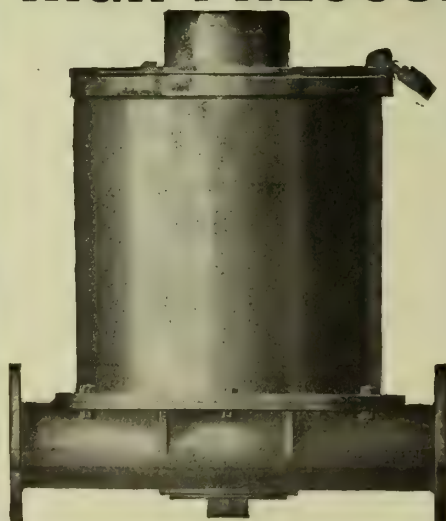
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LANCASHIRE, WIGAN (ARLEY MINE).

Gas made per Ton	12,145 cubic feet.
Fuel Consumption	12'2 lbs. per cent.
Illuminating Power	15'22 No. 2 Met. Burner.
Calorific Value	576'2 B.Th.U. (Gross).

See "JOURNAL OF GAS LIGHTING," June 8 & July 20, 1909, for description and results.

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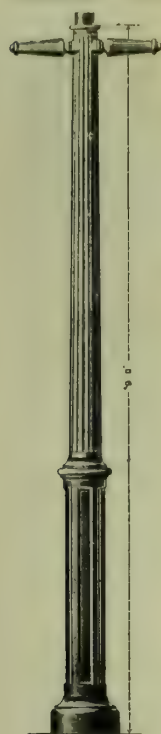
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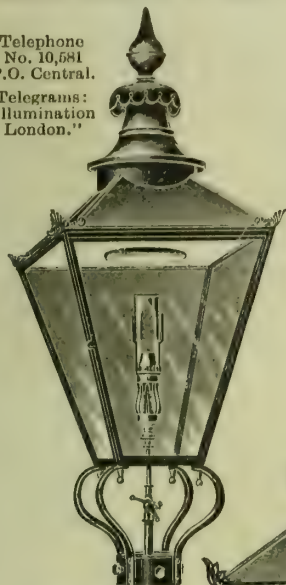
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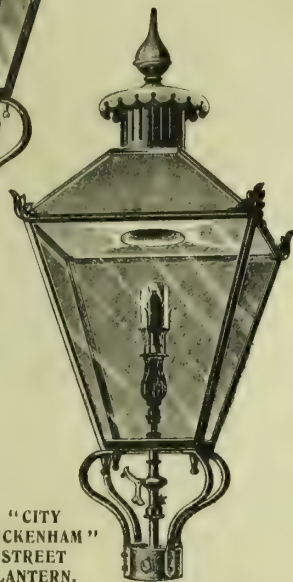
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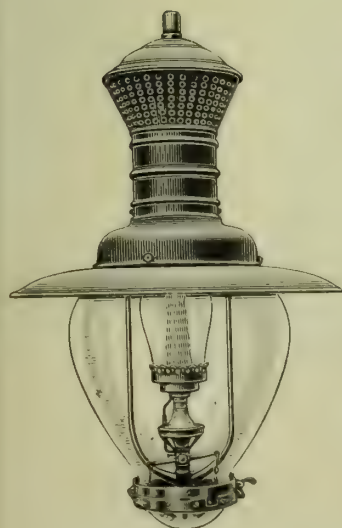
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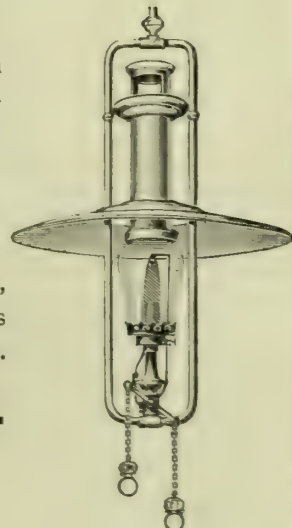
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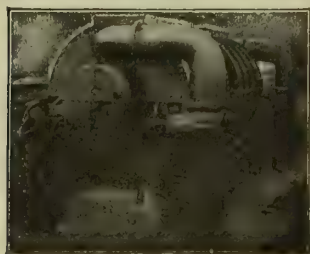


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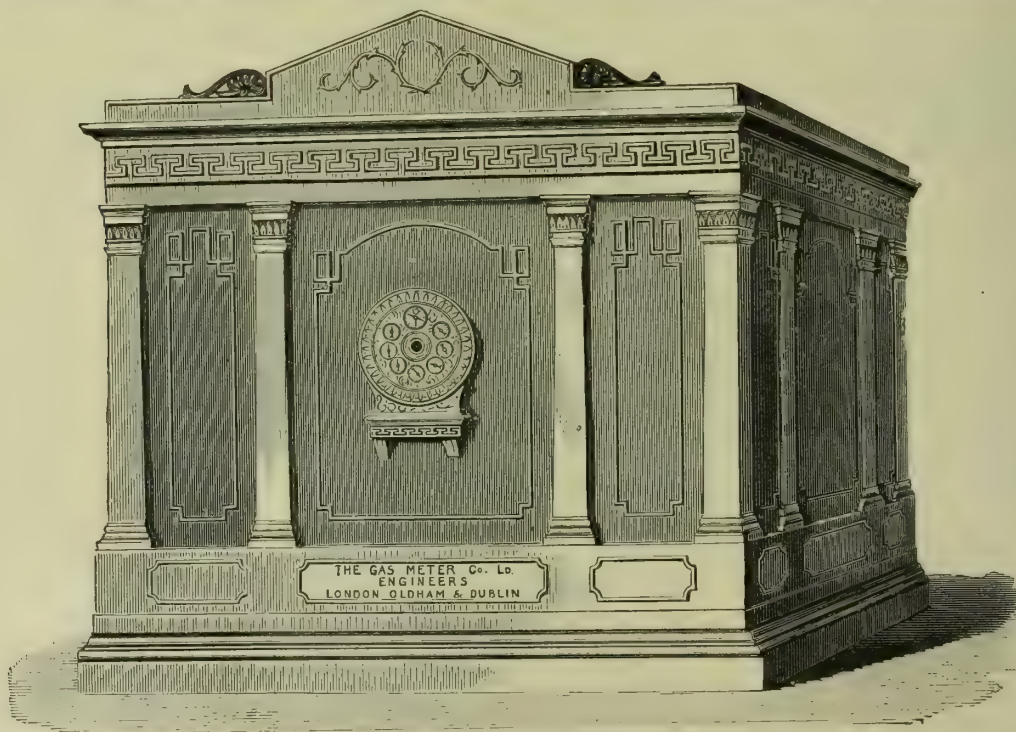
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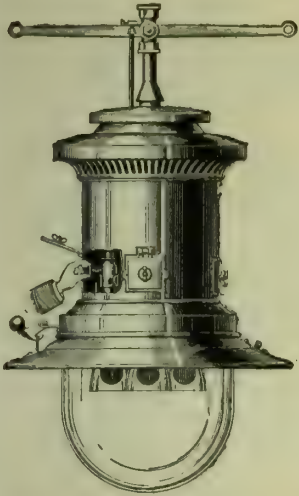
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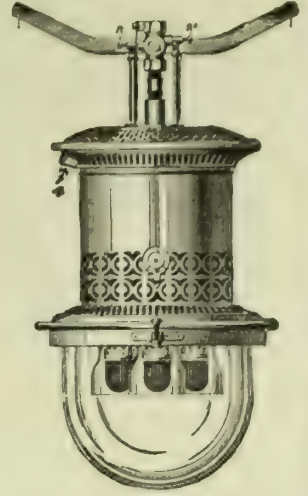
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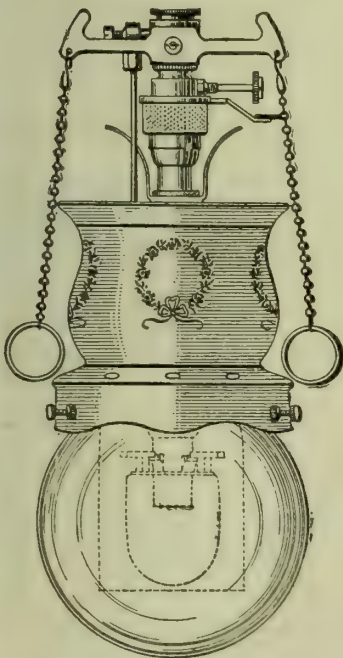
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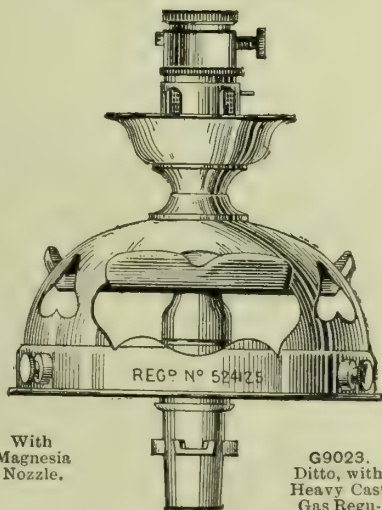


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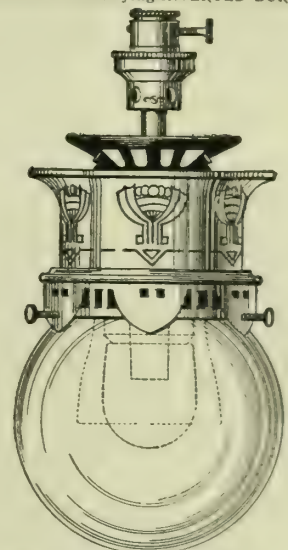
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Without Gas Regulator.

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Ditto, with
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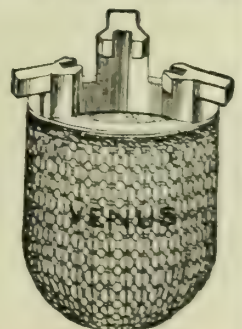
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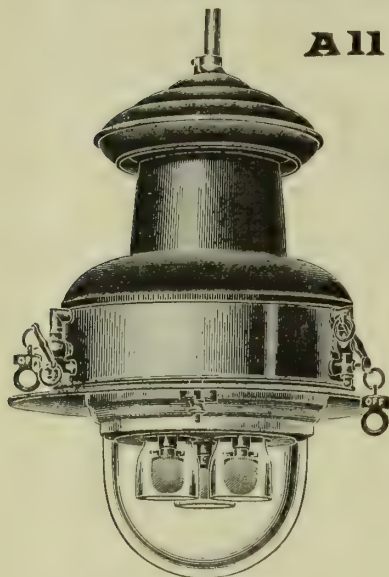
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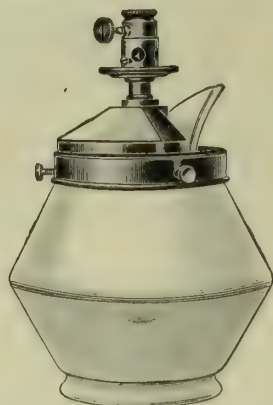
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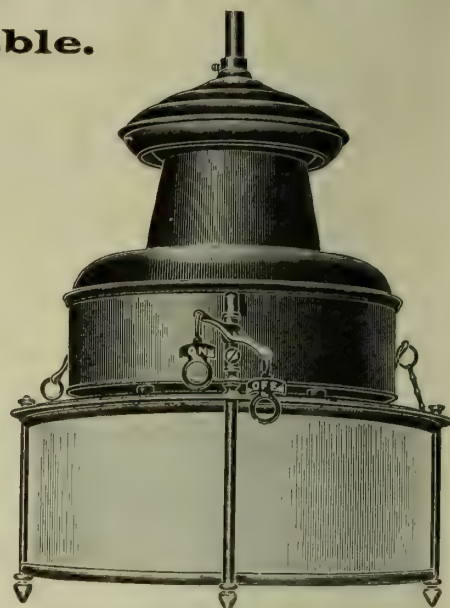


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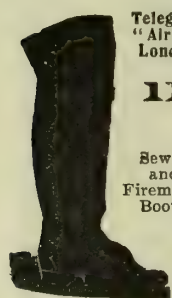


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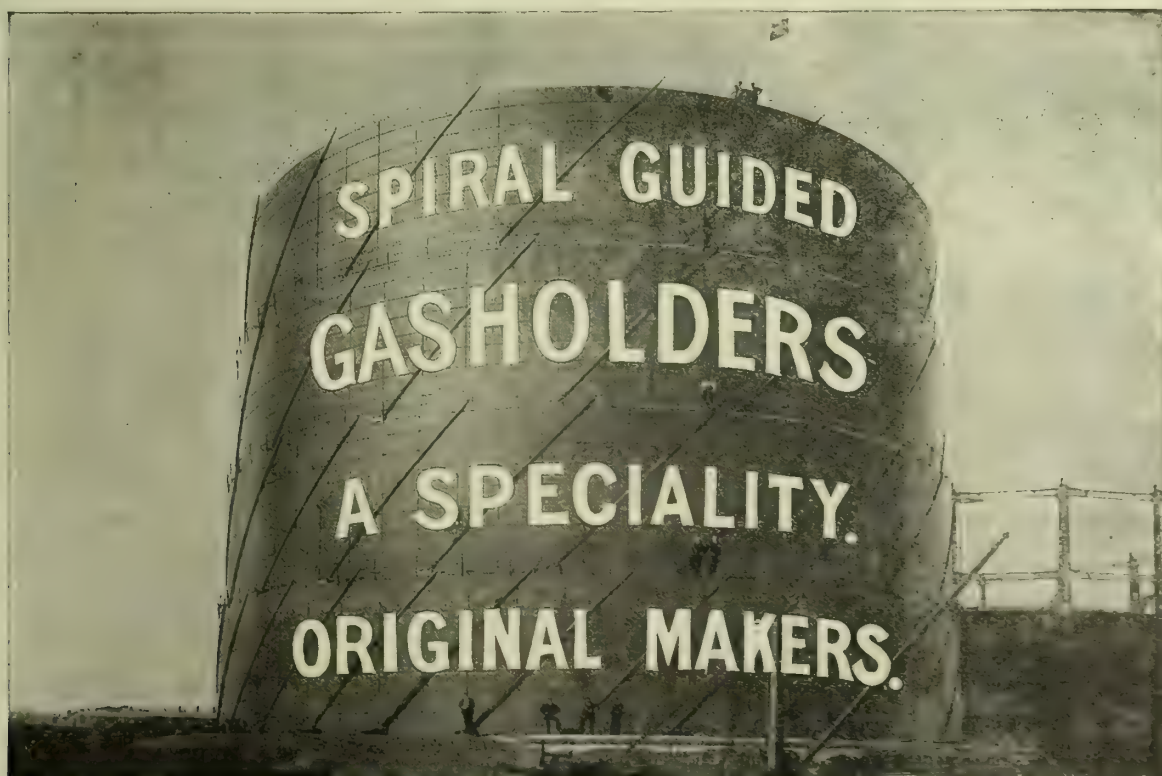
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Brentford . . .	1,200,000	Ilford . . .	650,000	Shanghai (3rd) . . .	1,600,000
Brentford (2nd) . . .	850,000	Innsbruck, Austria . . .	200,000	Southampton . . .	800,000
Bridgwater . . .	200,000	Ipswich . . .	750,000	Southampton (2nd) . . .	500,000
Bridlington . . .	150,000	Kampen, Holland . . .	350,000	Southampton (3rd) . . .	600,000
Bridlington (2nd) . . .	200,000	Kiel, Sleswig . . .	1,000,000	Southgate . . .	400,000
Brieg, Silesia . . .	100,000	Kiel (2nd) . . .	880,000	Southport . . .	750,000
Brighton . . .	1,750,000	L. & N.W. Rly., Crewe . . .	700,000	Southport (2nd) . . .	900,000
Brighton (2nd) . . .	1,850,000	Lausanne, Switz. . .	250,000	South Shields . . .	650,000
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Brussels-St. Josse (2nd) . . .	600,000	Leigh, Lancs. . .	350,000	Stockton-on-Tees . . .	500,000
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Brussels-Ville (2nd) . . .	750,000	Lemberg (2nd) . . .	500,000	Swansea (2nd) . . .	1,000,000
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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

Commerce, Capital, and Carbonizing at the Southern Association Meeting.

THERE was no shortage of subject-matter or of speakers at the meeting of the members of the Southern District Association last Thursday, held under the presidency of Mr. James Paterson, of Redhill. The whole proceedings appeared to be in plethoric condition; and the members to be well content with themselves and with their professional environment. And why not? The industry has not reached that moribund condition for which its electrical opponents have been watching so long, and the probability of which condition recedes and becomes more diminutive as time passes. The opening paper was just the kind to give a good swing to the proceedings; and it and the discussion upon it showed a full competence in engaging in the commercial conflict, as well as the successes of the new commercial spirit and methods in the keen struggle for advantage. The paper was by Mr. H. N. Clark, of West Ham—the scene of as determined an electrical competition, without regard for consequences, as there has ever been in any district of the country. But with it all, nothing has stopped the march of progress of the West Ham gas undertaking; and the honour for this rests indubitably with the distribution department, with which Mr. Clark has been largely concerned. But in discussing this matter of competition and the new gas commercialism, we must not fall into the error of giving too much credit for the latter to the former. The industry's own internal conditions have necessitated a complete reversal of the commercial order of things; for with a burner giving to-day as much light by using 1 cubic foot of gas as an old-time burner did by using 8 to 10 cubic feet, without the revision of commercial method the gas industry would have had experience very similar to that from which the electrical industry is to-day suffering—a backward movement of the consumption for lighting, and in that branch a greatly lessened business and profit per consumer. Side by side with this lower consumption and higher duty in gas lighting is the unbridled licence of our electrical competitors, through which—under municipal administration especially—their competition does not possess the characteristic of fairness. But with such of it as is honest and legitimate, it is the duty of every gas manager to keep not only in line, but in front; and Mr. Clark's paper and the discussion show that this is being done with splendid effect in many places. The paper and discussion are, indeed, full of hints and ideas; and, what is of as great importance, there is set forth the evidence of their success in consolidating business, and in reclaiming consumers who had gone over to the competitor.

The proneness to contentment with existing conditions is strong in some natures; but it will not do in the competition between gas and electricity. A score of maxims—advisory and otherwise—could be raked up to fit the spirit and the results. "Prevention is better than cure," is one. "Take time by the forelock" is another; and a further appropriate one impresses the stupidity of locking the stable door after the steed has been stolen. The best methods in competition are those that prevent the business opponents netting gains; and those who are presentient will see to it that the path of the competitor is not made easier, but the more difficult, by the methods adopted. These methods are the protecting pawns and fighting pieces in the game that save the gas man from being checkmated. Active letting out on hire of gas-lamps among shopkeepers, as at West Ham and numerous other places, is one such method; high-pressure lighting schemes, with lamps and lighting at an inclusive rent, as described, in the discussion, by Mr. A. E. Broadberry, is another; and many others might be cited. The electricians do such work; the gas industry must be in line. The latter can give light at a much cheaper rate than the former; so

the way is plain. A mural inscription at West Ham is that "Electricity is Cheaper than Gas." How the tradesmen of West Ham must smile when they read this, and know that there is a shop in the district where, to quote Mr. Clark, electric arc lamps and metallic filament lamps have been evicted by the use of high-pressure gas and Keith lamps; and "a better light is obtained at considerably "less than half the cost than when electric light was used." The contrarieties of electrical statement and gas fact are portrayed here; but there would be ingratitude on our part if we did not acknowledge that the electrical statement has been of material use to the gas industry through the investigation that consumers have been induced by it to make on their own account. In this particular installation, 45,000-candle power is obtained by means of a consumption of 750 cubic feet of gas an hour, which is equal to 60 candles per cubic foot of gas; and therefore every penny spent in gas in an hour, produces the value of 1875 candles. There is something there for the electrical men of West Ham and elsewhere to digest. It can only require, as Mr. Clark truly says, a little energy to get control of the greater part of shop lighting if the high-pressure system is only developed in the proper way.

From shop to domestic lighting. There was much talk, in paper and discussion, of the so-called free maintenance system—one that is largely extending. It is clearly a necessary to modern conditions. By the irony of fate, the newest possessions in gas lighting, which place in the hand of the gas industry the means to the cheapest artificial lighting, demand for the maintenance of their efficiency more attention than when the reverse order of things prevailed—when the simplest of the means of lighting gave small lighting efficiency for the volume of gas consumed. The gas industry has to take, as far as possible, the burden upon its shoulders of the maintaining of the efficiency of these new burners. At the same time, we are not sure that the so-called "free maintenance" is going to be an altogether big success, while it carries with it the obligation of purchasing just as many mantles from the gas supplier as the gas supplier's servant deems necessary. Consumers—we know this is a fairly widespread feeling in certain districts where free maintenance has been introduced—have an idea that it is through the number of mantles replaced, in their opinion sometimes unnecessarily, by the gas company's man that free maintenance is made to pay. We want free maintenance to be regarded not as an artful move, but as a mutual privilege. There is a defect in the system here; and the question is whether it would not be better to forego this oblique method of obtaining contribution to the expenses of "free" maintenance by profit on the mantles, than hinder the development of an excellent protective and advertising method.

The question of the capital of the gas industry has a large interest, and its study can be approached from such an illimitable number of avenues, that there is fear that all the labour spent upon it does not or will not have much salutary effect. The old ways will, with all the devoted consideration, be very largely preserved. In the paper which Mr. D. T. Livesey read at the meeting, there are two points upon which he is to be congratulated. One is that the prosaic subject with which he dealt is rendered attractive by the dress in which he presented it; and the other is the praiseworthy amount of labour and research that he brought to bear upon his calculations. But exercises of this kind can be made *ad lib.* from the Board of Trade returns; and the most persevering lucublator of these statistics can have his conclusions upset by another who has made equal investigation. The fact of the matter is the Board of Trade returns do not tell us the whole financial and productive tale of the gas industry; nor are the statistics carried nearly far enough to enable any proper analytical investigation to be made. The old basis of capital comparison per million cubic feet of production is also defective in these times of heavy outlay on labour-saving appliances, which often, through judicious initial expenditure, enables an engineer to show greater earning

power per unit of capital than many another can do with a lower capital expenditure. Anyway, Mr. Livesey's complaints as to the deficiencies of the returns are not without justification; nor are his criticisms of the uses of, and the inferences drawn from, the statistics available in them. Some strong comments, but not too strong to meet the case, were passed by Mr. Livesey on the plundering of the public by company promoters through gigantic capitals for puny gas undertakings, and the greater part of which capital finds its way into the pockets of promoters, and has no representation in works or property of any kind. Parliament cannot be charged with anything more than an ignorant complicity in granting powers for certain of such promotions. By a piece of good fortune, Parliament has, however, been the means of quashing a few of the schemes—notably the Mid-Oxfordshire one; but in other cases it has given powers which constituted, in the eyes of the professional company promoters, good property for which exorbitant prices have been squeezed out of a large public open to the craft of these schemers. How the granting of such powers by Parliament is to be prevented is a difficult matter; but the very granting of them exposes to view an unsound place in the methods of parliamentary investigation of privately promoted schemes. Mr. Arthur Valon makes a suggestion somewhat to the effect that Parliament should have a technical adviser in connection with each industry controlled by statutory powers obtained through Private Acts. If this were done, there would be hope of better detection. At any rate, undue capitals for what are merely rural concerns would, we think, become things of the past.

In his paper on "High-Temperature Carbonization, its Difficulties and their Cure," Mr. W. B. Randall took quite a cheery view of both difficulties and results; but we do not think that the whole story is told in his paper. Regenerators that are worn out in seven years, and brick or segmental retorts that only run, on an average, for three years, mean expenditure out of the common; and taking these and other points into consideration, it is a question whether Mr. Randall has not something to set against the advantage of high production, which seems his sole aim, without other considerations. There is no doubt he has secured some remarkably fine carbonizing returns. It would have been interesting if he had stated whether or not he works with a dry main, and whether he has any trouble with thick tar. It would also have been of interest if there could have been a reliable analysis of a continuous (over a period) sample of the gas produced at the rate of 13,000 cubic feet per ton from second-class South Yorkshire coal. Some may doubt whether the whole of the 13,000 cubic feet of gas is useful to the consumer. The paper, however, was full of interest; and it would stand a second one as a supplement on some future occasion.

Official Calorimetry of Gas.

THE paper which Mr. J. H. Coste, F.I.C., Chief Assistant in the Chemical Department of the London County Council, read on Monday of last week before the meeting of the London Section of the Society of Chemical Industry, referred mainly to the official calorimetry of town gas, although, as its title of "Technical Gas Calorimetry" suggests, there were portions of the paper which had a still wider application. A digest of its contents is given, with a summary of the ensuing discussion, on another page of to-day's "JOURNAL," and this will be supplemented by fuller particulars as soon as the right of priority of publication *in extenso* claimed on behalf of the "Journal of the Society of Chemical Industry" in respect of papers read at their meetings has been exercised in regard to Mr. Coste's useful communication. Some of the salient points raised in the paper and the discussion may, however, now be considered without disadvantage.

A great deal was said respecting the relative merits of the Junkers and the Boys calorimeters for the routine work of official gas testing. It was shown that while the average results obtained were practically identical with the two instruments, the deviation of individual readings from the mean was appreciably smaller with the Boys apparatus. This is a consequence of the latter being free from the sudden small fluctuations of the temperature of the outflowing water to which the Junkers instrument is liable. The parts of the Boys calorimeter are, moreover, more readily accessible for examination, cleaning, and repair; and the thermometers are all conveniently disposed for reading in the same horizontal plane, whereas with the Junkers calorimeter,

as exhibited by Mr. Coste, there is a great difference of level, and the observer has to mount a stand to read the upper thermometer and descend again to read the lower ones. We believe, however, that in a later type of the Junkers calorimeter the thermometers have been brought to the same level. But as neither Mr. Coste nor any of those who spoke after him at the meeting referred to this modification, we presume it is but little known in this country. The Junkers calorimeter was constructed in the first instance for varied or peripatetic use; but nevertheless it answers well for the routine work of a fixed testing-place. The Boys calorimeter, on the other hand, was designed primarily for the routine of official gas testing, and in its ordinary form cannot quite so readily as the Junkers be set up and used anywhere and everywhere. Bearing in mind, however, that a calorimeter at best cannot be a conveniently portable apparatus, owing to an experimental meter and a sensitive governor being necessary parts of its equipment, we do not think much importance need be attached to the ease with which the instrument can be transported, set up for use, taken down, and packed again. From one point of view at least, a portable calorimeter is to be deprecated only one degree less than the portable photometer of a bygone era.

Professor C. Vernon Boys made a salutary protest against the practice of assessing the calorific power of gas by its so-called "net" value, which, as he pointed out, has no truly scientific basis. Gas is surely entitled to be credited with the whole of the heat directly obtainable from it, especially as in some at least of the uses to which it is ordinarily put the whole of that heat is utilized. Gas undertakings should not, in future, accept a standard of calorific power which ascribes to the gas something less than its total heating value—how much less being an uncertain quantity depending on the character of the gas supplied, and having no real significance—but, if compelled to accept statutory calorific testings, should insist on the results being returned only in terms of the "gross" calorific power of the gas. It would be as reasonable to fix the standard illuminating power of gas as the light afforded by some arbitrarily selected burner which does not develop the maximum illuminating efficiency of the gas, because for certain, not all, purposes a better burner is not readily applicable. Now that Professor Boys has lent the weight of his opinion and arguments in favour of the recognition of the gross calorific power of gas as the proper criterion of its heating value, gas undertakings should have less difficulty than heretofore in convincing local authorities and parliamentary committees that the net calorific power is a meaningless expression which accords only part of its due to the gas.

On one point, but that a minor one, we venture to differ from Professor Boys. He prefers to express the heating value of gas in terms of calories rather than British thermal units per cubic foot. So long as the pound and the gallon are weights and measures in general use in this country, the calorie must convey less meaning to the ordinary user of gas than the British thermal unit. The user knows, or he may readily ascertain, that the latter unit represents the amount of heat required to raise one pound of water by one degree Fahrenheit, which is the scale of temperature to which he is also accustomed. Hence he knows forthwith that ten British thermal units raise one gallon of water by one degree Fahrenheit. The simplest of calculations then enables him to judge how much, or rather how little, gas should suffice to serve for many of its household applications. His bath holds (say) fifty gallons of water, which enters his geyser at a temperature of 50° Fahr. How much is the minimum quantity of gas which will raise the bath water to the temperature of (say) 100° Fahr. to which he has accustomed himself? If he knows the calorific power of his gas in terms of British thermal units per cubic foot, a simple exercise in mental arithmetic gives him the answer. Similarly with the heat required to raise the water in his quart kettle to the boiling-point. The calorie, however, is, and must remain, meaningless to the ordinary user of gas in this country until such time as he has learnt to express the capacity of his bath or his kettle in litres instead of gallons or quarts. To say that we hope that Professor Boys may witness that consummation is to say that we wish him a longer life than falls to the lot of most men. But until the pound and gallon give place to the kilogramme and litre in the every-day transactions of the household, we hold that the calorific power of the gas which the householder buys should be expressed, for his information and guidance, in British thermal units per cubic foot. Statutory testings of

gas are conducted ostensibly for the protection and benefit of the ordinary consumer of gas, and therefore just as here the illuminating power has rightly been expressed in terms of "candles" rather than in (say) "violles," so the calorific power will be better expressed in British thermal units than in calories. If for some slight convenience of testing it is preferred to obtain the result in calories in the laboratory, the conversion into British units should be done there once and for all, rather than that a host of consumers of gas should be puzzled and put to the trouble of calculations to bring the published results into correlation with the affairs of their every-day life.

Changing Conditions under Continental Rule.

THERE have been some remarkable changes during the past quarter of a century in the gas industry in the uses of gas, and in the classes of householder who have become consumers. It can, in truth, be said that the gas industry now caters for the masses for lighting and cooking, and in heating a bigger scope of usefulness is being continually created. In the processes of manufacture, too, and in product, there have been some notable changes. But beyond these that vast British organization—the Imperial Continental Gas Association—whose activities appear to know no bounds on the Continent to-day, discloses changes that have come about largely through the terminable concession system under which their operations are conducted, and through an administrative ability that no sooner finds one field of profitable capital utilization closed to them, than another is sought for, discovered, and worked, with the result that the prosperity of the undertaking shows no signs of abatement, but year by year an increasing stability. The process of dismemberment of the old, has in parallel a process of replacement so as to give profitable employment to capital and other funds. Capital cannot be allowed to lie idle; and dividends have to be provided. The result is that the operations of the Association exhibit a somewhat extraordinary distinction now from the conditions that ruled once upon a time; and those conditions have added vastly to the responsibilities of the Board of Directors.

Much of the diversity of interests that is now seen is, as remarked, the fruit of the terminable concession system, as will be observed by reading the address that was delivered to the proprietors by the Chairman (Mr. J. Horsley Palmer) at their meeting on Tuesday last. There has been, in times past, effluxion of important concessions; and the Municipalities have entered into occupation of the gas supply. But large as certain of these flights of business from the Association have been, fresh employment has been found for the capital, and a wonderful recuperative force has been displayed. The Association have practically entered into the business of financiers within legitimate spheres, by securing controlling influence in other gas and electricity concerns that have, in effect, a separate existence from the Association, and are complete Continental entities. In Hungary, there is the Central Gas and Electricity Company under the control of the Association; in France, the interests of the Association have been concentrated in what is, to all intents and purposes, a distinct Company; in Frankfort, there has been a fusion of the gas supplies of the Association and the Frankfort Gas Company, and the Municipality have entered as a third shareholding partner in the enterprise. In other directions, the Association have also secured, by investment, considerable interests; and they are constantly negotiating for the extension of contracts to suburbs both for gas and electricity. Their operations are manifold and unique, and so, as seen, are the important changes that have taken place in recent years in their operations. One other peculiar change, under which the Association, in common with other gas undertakings in Germany, will now work is the tax that pressure on the National Treasury has imposed upon gas-mantles.

There is nothing much to be said about the business results of the past half year. The Association during the six months did little more than mark time, looking at the aggregate results of the working of the whole of the stations. There has been depression of trade in Germany; and the Association have not escaped the general effect. But there can be nothing but satisfaction that, under the circumstances, the huge concern, with its unequalled ramifications—for it stands alone among gas undertakings in the order and diversity of its interests—has maintained its level of prosperity.

A Dry Process of Coke Quenching.

SOME of the simplest discoveries are oftentimes the most valuable. The traditional and customary method of quenching spent retort charges by water is now challenged as the superior method of performing the operation. Where there is fire, the natural process of extinction in most cases is by water; and that has been accepted in the matter of coke quenching without any questioning of whether or not the acknowledged—and perhaps there are unsuspected—detrimental effects of dousing the coke with water to slake it cannot be avoided by treatment in another practicable way, and so a superior coke be formed. By an article in other columns, it will be seen that claim is made that there is a still better way; and for the discovery of the simple means, protection has lately been obtained through the Patent Office. The new plan is to cool down the incandescent coke by a sufficient covering of dry breeze to prevent air reaching it so as to sustain combustion, and to maintain it free from moisture, and yet give vent for the volatile arsenic and sulphur and the emission of other gaseous impurities, the escape of which is completely checked by the old process of wet quenching. By this dry system of quenching, a fuel, it is claimed, is produced that excels coke or coalite as a fuel for domestic and industrial purposes. Of course, it is readily perceived that there are practical disadvantages to be set against the advantages that are presented to view by the patentees, and those who have made a study of the process. The treatment in the manner proposed would mean an increase in manual labour and in the time occupied in quenching; but we do not gather that the patentees suggest that any more of the coke should be treated in this manner than would realize a ready sale at higher prices than the ordinary coke would command. But if all the good points claimed for the dry process of quenching are established by experience, then the demand for "Charco"—as the coke so treated has been named—should be an extensive one for domestic purposes. The gas industry wants to improve the selling range of its coke; and the nearer to the place of production it can be disposed of, the better. Therefore any practicable idea that is presented which aspires to improve the attributes of coke as a domestic fuel is to be welcomed as worthy of consideration and trial. From this point of view only, the process is specially brought before our readers. Various gas engineers have already been considering the claims advanced. Mr. W. J. Dibdin, F.I.C., F.C.S., has also made some trials of "Charco" in comparison with coke; and he states the results and his conclusions in reports accompanying the article given elsewhere. His comparative analyses of coke and "Charco" show that in every item the latter is the superior of the former as a fuel for the domestic grate.

Life of British and German Retorts.

OF considerable interest, in connection with the revived attention that Mr. Charles Carpenter's recent letter in our columns has brought upon the question of the relative durability of fire-clay retorts of British and German production, is the communication of Herr E. Körting that appears on another page of this issue. Herr Körting is a technician, and patriotism is not allowed to interfere with his technical judgment and acts; and therefore the opportunity is not taken by him to praise the refractory materials produced by his compatriots. His plain unvarnished experience is all that he places before our readers; and, as a matter of fact, though he does not say so in precise words, he indicates that he does not believe the differences between the productions of the British and the German factories are really, after all, serious or great. There are a couple of sentences from which this view especially protrudes. "I should think 'that,'" writes Herr Körting, "in many cases the construction of the furnace, and deficient supervision are the cause of the premature collapse of a retort, and not the material or the workmanship. . . . I dare say a good many of us deceive ourselves." As a matter of fact, the *à priori* grounds for forming conclusive judgment in this matter, in connection with horizontal and inclined working, he believes to be defective. The temperatures of the flues of such settings cannot, owing to their position, possibly be properly ascertained; and there is a liability to temperature irregularities in them, which are not revealed until damage to the fire-clay material has already been occasioned.

There is a dash of justifiable ridicule in the reference of our esteemed contributor to the claims to extraordinary longevity at times put forward for retorts. "We sometimes

"go on mending and patching our retorts with bricks and "specials until nothing is left of the original material but the "mouthpiece and the bottom part; and we then attain a "duration of (say) 1500 days and upwards." The figures that Herr Körting quotes, for German manufactured retorts, are from the Berlin works of the Imperial Continental Gas Association; and his point as to longevity is sharpened by the laconic remarks in the third column of the table. In one instance, inclined retorts registered 1254 working days, with "extensive repairs;" in another instance, 1055 days, with "moderate repairs;" and horizontals have run up to 1506 days, with "extensive repairs." There is nothing exceptional about these figures; and many British gas-works, with perhaps "extensive repairs," can show durations for the home-made articles, of corresponding length.

From the foregoing, it will be gathered that Herr Körting is a little sceptical about fair judgment in respect of quality being rendered to retorts and other refractory material in horizontal and vertical settings; and it is his opinion that, for arriving at a just conclusion, vertical retort settings offer the proper means for testing. In their case, all the flues are accessible both to the eye and the controlling pyrometer; and the regulation is an easy one. Working with constant and regular temperatures of 1350° to 1400° C., Herr Körting has vertical retorts that have recorded two-and-three-quarter years of uninterrupted work. The retorts are still intact, and are without perceptible signs of deformation. This is a good record. But with all his experience of German-made retorts, Herr Körting has not satisfied himself as to their superiority over British-made ones; for he tells us that he has at the present time got some of the latter, for vertical working, alongside some German ones, in order to enable him to form an idea as to their quality. This is interesting in view of British gas engineers being now engaged in putting in German retorts alongside British made ones; and, in the case of the South Metropolitan Gas Company, not for trial only—with them the trial stage has passed. Though the contribution here noticed is brief, it is to the point; and it furnishes additional material to the current consideration of a matter of vital importance to the British fire-clay industry.

The Gas Companies' Joint Standard Burner Bill.

Matters have proceeded apace in connection with the joint Bill which it is intended to promote in the next session of Parliament to authorize the substitution of the "Metropolitan" argand No. 2 burner for the burners now used by the different undertakings that may associate themselves with the measure. It will be remembered that at the meeting last Thursday week of representatives of Companies interested in the Bill (which the Gas Companies' Protection Association were proposing should be promoted), it was stated that a good number of Companies had already signified their intention of joining in the Bill; and we learn that since then the list has been very considerably added to. In fact, the Companies who had up to yesterday decided to take part in the Bill, we are informed by Mr. Fred. E. Cooper, numbered thirty-two, representing an annual make of gas of about 18,000 million cubic feet. There is still opportunity for others to come in; but time is now getting short, and there should be no further delay whatever in communicating with the Secretary of the Gas Companies' Protection Association.

American Gas Institute Meeting—A New Departure.

In another part of the "JOURNAL" will be found a summary, by a correspondent, of the proceedings at the fourth annual meeting of the American Gas Institute, which was held in Detroit (Mich.) from the 20th to the 22nd ult., under the presidency of Mr. Charles F. Prichard, of Lynn (Mass.). The gathering was a good one—about 500 members registering their names; and nearly 400 were present at the opening sitting. Afterwards, however, the attendance averaged between 200 and 300. The report presented by the Board of Directors showed a gain of about a hundred members (making the total membership 1333), an existing surplus of \$2000, and an estimated one of \$4000 at the end of next year. This is very satisfactory. The address of the President comprised the three broad divisions of public relations, production and distribution of gas, and sales; and he expressed the opinion that the Institute had not attached sufficient importance

to the questions arising under the first division, that the second had received attention with good result, and that the third—the commercial side of the business—had been so neglected that a separate Association had been formed to take it in hand. There were a goodly number of papers and reports; and two of the former, both bearing upon the subject of carbonization, are given in another part of the "JOURNAL." They were taken together, and appear to have given rise to a good discussion. Unfortunately, however, this was not the case with some of the other communications, owing to want of time. To overcome this difficulty, on the second day of the meeting, the experiment was tried of dividing the business between two sections; and it was so successful that a resolution was passed by one of the sections requesting a continuance of the custom, for the reason that a more general and instructive discussion was possible of subjects presented before a comparatively small audience, all of whom were interested and competent critics, than could be expected when only a portion of the entire body of listeners really cared about what was being told them. This new departure by the American Institute may be worthy of consideration on this side of the Atlantic. Even with the division, however, those who attended the meeting did not, in our correspondent's opinion, get as much good as they might have done, owing, in the first place, to papers not being sent in sufficiently early to allow of prints being distributed in advance; and, secondly, to the authors not being called upon to give only abstracts of their communications. As the result of want of attention to both of these matters, our correspondent says "every important discussion had to be cut short for lack of time." As the Institute have made one new departure which appears to give satisfaction, possibly they will consider the advisability of making at next year's meeting another in the directions already indicated. Some reform in this respect is certainly needed.

Affairs of the Toronto Gas Company.

The last annual general meeting of the Toronto Gas Consumers' Company, a report of which is given elsewhere, is an event of more than ordinary interest. The Company has reached its sixty-first year, and the Directors, like many men who find themselves approaching the "grand climacteric," have thought it advisable to obtain a professional opinion on the condition of the machinery and its capacity to meet future demands upon it. They accordingly, as our readers are aware, consulted Mr. Thomas Newbigging, who last summer visited Toronto and made an inspection of the plant and works. The presentation of his report—short and to the point—to the shareholders by the President was one of the interesting features of the meeting. The report, as will be seen, is of the most satisfactory character. The only weak place found by Mr. Newbigging was in the storage plant; but this defect is to be remedied by the erection of a holder having a capacity of 5 million cubic feet, which will be by far the largest in Canada. As the rest of the plant is adequate and quite up to date, no improvements are suggested. The other feature of the meeting was the resignation by Mr. W. H. Pearson of the position of General Manager and Secretary, after fifty-five years' service with the Company. Mr. Pearson is perhaps better known to some of our readers from his association with Messrs. Merrifield and Westcott in the Economical Gas Apparatus Construction Company, Limited, than from his official connection with the Toronto Gas Company; yet in the latter Company he has been for many years the "man at the helm." He has had the rare experience of serving under eight Presidents in succession, and of seeing the business develop from an annual sale of 14 million cubic feet of gas to something like 160 times this quantity, accompanied by a reduction in price from \$2.50 to 75 c. per 1000 cubic feet, and the conversion of the crude gas-making apparatus into works of the up-to-date character found by Mr. Newbigging. Mr. Pearson has felt it incumbent upon him to relinquish his onerous duties; and the Directors have placed on record their high appreciation of his "long, faithful, and efficient services," accompanied by an expression of the hope, in which we most cordially join, that he may for many years enjoy a well-earned rest. His place is now filled by a younger man, who will ably second the Directors in their efforts to place the undertaking on a still higher plane. They will shortly be asking for financial assistance in remedying the single existing deficiency in their plant—the gasholder capacity.

Two Junior Association Meetings.

The meetings of Junior Gas Associations held so far this session furnish unmistakable evidence of the sympathy with these organizations entertained by gentlemen occupying positions in the highest ranks of the profession of gas engineering. A few weeks ago, the members of two of the Northern Associations had the advantage of listening to some excellent advice from Mr. W. R. Herring, of Edinburgh; and more recently those of the Southern District Association had the privilege of listening to a thoughtful address from Mr. Corbet Woodall. These addresses bore mainly on the practical, every-day affairs of those to whom they were delivered. Last Saturday, the Manchester Juniors were treated to a discourse of a totally different character. After visits to the gas-meter testing-station and the new fire station of the Manchester Corporation, they assembled at the Victoria University, where Mr. Harold B. Dixon, F.R.S., one of the Professors of Chemistry there, delivered a lecture on "The Chemistry of Flame." This is a subject which, as readers are well aware, Mr. Dixon has studied for some years; and he freely gave his audience the fruits of his researches. Though the lecture was in some respects a repetition of the one he delivered before the Institution of Gas Engineers in 1904, it was probably fresh to his hearers. But if they had read the lecture they had the pleasure on Saturday of hearing its author, and seeing the demonstrations and lantern views by which he illustrated his discourse. In connection with the vote of thanks which was heartily accorded to him, a suggestion was thrown out that such bodies as the Association and the Universities should be in closer touch; and Professor Dixon expressed himself as in thorough agreement with the idea. We are quite sure any movement in the direction indicated would have his cordial support. Another Junior Association meeting held on Saturday was that of the Western District Section of the Scottish Association, at which Mr. Orr, of Motherwell, brought before his colleagues some very interesting particulars in regard to carbonization as carried on fifty years ago. Both meetings are reported elsewhere.

The Italian Gas-Workers' Strike.

In this country, one is accustomed to hearing pretty frequent grumbling about the tyranny of Trade Unions and the unreasonableness of the labour agitator; but the condition of affairs which exists over here is mildness itself when comparison is made with the aspirations and the performances of an Italian Workmen's Federation. As will have been gathered from previous issues, the Union des Gaz Company are at their Italian stations in the throes of a struggle with the men, who have formulated a list of demands which would take away the breath even of a Socialist platform orator. These demands, unreasonable as they would under any circumstances be, appear doubly so when account is taken of the extremely favourable terms which the Company at present grant to all their employees. The ambitions of the men are fully set forth in another column; and it will be seen that among the claims are that the Company shall not dismiss men without the consent of their fellow workmen, and that new men shall only be engaged through a bureau to be established at each works, and to be composed of the men of the Federation. If the Company submitted to these terms, they would, of course, cease to become "employers" in the proper sense of the word; for they could have no control over the men whose wages they would be expected to pay. These demands, which deal with a matter of principle, are by no means the only ones put forward by the men, who evidently do not intend to run the risk of losing anything for want of asking for it. There is a long list of other claims, to concede which, it is calculated, would result in an increase of over 50 per cent. in the wages paid. To show how little cause the men have for agitating, we give full details of the manner in which they are already paid, and the numerous privileges which they enjoy. This will prove that the Company are model employers; and it is to be regretted the men have not the sense to recognize this, but have, instead, thought fit to repay the Company by formulating a string of demands which must be absolutely unparalleled in the annals of gas-works labour. It may be pointed out that the stokers now receive 5'50 frs. for only eight hours work, as compared with 4'50 to 5 frs. per day with twelve hours work in 1900; while at Brussels the pay for twelve hours work is stated to be from 4 to 4'50 frs. The strike in progress has, of course, imposed an anxious time on the officials;

but it is pleasing to gather that their efforts to cope with the trouble are proving successful, and that the gas supply is rapidly resuming its normal condition. This firm stand will doubtless be of greater permanent benefit to the Company than would the patching-up of the dispute by the granting of these unreasonable demands.

A Protest at Southampton.

The proceedings at the half-yearly meeting of the Southampton Gas Company, a report of which appears in this issue, were not of a lengthy character; for the Chairman (Captain A. J. Corse Scott, J.P.) had only one matter to refer to which called for anything like extended remark. Progress is satisfactory—there being both an increase in the sale of gas and in the number of consumers to chronicle; and after payment of the maximum dividends, there will still be a handsome balance to be carried forward. The subject on which the Chairman did feel it his duty to speak a little fully to the proprietors (and through them, of course, to the rate-payers generally) was the action of the Corporation in transforming during the past six months more than four hundred of the gas-lamps into electric lights. That this is a retrograde step in the opinion of many of those best qualified to judge, he was clearly able to show, by instancing the developments which have recently been taking place in other parts of the United Kingdom. He ventured on the opinion that, if the ratepayers only knew the cost of the electric light, they would not submit to the action the Corporation were taking. It is to be hoped that his well-reasoned and convincing protest will quickly bear fruit, and that the rate-payers will set themselves seriously to consider, not only the comparative cost, but also the comparative efficiency, for street illumination of electricity and the latest forms of incandescent gas lighting that have been adapted to the purpose. If they can be induced to do this, the Gas Company should have little need of fear as to what the result will be. In other directions, it will be noted with satisfaction, the Southampton Board are keeping well abreast of the times. A large range of gas-fires is to be hired out at very low rentals; and, if requested, advice will be given to consumers as to the most suitable types of fires for their requirements. Arrangements are also being made to (where desired) periodically clean and adjust gas-burners free of charge—all renewals being priced out at the lowest possible rates. These are facilities which have been appreciated elsewhere; and there is no ground for thinking that the experience of Southampton in this respect will be on any different lines.

Midland Junior Gas Engineering Association.—The members of the Association will visit next Saturday afternoon, by permission of the Engineer (Mr. Fletcher W. Stevenson), the new Foleshill Gas-Works of the Coventry Corporation. During the building the members were afforded an opportunity of inspecting the works; and they will now see them in their completed state.

The New Chairman of the Newport (Mon.) Gas Company.—At a meeting of the Board of Directors of the Newport Gas Company last Friday, Dr. H. Melvill Brewer was elected Chairman, in the room of the late Mr. Richard Laybourne; and Sir J. T. Firbank was appointed Vice-Chairman in succession to Dr. Brewer. The new Chairman became a Director of the Company in August, 1886, and was appointed Vice-Chairman in February, 1900. The Vice-Chairman joined the Board in May, 1891.

Successful Appeal by the Barnet Gas and Water Company.—In the "JOURNAL" a fortnight ago, we reported the arguments in the appeal by the Barnet District Gas and Water Company from the judgment of Mr. Justice Ridley, granting an injunction to restrain the Company from proceeding with the sinking of a well at Colney Heath, for the purpose of obtaining an additional supply of water. At the close of the arguments, which were heard by Lords Justices Vaughan Williams, Buckley, and Kennedy, judgment was reserved; and it was delivered yesterday. Lord Justice Vaughan Williams said in this case he had the disadvantage of differing from his learned brethren. He gave at length his reasons for holding that the principles laid down in the Frimley and Farnborough case were fatal to the defendants' contention, though the decision itself might not actually govern the present case, being on a different Act of Parliament. Lord Justice Buckley read an elaborate judgment, and came to the conclusion that what the defendants are doing is not *ultra vires*, and that the injunction ought not to have been granted. Lord Justice Kennedy said he had read Lord Justice Buckley's judgment, and entirely agreed with it. The appeal was therefore allowed, with costs. An application by Mr. Eustace Hills, representing the respondents, that the further sinking of the well might be stopped pending an appeal to the House of Lords, was not acceded to. The report of the judgments is unavoidably held over till next week.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 420.)

BUSINESS on the Stock Exchange last week (a five-day week only) was quiet, and almost entirely devoid of interest. A heavy feeling brooded over it generally, especially in the earlier half, when the condition of the Money Market produced some degree of apprehension that Thursday would witness a further rise in the Bank rate. And when that dread was averted, markets sank back into languor. Upon the re-opening on Tuesday, the tendency was rather dull, but with brighter spots here and there, and business was quite active. Consols throve and picked up $\frac{3}{8}$. Railways were, however, flat; and there was weakness in the speculative quarters. Wednesday was dull and a prey to *malaise*; and markets in general seemed to have no spirit in them. Money was at the bottom of it. Consols were lower; Railways were freely offered; Americans were heavy; and South Africans weak to a marked degree. Thursday came and went with no rise in the Bank rate, and the advent of a few buyers infused some improvement. But Home Government issues were still poorly. Friday's business was quiet and without any interesting point, beyond a slight recovery here and there—the gilt-edged division remaining dull. On Saturday, the latter picked up a bit. But some Railways showed shrinkage. South Africans were weaker. In the Money Market, the tendency swung backwards and forwards from time to time, closing rather firmer at the finish. Business in the Gas Market was again below the average; and it was confined to a much smaller number of issues than usual. The tendency, which for many weeks past had been so strong, was now decidedly the other way; and what few changes were made in quotations were in the downward direction, with the single exception of a Provincial issue quoted in a local market. Gaslight and Coke ordinary was again offered, and the price was lowered a point-and-a-half. This naturally brought down with it West Ham ordinary—the two issues being now practically one. Then there was a revision of Gaslight and South Metropolitan debenture stocks, which had been striding ahead for some time; and they were brought back a couple of points. Beyond these, there was no change. On Tuesday, Gaslight and Coke ordinary opened at $104\frac{3}{8}$; but it did not see that figure again, and on Saturday $102\frac{3}{8}$ was marked. The only secured issue touched was the preference, which fetched from $104\frac{1}{4}$ to $104\frac{1}{2}$. South Metropolitan was quiet and steady at from $120\frac{1}{2}$ to $121\frac{1}{2}$. The debenture marked $85\frac{1}{8}$, and then dropped to 83. Only one transaction was noted in Commercials; the $3\frac{1}{2}$ per cent. changing hands at $105\frac{1}{2}$. Among the Suburban and Provincial group, Brentford old realized $254\frac{1}{4}$, ditto new 190, Brighton and Hove original 210 and 211, and West Ham preference $127\frac{1}{4}$ free. In the Continental companies, Imperial was lightly dealt in at 181 and $181\frac{1}{2}$, Union marked $97\frac{3}{8}$, and Malta $41\frac{1}{8}$ and $5\frac{1}{8}$. Among the undertakings of the remoter world, Bombay new changed hands at $41\frac{1}{8}$, Buenos Ayres at $131\frac{1}{8}$ and $13\frac{3}{4}$, Primitiva at $7\frac{1}{8}$, ditto preference at $5\frac{3}{8}$ and $51\frac{1}{8}$, ditto debenture at $97\frac{1}{8}$, River Plate at $16\frac{1}{2}$ and $161\frac{1}{8}$, and ditto debenture at $97\frac{1}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

Pressures and Misrepresentation—Viewed from Mount Pisgah—Electrical Cooking Contrarities Price Indecision—Further Tariff Reform Advocated—The Drift of Net Profits.

OWING to pressure on our space a fortnight since, the concluding paragraphs of the review of the domestic electrification number of the "Electrical Times" had to be omitted; and last week some public lighting topics required consideration. But the paragraphs of the review that have been standing over may be given first place in the "Memoranda" this week; and the prominence will compensate our contemporary for the delay in their appearance. Just now our friends are strong on the subject of variations of gas pressure. But the deeper they get into the subject, the more delightful to the gas technician is the display of sheer ignorance. Where ignorance is bliss, 'tis folly perhaps to be wise; but it would be a little more creditable not to employ the ignorance for the base purpose of slander. Our contemporary, it is clear, knows nothing about initial and terminal pressures, knows nothing about district governors, knows nothing about governing at the meter, knows little about the means provided for the regulation of incandescent burners, knows nothing about the regulators provided for adjusting gas-stoves to the local pressure. In fact, charlatanism peeps out of almost every line. To show the degree of knowledge, let us just quote one sentence: "A mantle is tested and marked for a certain pressure; but it is nothing but a huge joke." We ask for the production of a mantle so marked. On the subject of pressures, recourse is had, by our contemporary, for supposed damning evidence, to a paper read recently before the London and Southern Junior Gas Association ("an institution meeting" is the description of our contemporary), the intent of which paper was to show how inspection and advice would save gas consumers from wastefulness that inefficient fitting up, indolence, or ignorance—one or the other—sometimes occasions. Is it fair to quote, from a paper having that purpose, an isolated case of a gas-stove that the author (Mr. T. V. Fenn) found flaring away at

the rate of 70 cubic feet an hour through excessive pressure, when a simple adjustment and an explanation to the consumer were sufficient to bring matters to normal condition? We also ask the "Electrical Times" to put definite figures to the variations in illuminating power that changes in pressure marked on the right-hand side of the decimal point occasion.

Then again, in the matter of water heating, it is stated in the pressure article: "We find that a certain ordinary boiling-ring burns 50 cubic feet an hour." As presented, this is gross misrepresentation; and a fair sample of the dishonesty that is scattered somewhat freely about the special issue. We have at hand a number of tests of most of the boiling-rings on gas-stoves of modern make; and the largest tested only passed at district pressure, 44 cubic feet an hour, descending, according to size, to very modest consumptions. If careful reading is made by our contemporary of the source from which the figure quoted was obtained, it will be seen that it was not an "ordinary" arrangement of boiling-ring, but an extraordinary one. The use of the term "ordinary" and of the figure is a deliberate perversion of the truth, or an evidence of ignorance. From Mr. Fenn's paper were also copied some figures as to the consumption of gas and the time occupied in boiling two quarts of water at different gas pressures, which figures it is thought electricians may care to have. It is not explained by our contemporary that the whole purpose of these figures was to show that, as the pressure descended, so did the consumption of gas for performing a certain duty, though the time occupied increased.

We need not go further into the matter composing the case for domestic electrification. In connection with heating, cooking, and water-heating by electricity, we have shown recently in the "Memoranda" the great gulf that exists between the available heat units for a given sum spent on electricity and on gas; and that gulf cannot be bridged by words only. If this domestic electrification number comprises the best that can be said for the use of electricity and in the abuse of gas for domestic purposes, then we are not surprised at the exhortation to electrical engineers in the introduction "Be strong and of good courage." They need all the strength and the encouragement that can be given them; but they will not find it in misrepresentation. Those who are honest will repudiate it. Nor will such see very much by going, as advised, up Mount Pisgah, and viewing the land flowing with milk and honey through the blurred glasses that are offered by the "Electrical Times." It was from Mount Pisgah that Moses took his first and last view of the Land of Promise. "Meteoric" might note the point; and at the same time read up a modern account of the conditions of the Promised Land.

On the subject of electrical cooking, our contemporaries generally appear to be in a hazy condition as to the true situation. There is a terrible floundering about among bare assertions; and writings are full of the pointed contrarities that arise from a combination of difficulties, insufficient knowledge, and little experience. In "Electrical Industries," we find the Editor giving vent to his feelings on a statement by Mr. F. W. Goodenough regarding the relative efficiency of gas and electricity for cooking; and a few pages later in the same issue, Mr. R. Borlase Matthews—an old friend of ours, and author of a book with a reputation—has something to say on the same subject. This is what the Editor remarks:

In electric heating and cooking appliances, practically the whole of the heat generated is usefully employed; and the difference in working economy is so great that, even on Mr. Goodenough's own figures, electricity at 1d. per unit can compete with gas in heating and cooking. Allowing for the usual romantic element in gas statistics, it appears that electricity at the rate mentioned has a very good chance of leaving gas well in the rear.

This is what Mr. Matthews observes in the same issue:

One of the great drawbacks to the introduction of heating and cooking appliances into ordinary homes is that the apparatus has not yet become fully standardized; the details of the practical operation under the rough conditions of domestic service are still difficult to obtain. . . . Recommendations have to be made with extreme care, for certain types, though test-room experiments indicate that they give the required temperatures, will fail properly to cook certain items, such as pastry. The cooks complain that the fruit in a pie boils, while the pastry becomes heavy. It is difficult to say why this is so; but it seems likely to be due to lack of storage of heat in the oven itself and absence of deflected or reflected heat from the oven top. Such a point as this is apt to condemn the whole apparatus, so that special attention should be given to the details when recommending an oven.

Who is romancing, the Editor or Mr. Matthews?

Then we have in the "Electrical Review" our old friend "Maud," who exercises to the full the ladies' prerogative of expressing views and making assertive statement without giving the slightest inkling as to reasons. We have asked this lady for reasons before; but she has maintained an absolutely frigid and unfriendly reserve on the matter. Perhaps, from her point of view, it is as well. In an article in the "Review," she unintentionally contradicts Mr. R. Borlase Matthews. She says:

The electric oven takes a very short time to heat up to its maximum temperature, and when so heated can be easily regulated by the switches, with the result that meat can be cooked to perfection, and cakes and pastry browned, in a way almost impossible with the ordinary cooking range. It will also be found that the lighter forms of confectionery can be cooked after the current has been switched off, by means of the heat contained in the oven.

What Mr. Matthews says is that "the cooks complain that the fruit in the pie boils, while the pastry becomes heavy." We have heard

frequently before all that "Maud" has to say; and we also know that where certain trials with electric cooking have been made, and even at first enthusiastically spoken of, the apparatus has since been discarded. But "Maud" does not suggest that the electrical cooker is without blemish. She remarks:

The only fault I have to find is the entire absence of a ventilator on the oven. The want of this ventilator means that there is always, when cooking, a fair amount of steam in the oven; and this tends to take up some of the heat which should be given to the contents of the oven. I am sure this small thing has only to be appreciated by the makers to be remedied.

Now, "Maud," do not you see that you contradict here the claim of "Electrical Industries" that practically the whole of the heat generated is usefully employed in the oven; and if you are going to ventilate the cooker, as a cooker should be ventilated, then some of the heat that you think should be given to the contents of the oven will become dissipated *via* the ventilator? Electricity in competition for cooking purposes cannot afford to lose any part of its heat. The claimants of superiority for electricity in cooking assert that the contention rests on the confinement of the calorific power of the electricity within the walls of the oven without any escape other than by radiation, and when the oven-door is opened for examining the condition of the food within. Pity the door of the oven has to be opened at all; for then the heat when once produced, we judge from the claims, would be perpetually stored. In another part of her article, "Maud" quotes 2½d. as the cost of cooking a dinner (as specified) by coal, costing 16s. a ton. Passing on to gas cooking, she says "this is undoubtedly the most popular method of cooking at the present time; but it is found that this costs for the same dinner 3d. This price does not include the time and gas taken to heat up the oven, or the greater time taken to rid the oven of the objectionable smells. If the latter precaution is not taken, the smell permeates the food." What nonsense for a technical paper to publish. In the first place, "Maud" does not quote the price of gas per 1000 cubic feet. She does not describe the size or style of the oven in which this 3d. of gas is supposed to have been used. At 2s. 6d. per 1000 cubic feet of gas the 3d. would represent 100 cubic feet of gas, and, in round figures, 55,000 B.Th.U. But this does not "include the time and gas taken to heat up the oven." Why not? What, too, are those "objectionable smells" that have to be got rid of in a clean oven, with a free burning bunsen flame; and where has "Maud" found these objectionable smells permeating food? In her own house, or at the great hotels or dining establishments in the West End of London? If in her own house, then she stands confessed a slattern.

All this prattle about the economy of the electric oven, notwithstanding the tremendous difference in favour of gas in the calorific power purchasable for a given sum, is rather discounted by the repeated emphatic statements in the electric press that not more than 1d. per unit must be charged if electrical cooking is to gain entry and become established in the household. Now 1d. per unit does not pay works costs and capital charges; and why, it may be asked, must electricity for these purposes be sold at such a price if electric cooking is so economical, and if it has so many inimitable advantages on its side? The answer, of course, is obvious, though it may not be openly acknowledged by our friends. In "Electrical Industries," an electrical manufacturer writes: "I think it will be generally agreed that if any higher price than 1d. per unit be asked, it is rather like beating a dead horse to endeavour to persuade even the most comfortably off householder to adopt electric cooking." Other correspondents share this view. But what is to be thought when, in the face of these declarations, we are told that not 5 per cent. of the undertakings are willing to descend to the flat-rate of 1d. per unit. On which the Editor of our contemporary remarks that "central station engineers may retort that such a rate would not, and could not, be profitable; but to that contention it may be answered that any practical experience of the revenue-earning capacity of electric cookers is so limited that the grounds for scepticism are purely theoretical." Just so; then whence comes the confidence of some writers in the 1d. a unit being a paying price? We read on: "Further, if 1d. per unit is admitted to be a necessary condition of business, and is at the same time declared to be a losing price, the situation becomes a deadlock. The only line of escape is the adoption of a simple tariff on the 'telephone system,' or any other which provides a fixed charge with a low running charge. The longer this question is studied, the clearer it becomes that the future of electric cooking and heating depends upon tariff revision." We have said and quoted enough to illustrate the indecision that at present prevails in electrical circles regarding this electric cooking question, both in respect of price and the efficiency of the cookers.

While on this subject of tariff reform, we notice that Mr. S. J. Watson, the President of the Manchester Institution of Electrical Engineers, in his inaugural address, sympathizes with the electrical manufacturers upon the parlous character of the reward they receive for their services; and he gives expression to his conviction that, unless greater financial stability can be secured in one way or another, it will be difficult, if not impossible, to maintain the industry's position in "the vanguard of the army of progress." Not only in the electrical manufacturing field, but among electrical undertakings, there is a curious financial drifting. In many undertakings, increased connections and business are booked, but the financial results are rolling down hill instead of climbing up. Some instances were shown in the "Memoranda" not long

since; another illustration comes from Kingston. There the number of consumers increased last year from 1024 to 1106; and the number of connections in terms of 8-candle power lamps increased from 45,229 to 50,963—the largest increase in any one year since the commencement of the undertaking. Nevertheless, the debit balance is £1251, against £884 in the preceding year. This is a condition suggesting that all is not well in connection with the commercial methods of the concern, and that the charges need revision. One councillor advocates the taking of some very drastic steps; and he is not far wrong in regarding the position seriously.

PERSONAL.

Last Friday week, at a supper, a formal farewell was taken of the employees of the Carlisle Gas Department by Mr. W. J. SMITH, who is giving up the Gas Managership there to go to Bolton. Over a hundred guests sat down; and in the course of the evening, Mr. Smith was presented with a cigar and liqueur cabinet from the officials and workmen. Mr. H. Wilson, Chief Mechanic, presided, and referred to the pleasant feelings which had always existed between the management and the employees during Mr. Smith's service at Carlisle. In making the presentation, Mr. Carr, the Acting Manager, referred feelingly to the departure of Mr. Smith, and assured him of their esteem and goodwill on his taking up the important post at Bolton, and remarked that he left Carlisle one of the best-lighted cities in the kingdom. In returning thanks, Mr. Smith referred to the splendid support he had received from both foremen and workmen, and congratulated them upon the high efficiency of their work, with special reference to the carburetted water gas, coke, and sulphate returns. He felt his leave-taking of Carlisle; but, in returning to Bolton, he was renewing old friendships, and the break was not so great. He thanked all most heartily for the beautiful present, which would ever remind him of his connection with Carlisle. The remainder of the evening was devoted to music; and at the close of the programme Mr. Birkett, Works Foreman, proposed, and Mr. Routledge seconded, a vote of thanks to Mr. Smith for his hospitality.

OBITUARY.

The obituary column of the London daily papers last week contained an intimation of the death on the 2nd inst., at his residence in Forest Hill, of Mr. FREDERICK HUNT LESTER (Messrs. Parker and Lester), in his 70th year.

Friends of Mr. ALFRED ATHERTON, the Secretary to the Madeley Coal, Coke, and Brick Company, Limited, will be sorry to learn that, on Oct. 14, he lost his wife, who had received a severe shock through the sudden death of their twelve-year old son Philip last August.

The death occurred at Mansfield, Notts, on Saturday of Alderman J. H. BLAKE, J.P., the Chairman of the Gas Committee of the Corporation, who had long occupied a prominent place in the commercial and public life of the town. Prior to the incorporation of the borough in 1891, when he was elected an alderman, he did valuable work as one of the Improvement Commissioners. He was elected Mayor in 1895; and he again filled the position in 1896. Succeeding Mr. T. Savage as Chairman of the Gas Committee, he was instrumental in effecting many profitable developments of the undertaking, from which substantial sums have been contributed from time to time in relief of rates. During his chairmanship several reductions in the price of gas were made.

Mr. GEORGE REDFERN, who passed away at Nottingham on the 23rd ult., in his 60th year, was born at Uttoxeter; but at the age of 13 he went to North Wingfield (Derbyshire), and accepted service with the Wingerworth Coal Company—the parent Company of the present Hardwick Colliery Company. He retained his connection with this Company up to the time of his decease. For some time he attended the London Coal Exchange; but during the last few years he represented his Company in the Midlands—principally in connection with the gas coal trade—and there are few gas managers or railway officials, from Nottingham to London and King's Lynn to Newbury, who did not know him and admire his upright business characteristics. The deceased leaves a widow and six children.

Presentations to Mr. Fred W. Taylor.—Before Mr. Fred W. Taylor left Shanklin to enter on his duties as Manager of the Harpenden Gas Company, the workmen employed by the Shanklin Gas Company presented him with a meerschaum pipe in case; and the Directors presented him with a gold chronometer, suitably inscribed.

Scottish Junior Gas Association (Eastern District).—A quarterly meeting will be held next Saturday afternoon in the Masonic Hall, New Row, Dunfermline. Mr. R. B. Chalmers, the Gas Engineer and Manager to the Alva Town Council, will read a paper dealing with various economies that have resulted from appliances designed by him for use in his works. Two questions will be submitted for discussion—the first upon the subject of heavy as compared with light carbonizing charges, and the second upon the personal experience of members in incandescent gas lighting.

RETIREMENT OF MR. PEARSON, OF TORONTO.

General Manager and Secretary of the Gas Company.

IN the report which the Directors of the Toronto Gas Consumers' Company presented at the sixty-first annual general meeting on the 26th ult., they expressed much regret at announcing the relinquishment by Mr. W. H. Pearson of the position of General Manager and Secretary, after having been with the Company upwards of fifty-five years. They recorded their high appreciation of the long, faithful, and efficient services rendered by him, and expressed the hope that he might enjoy a well-earned rest for many years, when relieved from the responsible and onerous duties he had so ably performed for an almost unprecedented length of time.

Referring to the matter in the course of his address at the meeting, the President of the Company (Mr. John L. Blaikie) stated that when Mr. Pearson's letter, announcing his resignation, came before the Directors, and after he had more fully stated his reasons for resigning—viz., that he was convinced that at his advanced age he could no longer discharge with efficiency the very arduous duties pertaining to the position of General Manager, and that both in his own interest and that of the Company, it was his duty to tender his resignation—they accepted it with regret, and with entire unanimity assured him, in a resolution, of their very sincere wishes for his welfare, and expressed the hope that he might for many years, when relieved from the cares and the anxieties incident to the details of the Company's business, realize that the evening of his life was the happiest and the best. Recognizing the remarkable fact that Mr. Pearson had been connected with the Company for fifty-five years, and had seen it grow from small beginnings to its present extensive and complete equipment in all its departments, the Board were desirous that he should sit for his portrait, so that it might adorn the walls of the Board-room as a perpetual reminder of his long, faithful, and highly-appreciated service to the Company. The Board had also suggested to their successors in office that they should make such liberal retiring allowance to Mr. Pearson as could with propriety be entertained under all the circumstances of the case.

Mr. Pearson expressed his gratitude for the kind things which the President had said regarding him, and for the words of commendation and appreciation contained in the report. To have secured the confidence and the approbation of the President and Directors, with some of whom he had been associated for a long time, was, he said, worth more to him than any mere pecuniary recompense. He expressed his appreciation of the kindness and consideration with which they had always treated him. Whatever his failures had been, he could truthfully say he had always endeavoured to deserve the confidence reposed in him. Referring to the changes which had taken place during his period of service, he said:

I have seen the Company grow from very small beginnings to its present position, ranking among the very large ones on the Continent. The output of gas for the year 1854, when I entered the Company, was 13,954,000 cubic feet. For the past year it was 2,226,163,000 cubic feet, or 159 times more. The population of the city then was 41,500; now it is 350,000, or 8·33 times more. The number of clerks in the Company in 1854 was two, and of employees about 50; the number now are 40 and 747. There were then 924 meters in use, whereas now there are 58,513, or 63 times as many; and the mains have increased from 20 to 394 miles. The net price of gas in 1854 was \$2·50 per 1000 cubic feet; and it was raised to \$3 in 1855 and to \$3·33 in 1858; but now it is only 75 c. Fifty-five years ago, the works and apparatus were of a crude and primitive kind. Now the works have been pronounced by a number of engineers who have inspected them as unsurpassed on the Continent. It would have been very unfair for me to take to myself the credit for the present prosperous condition of the Company. I most cheerfully bear testimony to the valuable—indeed, indispensable—and loyal service rendered by the other officers, who have always been ready to render me every assistance in their power. I have served under all the Presidents—eight in number; and I know of but one person living who was connected with the Company when I entered its employ. It is to me a source of much satisfaction that I am retiring when it is in a better position than ever before—with works unsurpassed, with every department in efficient operation, with a rapidly-increasing business, with the ability to compete successfully with competition from any quarter, with the knowledge that my position can be efficiently and ably filled, and with the belief that the interests of the Company will not suffer by my now leaving its service. I shall always take a deep interest in its future, and shall at any time be glad, if called upon, to give any assistance that I may be able to render. I leave it with my best wishes for its prosperity, with the kindest feelings towards all connected with it, and with my most sincere desire for their health and happiness.

As to Mr. Pearson's retirement, the "Toronto World" said:

Mr. Pearson has honoured himself and dignified the community by a record of faithful and devoted labour, and the maintenance of a standard of single-eyed regard for the interests to which he owed allegiance. Ideals of conduct are not so closely followed, and examples such as Mr. Pearson's are not so common, that society can afford to overlook or ignore them. Humanity is the better for the fidelity of a faithful servant, and that quite apart from the cause he serves.

Mr. Pearson's successor is Mr. Arthur Hewitt, who was formerly the Assistant General Manager.

THE ART OF COOKING.

THE Royal Horticultural Hall, in Vincent Square, Westminster, is one of several places in London which at different times of the year wear widely varying aspects. That is to say, it is the chosen spot for the holding of a number of sectional exhibitions quite unconnected one with another—and many of them, at any rate, having no relationship whatever with "horticulture." With some of these displays, the "JOURNAL" has no concern; though generally—to whatever professions or trades the shows may be primarily dedicated—a careful inspection will reveal the fact that the gas industry is in some way interested. During the last few weeks, we have on no less than three occasions turned attention in the direction of the Horticultural Hall, in consequence of the holding of exhibitions of totally different characters; and each time there has proved to be something to arouse interest.

The first of the three was provided mainly for those who study medicine; the second emphasized the ingenuity to be found among model engineers; while the third, which took place last week, appealed to everybody—for it had to do with cookery and food. It has been remarked that these three exhibitions were of totally different characters; but this, of course, does not necessarily mean that they had no connection one with another. Model engineering may perhaps be allowed to stand apart (though if memory serves rightly, even in that case one of the most remarkable of the models shown was the work of a grocer's assistant); but the connection between medicine and food and cookery is so close that no disposition to deny it will be evinced by even quite young boys and girls. Good food is essential to good health, and good cooking hardly less so. Bad food, it is true, cannot be made good, however careful may be the cooking; but the best food may be rendered absolutely injurious by want of care or knowledge in preparing it for the table. Seeing, therefore, how much depends upon the cook, anything likely to lead to increased proficiency in the exercise of the culinary art should be received with acclamation. It is doubtless as the result of some such train of thought as this that so hearty a welcome is accorded to the annual function organized by the Universal Cookery and Food Association.

Last week's exhibition was the twentieth of the series; and in no respect was it inferior to—in most, it was a decided advance upon—its predecessors. The crowds which flocked to the hall gave the impression that if the run had extended over much more than the five days to which it was limited, the show would still have remained a success right up to the end. All conceivable kinds of cookery were represented; and there was a most tempting display of confectionery, bread, pastry, &c., together with the necessary appliances for kitchen and bakery use. There were many competitions and practical demonstrations, which proved a great source of attraction. Army and navy cookery competitions took place at frequent intervals in the main hall annexe; there having been fitted up for the purpose by the Gaslight and Coke Company six gas-cookers, with some hot-water circulators.

Other demonstrations and competitions were carried out on the first floor, where three model kitchens, side by side, had been put up by the Gaslight and Coke Company in a large room, which, big as it was, proved quite unequal to accommodating all the people who desired to witness the operations. At least, this was the case at the time when a "JOURNAL" representative visited the exhibition to see what was going on. Scores of ladies were then perforce being refused admission; and the supply of reserved seat tickets for the next following demonstration had already been sold out. The competitions were of all kinds; while the practical demonstrations were conducted by numerous capable exponents, including Miss Helen Edden, M.C.A. Everything was, of course, done by gas; and Miss Edden's demonstrations (in which she was assisted by Miss Baldwin, M.C.A.) were stated to be specially given to illustrate the economy of this method of cooking. On Wednesday, the following dinner was cooked in one hour, with a consumption of only 40 cubic feet of gas, by means of a Wil-on "Advance" cooker, No. 2: Dinner rolls; tomato soup; toast; fish, baked and fried; roast lamb; potatoes, baked and fried; green vegetables; roast chicken; fruit tart; and cheese savoury.

It has been remarked that the three model kitchens were erected side by side; and on their arrangement and appearance the Gaslight and Coke Company deserve congratulation—especially when one considers the short time in which everything was got together. There were, of course, more gas-cookers than would be required in ordinary kitchens; but, as will be understood, this profusion was needed in connection with the competitions, and was not intended as an indication of what the Company would suggest should be fitted up in an ordinary private house. All the gas apparatus displayed was connected up; and there was a separate hot water supply to each kitchen. The hot and cold water pipes, waste pipes, and gas supply pipes were hidden away behind the walls, so that neither the emdca and paper covered walls nor the floors were defaced in any way. The lighting, too, was admirably carried out with Sugg's cluster lamps, each containing four upright incandescent burners, controlled in pairs by pneumatic switches. The fittings properly belonging to the two principal kitchens were as follows: No. 1 (large domestic kitchen), a Main "Normanic" open and close fire gas and coal combination range, a Sugg "Westminster" gas kitchener; a Sugg "Royal" confectioner, a Davis cast-iron enamelled grill and toaster, with hot closet; a John Wright and Co. "Sun" automatic high-pressure gas-boiler; a Richmond gas-heated kitchen boiler, made of copper

tinned inside; a Davis "Uno" gas-heated coffee roaster; and, last, an enamelled vegetable washer and sink combined. No. 2 (small domestic kitchen), a "New Davis" gas-cooker, green enamelled steel inside and out; a Wilson gas hot-water circulator; a gas-heated "anti-tear" washing machine; and a "Uno" gas-heated coffee roaster. No. 3 was a schools competitions kitchen; and it was provided with three Main school gas-cookers, and one Sugg double "Regency" gas kitchener. These have been specially constructed for use by school children; the height enabling them to cook with ease on the top of the hot-plate, and to witness cookery operations with facility. The first two kitchens were luxuriously fitted with cooking utensils which were lent by Messrs. Jones Bros., of Down Street, W.

The use of gas-stoves in the exhibition was by no means confined to the model kitchens and the competitions in the annexe, for many of the stall-holders were using them for the production of samples of their specialities. In addition, several gas apparatus manufacturers had stands on which they displayed appliances appropriate to the occasion. Messrs. W. Sugg and Co. (whose stand was admirably lighted by inverted burners supplied with high-pressure gas by means of a hot-air engine) made a special feature of a cooker fitted with two ovens side by side. One of these is smaller than the other; the idea being to economize in the consumption of gas when the article to be cooked is not big. This saving in space gives room for a plate warmer underneath—which is heated by either oven, and is also provided with a burner of its own. The firm have, too, a closed-in grill, designed for the purpose of keeping in the heat and keeping out the draught. Messrs. W. M. Still and Sons, in addition to their well-known water-boiling and coffee-making machines, egg-cookers, and milk, cocoa, tea, and coffee urns, displayed a new and very ingenious gas-heated plate washer. This is only emerging from the experimental stage at present; but already there is eager inquiry about it from many hotel and restaurant managers. Any sized plate is automatically clasped by clips on a revolving chain-band, and passes through one water chamber, is scrubbed, and is then taken through a clean hot-water tank, and brought again to the top of the apparatus, when it is automatically released. The only manual "labour" required, therefore, is the placing of the dirty plates one by one on the revolving chain-band and the removal of the clean ones as soon as they reach again the point from which they started. Messrs. Arden Hill and Co. (whose stand was lighted by "Nico-Intense" burners) exhibited the "Janus" bread baking and confectionery oven, a feature of which is that no products of combustion get inside the oven or come into contact with the pastry, and in which it is claimed the heat is absolutely uniform. Along with this were their "Zenith" automatic high-pressure boiler for delivering hot water to any part of a building, and their "Mars" gas-heated steam radiator. Messrs. Main showed their new "London" gas-cooker, a description of which recently appeared in the "JOURNAL," which is constructed on the regenerative principle, for the purpose of securing economy of gas consumption. There were also to be seen the firm's "Rosslyn" condensing fire; and a large baking oven also on the regenerative system. The size of this oven is roughly 4 ft. by 2 ft. by 2 ft.; and the gas consumption is stated to be 50 cubic feet per hour. An improved coffee or milk urn fitted with white earthenware sloping bottom jar, is another article useful to confectioners, &c., which Messrs. Main have to offer; while their "Fountain" water-boiler is so constructed that absolutely boiling water only can be drawn from it.

The Humphrey Internal-Combustion Pump.—In the "JOURNAL" for the 26th ult. (p. 254) we gave an illustrated description of the above-named pump, accompanied by some extracts from a report on its working at Dudley Port by Professor W. Cawthorne Unwin, F.R.S. An opportunity will shortly be afforded of learning more about the pump, as Mr. Humphrey is to read a paper on "An Internal-Combustion Pump and other Applications of a New Principle" at the meeting of the Institution of Mechanical Engineers on the 19th inst.

University of Leeds.—In an article on this subject, from an engineering correspondent, in the Engineering Supplement to "The Times" last Wednesday, reference is made to the addition, three years ago, of an Applied Science Department, and the appointment of Dr. Bone as Professor of Gas Engineering, Fuel, and Metallurgy. The writer explains that the departments of mining and gas engineering, fuel, and metallurgy are housed in a new building, which is self-contained and admirably lighted; and he says there is "a close association between these departments and the other departments of applied chemistry." Professor Smithells, the Dean of the Faculty of Science, has given most valuable assistance in the introduction of this branch of teaching and research. The fuel and metallurgical laboratories, which form one of the great features of the scheme of applied science, provide for instruction and research in gas analysis, photometry and calorimetry, gas explosions, the chemistry of gas production and analysis, and testing of coal, slags, &c. When referring to the confidence shown by the Institution of Gas Engineers in this department of the University, by presenting a sum of upwards of £10,000 for this work as a memorial to the late Sir George Livesey, the writer says: "No attempt has been made to set up an experimental gas-works, or to do anything on a large scale, although an excellent series of working models will be of no small assistance for demonstration purposes."

"CHARCO."

The Dry Quenching of Coke.

"WHAT IS 'Charco'?" is an inquiry that has been addressed to us from several quarters; and an answer of a more complete nature than we have hitherto been in a position to afford can now be given. "Charco" is to be a competitor of "Coalite"; and it is intended to increase the range of utility of the first bye-product of gas manufacture coke, and that by treatment, when incandescent, in a simple manner. By such treatment it is claimed that changes are effected which enhance the value of the coke as a domestic fuel, and for other purposes. We are not going to pretend to describe definitely and particularly what the changes are that cause a material that, on its exit from retorts, quenched by one method burns in a stove with a crackling sound, and soon, unless there is a good draught, loses the cheerful glow that one likes to see in a fire grate, and when smothered by another method burns quietly, and maintains in the same grate a good incandescent fire without attention. But there is authoritative testimony that this is so; and therefore it can only be assumed that the method of treating the coke on its issue from the retorts has an effect in altering its physical characteristics. From time to time, there have been proposals made for quenching spent retort charges without applying water to them; but for one reason or another, they have, one after the other, receded into oblivion. One of the earliest ideas in connection with the coalite system was that the partially carbonized coal should be smothered in closed iron vessels; but after a time the idea was abandoned. But we do not remember that anybody has ever tried the effects of attempting to quench an incandescent spent charge from a gas-retort by smothering it with solid material; and, had anyone done so, it would have been a *sine qua non* that the smothering material should be one that would not have a deleterious effect. For instance, sand mixed with coke would not improve its characteristics as a fuel. But it has fallen to the lot of Mr. B. Ely and Mr. A. Rollason, of Pye Bridge, to discover that a marked difference—according to them, their chemical consultant (Mr. W. J. Dibdin, F.I.C., F.C.S.), and others who have tried the fuel—is obtained by treating coke, on its ejection from retorts or coke-ovens, in a manner so as to exclude air and moisture from the heated mass during the process of slowly cooling, by covering the coke while incandescent with a thick layer of coke breeze. To exclude air and moisture, the depth of the breeze covering must be some 6 to 8 inches. That is the process; and the discoverers of the beneficial effects ensuing from the simple plan have protected themselves by patenting the discovery, for the purpose naturally of securing from its use some consideration.

What happens is that by the process slow cooling of the incandescent coke is ensured; and there is no sudden reduction of temperature such as there is by the throwing of water upon the incandescent mass. One result of this is that the coke is softer; and consequently is not so brittle as the material quenched in the ordinary way. By the process, the volatile sulphur and arsenic, and the residual gases, are allowed to escape through the breeze just as sulphur and arsenic are driven off in the roasting of ores; and nothing is left behind but practically pure carbon and ash. Perhaps of as great importance is the fact that a dry fuel is obtained, instead of one containing from 15 to 20 per cent. of water. When the process was first tried, wet breeze was employed; but, singularly, it is true that, even with the moderately small quantity of water held in suspension by the breeze, the resultant material was not so good as when dry breeze only was employed, which seems to confirm that it is the dry quenching that has the peculiarly favourable effect on the coke as a fuel for domestic purposes. To this fuel the name of "Charco" has been given.

We have some samples of it, as produced at the Alfreton Gas-Works, from Nottinghamshire coal, which is low in ash, and which gives a soft coke. The material is of a remarkably fine and close texture, and soft; and there is no questioning its suitability as a fuel for all domestic purposes. But with Yorkshire and Durham coals, "Charco" has in appearance a greater identity with ordinary coke. Still the same beneficial claims are made for it, in comparison with coke quenched in the ordinary way. The advantage to the gas maker of the process is, as suggested, that the coke is rendered more valuable for domestic purposes; and in these days of increasing coke production and competition, there is more reason than ever for doing everything possible to increase the local sales. From the financial standpoint, the coalite system as an aid to this end is altogether out of the bounds of practicability for the manufacturer whose prime product is town gas. Unlike the treatment of coal in the coalite system, from this fuel all has been extracted in carbonization that is of value to the gas maker—the ordinary process of carbonization not being interfered with in any way whatever. This is demonstrated in a simple manner when making the ordinary test for arsenic. When coalite is being treated, a distinct odour of carbon compounds is noticed; while with "Charco," there is an odour more like burning charcoal.

In connection with the production of the new form of coke, no special plant has to be erected, which is another consideration. The only drawback, if drawback it can really be called with the advantages claimed, is that labour is required for covering the incandescent coke with breeze, and the material after quenching has to be forked to relieve it of the breeze. But to set against this again, there has to be no provision of water for quenching; the breeze can be repeatedly used; and the retort-house is saved

the inconvenience and injury arising from the constant clouds of steam and dust that are caused by the old style of quenching. Furthermore, the fuel resulting from this dry system of quenching is less friable than the coke quenched by the wet system; and therefore less breeze will be produced in its handling. It follows from what has been said that the coke from the poorer classes of coal should also be improved in value by the system. Last, but not the least advantage to the gas maker is—assuming the claims to be substantiated by further experience—the increased market value of this form of fuel over ordinary coke. From all of which considerations, it will be seen that, though we have only at present the direct experience of the patentees to place before our readers, there is abundant advantage in the claims to warrant the fullest investigation on the part of gas engineers.

Now from the householders' point of view, the distinctive features of "Charco," as presented for consideration by the patentees, are: "(1) It is absolutely smokeless. (2) It readily ignites and burns with a steady flame, without noise, and lasts for hours without attention. (3) It gives off no offensive odour. (4) The ash remains in the grate instead of being diffused as dust in the atmosphere. (5) It produces intense heat. (6) On burning, the combustion is more complete than is the case with any ordinary fuel; and a less quantity is required in comparison with other fuels." The scare of some time ago that was produced by arsenic being found in beer will be remembered; and how gas-works coke was then tabooed for malting purposes. If this method of treating spent charges from the carbonization of coal does influence the dispersion of the volatile arsenic, sulphur, and other undesirable chemical compounds otherwise retained in the coke by the sudden drenching it receives in quenching with water, then the material produced by the dry system of quenching should be found of special advantage for malting. For metallurgical purposes, too, such a fuel should be of benefit—in short, there is no readily definable limit to its useful applications.

Enough has been said regarding the information to hand as to process and the effects promised from its application. We leave that information to quote two reports that have been made by Mr. Dibdin, whose name is well known in the gas industry through his former long association with Metropolitan Gas Supply as Chief Chemist and Gas Examiner to the London County Council, and for his writings on the science and art of photometry. Two reports have been made by him; and the interest of the subject justifies their reproduction. He writes:

I have made a careful series of experiments with the fuel made in accordance with Mr. Rollason's patented process, and obtained the following results.

The chemical analysis showed the fuel to have the following composition, viz.:—

Fixed carbon	88.78 per cent.
Matters volatile at a red heat	4.07 „
Ash	4.35 „
Sulphur	1.10 „
Moisture	1.70 „
100.00	

From these figures, it is evident that the calorific value of the fuel is practically equal to that of the best on the market—a result which was confirmed by careful calorimetric tests which indicated 12,600 B.Th.U. per pound, against 14,500 for pure carbon. Allowing for the ash, &c., in the fuel under test, the difference is well within the experimental error; and it is, therefore, clear that this fuel contains the maximum practical calorific value obtainable—a result which is fully borne out by the careful series of experiments on the burning qualities of the fuel in ordinary practice in open grates, as set out later in this report.

The physical character of the fuel is distinctly different from that of coke, or any of the allied products arising from the distillation of coal. It is close grained and of an amorphous character, so much so that it can be ground to a fine black amorphous powder—a result which, combined with the absence of water (which I have found to be present in some samples of other fuels to the extent of 22.5 per cent.) accounts for the ready way in which it will light up, beginning to glow at once instead of refusing to burn, like coke, until it is well warmed up.

The low percentage of sulphur is a very important point in its favour. It is well known that with some fuels a most distinctive and unpleasant odour is perceptible in a room warmed with an open fire. With this fuel there is an entire absence of any smell or sensation of a "dusty" atmosphere; while the combustion proceeds in a remarkably quiet way—the fuel simply glowing with the development of great heat, and steadily burning away until only a few fragments are left in the grate. This glowing fire is more lasting than one which burns fiercely for a shorter time, and then rapidly dies-down, requiring frequent replenishing with fuel to keep it alight. In the case of the fuel made by Mr. Rollason's process, the fire burns steadier and lasts longer than with other fuels.

In the case of a fire made with Mr. Rollason's fuel in an open grate, with only the natural draught caused by a short chimney, the first charge of fuel placed on when the fire had fully developed lasted steadily for eight hours without being disturbed or replenished. In the case of a fire made with the fuel in a small open hall stove, the fire burnt brightly and steadily for six hours. These tests were frequently repeated under other conditions, such as those in which there was a full, sharp draught in consequence of very high chimneys, with equally satisfactory results. The character of the fire obtained is comparable to that yielded by anthracite, but with the great advantage that it lights up readily, and will burn to the last under ordinary conditions of combustion, whereas anthracite can be used only in specially constructed stoves.

From the results of the numerous trials I have made, not only in the laboratory but also in a closed kitchen range, in small room stoves with a sharp draught, in a wide and open old-style kitchen range, in ordinary

dwelling-room stoves, and in hall stoves, it is absolutely clear and definite that the fuel is of an exceptional character, and far superior to coke and its allies and substitutes, in that it lights up easily and rapidly without the assistance of coal, burns well and brightly without smoke, giving a good clean and steady heat, without noise or the projection into the room either of odours or dust, remains bright to the last, and leaves a minimum quantity of ash.

The cost of production is not a question within my special province; but from the information supplied to me, and from that gained by the examination of the samples submitted to me, it is evident that the fuel can readily be made on a commercial scale at a rate which, after paying all charges and selling it at a fair market value, will afford a sufficient margin to repay interest and capital charges on sound business lines.

In a second report, Mr. Dibdin says:

The following are the results of the examination of samples of coke and "Charco" made therefrom, and show the distinctive character of the alteration made by the process in converting coke to "Charco."

	Coke, Per Cent.	Charco, Per Cent.
Fixed carbon	74.39	88.78
Matters volatile at a red heat	6.23	4.07
Ash	6.13	4.35
Sulphur	1.83	1.10
Moisture	11.42	1.70
Volatile arsenic	Trace	Nil
Fixed arsenic in ash	0.35 grn. per lb.	0.315 grn. per lb.

From these results it will be seen that in the case of the coke the consumer is paying for no less than 11.4 per cent. of water which coke necessarily contains, whereas "Charco" has only 1.7 per cent.; thus securing some 10 per cent. greater heating quality, in addition to saving the heat which is absorbed by the water on its evaporation from the coke.

In addition to this very substantial advantage from the financial point of view, the reduction in the quantity of sulphur and arsenic is of the greatest importance in regard to the contamination of the atmosphere.

Charco, Limited.

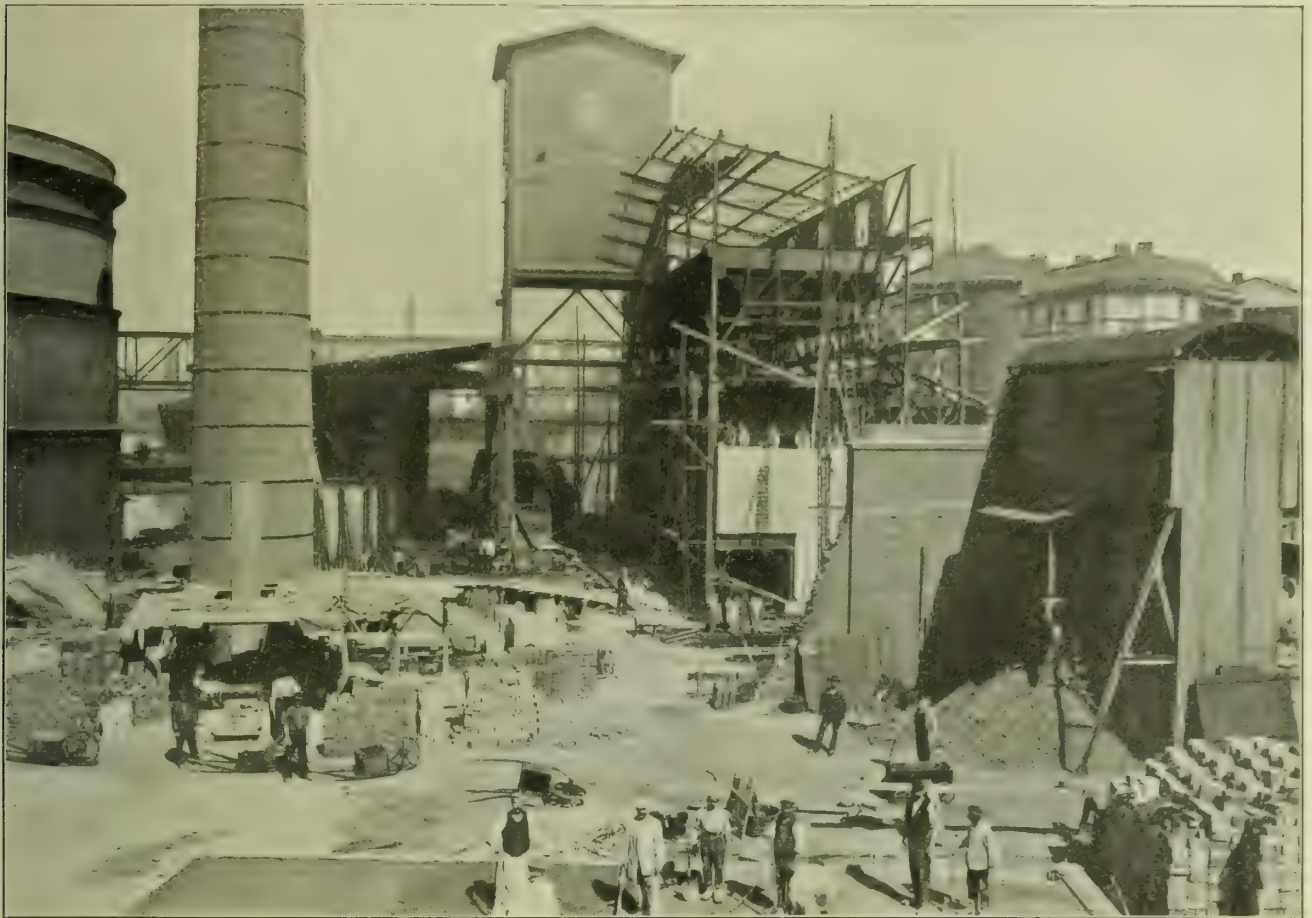
On Aug. 26 last, Charco, Limited, was registered, with a nominal capital of £21,000 in £1 shares. It was stated that the chief objects were to enter into and carry into effect, either with or without modification, an agreement between Mr. Benjamin Ely and Mr. Arthur Rollason of the one part and the Company of the other part, to acquire patents, trade marks, &c., conferring the right to use any invention, process, &c., which may seem capable of being used for any of the purposes of the Company; to form, promote, subsidize, and assist any company for the purpose of acquiring all or any of the property; and to undertake any business or operations likely to assist or benefit the Company. The agreement relates to the acquiring of (1) an invention for improvements in the treatment of coke, in accordance with patent No. 26,121 of 1908; (2) an application dated March 18 last in respect of provisional specification No. 6531, and any patent granted in respect of same; and (3) any other patents granted or to be granted to the inventors or either of them in connection with the same or any kindred process, or any improvements in or additions thereto, whether the same be in connection with fuel for domestic or metallurgical use, or for the manufacture of carbon, or otherwise howsoever. The purchase consideration is £19,997, in fully-paid shares. Neither of the inventors shall, for 25 years from the date of incorporation of the Company, if the Company shall continue so long, carry on business solely or jointly with any other persons engaged in a competing trade or business. The number of members of the Company (exclusive of persons who are in the employ of the Company) is not to exceed fifty; and no invitation is to be made by the Company to the public to subscribe for any of the shares or debentures. The Directors' qualification is to be the holding of 200 shares; and the first Directors are stated to be as follows: Mr. Benjamin Ely, Gas Engineer, Pye Bridge; Mr. Arthur Rollason, Gas Engineer; and Messrs. Robert Burn, Robert Mortimer Moir, and Charles Polden. The registered office is at Winchester House, Old Broad Street, E.C.

Further Extension of the Fleet Street High-Pressure Main.

In consequence of the growing demand for connections in the neighbourhood of Whitefriars and the adjacent printing establishments, it is proposed to put down a second compressor-house in the heart of the area from which the demand chiefly comes. At the meeting of the Common Council of the City Corporation last Thursday, the Streets Committee reported relative to an application by the Gaslight and Coke Company for permission to extend the 6-inch high-pressure gas-main in New Bridge Street, along the south side of Tudor Street for a length of about 110 yards, and recommended "that no objection be offered thereto subject to the regulations, and to the work being commenced on a Saturday afternoon and carried on continuously—by day and night, Sundays included—until completed."

Junior Institution of Engineers.—The annual general meeting of the Institution was recently held at the Royal United Service Institution, Whitehall. The Council's annual report, which was presented, showed that the membership had increased to 1063—85 elections and transferences having taken place during last year. Nine ordinary meetings had been held and 39 visits to works made, covering practically every branch of engineering. The summer meeting in the Midlands had proved very successful. Birmingham had been made the centre on account of the Institution's first Local Section having been established there during the year.

ANCIENT AND MODERN RETORT-FURNACES IN GERMANY.



THE accompanying reproduction of a photograph received from Mr. Robert W. Wilson, the Secretary of the Imperial Continental Gas Association, will be of interest—showing as it does side by side the most ancient and modern types of retort-furnaces.

The photograph was taken at the Association's gas-works in the Holzmarktstrasse, Berlin, at which works there were 22 old horizontal settings of seven retorts each, which are now being

replaced by eight settings of vertical retorts. As it was not possible to throw the works out of action altogether, it was necessary to build the retort-house in two halves. The photograph shows the new construction on one side, supporting in the centre the old roof, covering half of the horizontals still in action, on the opposite side. The latter will be taken down next year; and the other half of the verticals will then be erected in their place.

BRITISH AND GERMAN RETORTS.

By E. KÖRTING, of Berlin.

ACTING on a kindly suggestion that I should give some figures for the benefit of your readers as to the lives of German-made retorts in horizontal, inclined, and vertical settings, with some particulars as to the temperature and other conditions under which they were used, I may say that it is always with great pleasure that I place my experience at your disposal; but I am afraid in this case it will be found to be of a somewhat vague character.

In point of fact we know very little about, firstly, the temperature of horizontal and inclined furnaces, and, secondly, about the duration of the retorts. For the ordinary retort-furnaces are heated in such a manner that the heat is going up and down through a number of flues, situated one behind the other, and separated by brickwork or specials. It is, in consequence, quite impossible to look into the different flues so as to ascertain the temperature therein. On the other hand, the horizontal, and more especially the inclined, furnaces, are liable to irregularities in the heats, and one flue will become appreciably hotter than another. These irregularities are only perceived when the retorts show bright spots from the inside; but then the temperature in many cases has for some time surpassed anything the fire-clay could stand without damage, and the life of a retort is thus shortened by circumstances beyond control. Irregular charging can also, of course, be the cause of a partial overheating. In consequence, I should think that in many cases the construction of the furnace and deficient supervision are the cause of the premature collapse of a retort, and not the material or the workmanship. I will not go so far as to say that in this respect "terminological inexactitudes" are liable to occur in our profession; but I dare say that a good many of us deceive ourselves. We sometimes go on mending and patching our retorts with bricks and specials till nothing is left of the original material but the mouthpiece and the bottom part; and we then attain a duration of (say) 1500 days and upwards.

Other engineers, however, do not believe in much patchwork, but simply put new retorts in when the old ones become invalided

to any extent, and thus reach only 700 to 1000 days. In both cases, the financial result will very likely be the same; but the figures, without an exact description of the amount of repairs, are utterly misleading.

Dixi et salvavi animam meam, and beg to add a few figures.

BERLIN WORKS OF THE IMPERIAL CONTINENTAL
GAS ASSOCIATION.

[All retorts made by the Stettin Chamotte Factory.]

Works.	Five Years' Average Duration, Days.	Remarks.
No. 1. Inclined retorts	1254	Extensive repairs
" 2. " "	1055	Moderate repairs
" 3. Horizontal retorts	1506	Extensive repairs

Vertical furnaces are in an absolutely different position. All the flues are accessible both to the eye and the controlling pyrometer; and the regulation is a very easy one. In these furnaces we have, in consequence, to deal with high, but very constant and regular, temperatures—1350° to 1400° Centigrade. Under these conditions, the retorts seem to keep uncommonly well. At any rate, I call it so when a retort, after two-and-three-quarter years of uninterrupted work, is without holes, and has kept so well that a deformation is not perceptible, either to the eye or by any hindrance to the sliding-out of the coke cake.

If it is desired, therefore, to ascertain the comparative value of rival fire-clay materials, the vertical furnace must be looked to for the proper means of testing; and I may add that I have already myself arrived at this conclusion, and have put some British-made retorts alongside German ones in some of our vertical furnaces, in order to form some idea as to their quality.

Masonic.—At the recent annual meeting of the Province of Bedfordshire, among those who were selected for honour by the Provincial Grand Master (Lord Amptill) was Bro. C. F. Ruggles, of Leighton Buzzard, who was appointed Provincial Grand Standard Bearer.

THE GAS WORKERS' DISPUTE IN ITALY.

THE gas workers' dispute at the various Italian works of the Union des Gaz Company, to which reference has been made in previous issues of the "JOURNAL," resulted in the men going out on strike last Tuesday evening. The Company are using their best endeavours to maintain the supply of gas by means of English engineers and foremen stokers they have sent out, and the men from the German and French works—employing for all the general labour Italians. Of course, the staff are having a most anxious time; but from the telegrams which are being continually received, it is clear that they are working manfully and with a thorough determination to overcome every obstacle. In fact, the latest advices received from Italy are of a most gratifying character, indicating that the manufacture of gas at all the stations is now proceeding satisfactorily.

At Genoa (where the works are under the management of Mr. P. S. Morton) all the strikers have been replaced with Italian workmen; Englishmen being employed only for driving West's charging machinery and the exhausters. A limited supply of gas was given the first two or three days, but the make now exceeds the demand. At Alessandria all the gas that is required can be supplied; and the same may be said of Modena, where the men coming to replace the strikers were intercepted by the Union and prevented from entering the works. This town was without gas one day; but the next day the Company obtained more men than they required. At Milan, where Signor Grüss is the Director, and Mr. Hovey the Chief Engineer, with the constant attention given by these officials, everything is now proceeding satisfactorily at all three works. The make of gas on Sunday was 90 per cent. of the consumption required; and it was hoped yesterday to give all the gas that might be needed. As an instance of the difficulties to be contended with, it may be remarked that last Friday afternoon the head of the Men's League, by some means, obtained one of the badges which is an indication of the men being employed, and by this means got into the San Celso Gas-Works, and made a survey of all that was taking place before he was discovered. It is pleasing to note that the authorities in Milan have given the Company much greater support that has been the case on former occasions. Large bodies of troops were sent into the works as soon as the strikers left, and others were held in readiness outside; while the railway approaches to the different works were patrolled by troops. But little damage seems to have been done to any of the Company's property.

In dealing last week with the men's memorial, it was shown that a number of excessive demands were made by them. How excessive they were, will, however, perhaps be better gathered from the following list of some of the demands of the gas workers in Milan. Among the numerous claims there set forth, some of the most objectionable are that no piece-work shall be allowed, and no contract work; that the Company shall not dismiss men without the consent of their fellow workmen; and that new men shall only be engaged through a bureau to be established at each works, and to be composed of the men of the Federation. If the Company agreed to the terms, also, they would not be able to promote any man according to merit, but only according to length of service. The memorial of the men is framed in a way that might lead the public to think they only require 10 per cent. increase on their wages; whereas, as a matter of fact, all the demands which they make, including their holidays and other privileges, would amount to an increase of over 50 per cent. It may be pointed out that the Union des Gaz Company prepared a scheme of profit-sharing, which they submitted to the men; but the latter so far have declined to give a reply to the proposal. In proposing to share with them all future profits that might be derived from economies in labour and other ways, as well as increased consumption, a most liberal offer was made by the Company on the men's already liberal scale of wages.

SOME OF THE DEMANDS OF THE GAS WORKERS IN MILAN.

- 1.—In 1907, the Company granted the men an increase of 10 per cent. in their wages; the men agreeing to submit the number of men to be employed to arbitration. The Arbitrators have not yet given their decision; but an expert named to examine the question has reported that the number of men employed is too great, and should be reduced. The men now demand that this arbitration be cancelled.
- 2.—The men demand that all piece-work be abolished.
- 3.—The abolition of contractors' men being engaged on any work connected with the manufacturing and distribution services.
- 4.—The establishment at each works of a bureau composed of men of the Federation, who would solely have the engaging of men.
- 5.—The non-dismissal of a workman unless it is in accord with a Commission of the men.
- 6.—Twenty-four days' holiday per annum with full pay to the stokers, besides 37 days' rest already fixed by law.
- 7.—After three months' trial, the men to be fixed employees.
- 8.—The number of labourers to be according to the exigencies of the services, as decided upon by the men.
- 9.—To reduce the old-age limit of insurance from sixty to fifty years for those who work in warm places.
- 10.—After 21 years' service, all employees to be paid 5 frs. per month extra for length of service.
- 11.—Those men who work ten hours per day to only work nine hours from November to February.
- 12.—The wages all to be increased 10 per cent.
- 13.—Special demands:—

The retort stokers one man extra per battery per shift of eight hours = three per battery per day.

The boiler stokers demand one extra man per shift for every two boilers.

Men at exhausters demand to be treated as retort-house stokers, and have eight-hour shifts.

The labourers demand to be considered as second-class stokers, and their number increased by one to every seven; also that their pay be increased in addition to the general 10 per cent. increase.

That men be promoted according to length of service, and not according to merit.

Increases are demanded in the payments which the Company make on account of each man so as to enable him to have a suitable pension at the age of sixty.

HOW THE GAS WORKERS ARE PAID.

In explanation of the gas-workers' conditions in Milan, the following article from the "Corriere della Sera" for the 24th ult. may be quoted.

As the men of the Union des Gaz Company bring forward as justification of their agitation the necessity of obtaining an improvement of their wages and conditions of work, we considered it advisable to go into the question of the present wages of these gas workers; and the following are the figures and data supplied to us by the Union des Gaz Company on the basis of the "Organicos" and regulations in force.

The staff are divided into two categories—the men belonging to the management, who work 6½ hours per day, and the gas-works staff, who have a 8½ hour day's work. Their wages per month are: For the first category, from 132 lire to 330 lire for the first class; and from 121 lire to 275 lire for the second class. For the second category, from 143 lire to 346.50 lire for the first class; and from 132 lire to 291.50 lire for the second class. The maximum wages being obtainable after the nineteenth year of service. After this, the men have a fixed bonus of 8 lire per 100 lire of their wages every three years. There is a further category of men—the under-inspectors of the public lighting—receiving from 115.50 lire to 220 lire per month maximum, which they reach after seven years of service. The collectors receive from 165 lire to 198 lire, to be reached after sixteen years of service; and their day's work is 7 hours; the inspectors, from 115.50 lire to 170.50 lire on the sixteenth year of service; and the messengers, from 115.50 lire to 148.50 lire after thirteen years, with an 8 hour day's work.

This is the list of the salaries of the various categories of men:—

	Lire.	Lire.
Retort-house stokers	165.00 to	170.50 per month
Yardmen	3.00 „	4.00 per day
Wagon wheelers	3.30 „	4.30 „
Plumbers	3.63 „	6.05 „
Fitters	3.63 „	6.05 „
Smiths	3.85 „	6.05 „
Motormen	3.85 „	5.50 „
Carpenters	3.30 „	5.50 „
Bricklayers	4.07 „	5.50 „
Street-pavers	4.07 „	4.95 „
Boiler-stokers	4.40 „	5.50 „
Sulphate plant men	4.40 „	6.50 „
Assistants	1.54 „	3.30 „
Lamplighters	1.76 „	2.20 „
Yardmen assistants	4.80 „	7.00 „
Retort-house foremen and assistant foremen	7.15 „	8.34 „

The maxima are all reached on the tenth year of service. The retort-house boiler stokers, the sulphate plant men, and the retort-house foremen have an 8 hour day's work; and all the others 10 hours. The retort-house staff, in addition, receive 270 grammes of meat per day; and, during the summer months, lemons, &c. Besides the weekly day rest with full pay, they claim annual holidays with full pay. All the other men have a day's rest in the week with full pay. The other benefits enjoyed by them are as follows:—

CLERKS.

Providence.—The Company pay to the credit of the clerks at the savings' bank from 5 to 15 per cent. of their salaries.

Illness.—In case of illness, the Company for three months pay the entire salary.

Holidays with Full Pay.—From 8 to 21 days per year are given in accordance with the years of service.

Life 8000 Insurance Policy in favour of inspectors of the works department, meter inspectors, under-inspectors of the public lighting, and railway sidings' staff. The under-inspectors of the public lighting receive a revolver, and those of the works department 45 lire per month for tramway expenses.

COLLECTORS, INSPECTORS, AND PORTERS.

Providence.—They are all insured with the Cassa Nazionale; the Company paying from 56.76 lire to 170.64 lire per annum, in accordance with their age.

Illness.—The same as the clerks.

Holidays with Full Pay.—Collectors have 10 days per annum, not including Sundays; the inspectors and porters, 8 days.

Indemnity.—To the collectors, 20 lire indemnity per month; to the porters of the works, 10 lire.

WORKMEN.

Providence.—The same as the collectors.

Illness.—Half-pay for a period of 15 days to 8 months, in accordance with their time of service. The foremen and under foremen receive three-quarters salary for a period of 15 days to 8 months.

Accidents.—They are all insured with the Cassa Nazionale. In case of accident, the Company pay the full pay for five days and 90 per cent. during the rest of the time.

Men Called to Serve in the Army for a Time.—One month's pay—15 days on half pay, and the other 15 days on one-third pay.

The above-stated advantages represent 13 per cent. of the amount paid for wages and salaries. The days of rest on full pay are up to 92 (maximum) for the clerks, and 69 for the foremen and men.

The Union des Gaz Company remarked that their wages are higher

than those paid by the other firms of Milan, and by gas companies in the other towns of Italy.

The "Corriere della Sera" for Oct. 23 contained a report of an interview with Signor Grüss (the Company's Manager for Italy), who said the Company were surprised at the action taken by the men, which was for many reasons unjustified. In the first place, during 1907 the gas workers received considerable benefits; and the points on which there was disagreement were still awaiting the decision of the Arbitrators who investigated the matter. In addition to this, he had made other efforts to improve the relations between the Company and the men, and to clear away several causes of disagreement—both in the interest of the service and of the men. The staff received some substantial concessions. In fact, when the "weekly rest" law came into force, every effort was made to prevent its operation causing the men material damage. To this end, Signor Grüss arranged that the rest-day should be fully paid for, which meant that the men worked six days and received payment for seven. Before the coming into force of this law, they had only a short rest on Sunday. This payment for the rest day prevented the Company from making an economy of 100,000 lire per annum, which they might have realized by not granting the payment. At first, this payment was refused to the labourers, as they were not working by the day; but, in consequence of the insistence of the Gas-Workers' Federation, and in order to remove any cause for striking, the Company ultimately granted the concession to these men also. As compensation, the Federation undertook to obtain more efficient working from the labourers. This concession involved a new burden of 32,000 lire. The week-day rest, of course, rendered necessary some increase in the number of men. All that was done, however, had not the result of pacifying the men; and for the last eight months there had been a continual succession of incidents, ill-feeling, and discontent. This resulted in interruption of work, which caused great damage to the Company; and it had now become impossible to obtain from the men the amount of work which could reasonably be expected. The works were perpetually in agitation; and further benefits were continually being claimed by the men. When agreements were arrived at, they proved of no value, because they were only binding on the Company, and not on the men, who considered themselves entitled to break them when they liked. In fact, the men now denounced the agreement made in 1907, and declared that the Arbitrators then appointed (whose award had not yet been issued) had no longer any power; so they had presented the new memorial to the Company. Thus they violated the agreement under which both parties undertook to abide by the decisions of the Arbitrators. In explanation of this extraordinary step, Signor Grüss expressed the opinion that the men feared the award of the Arbitrators. In conclusion, he pointed out the considerable amounts involved in the demands of the men, which meant an increase of 30 per cent. for the men generally, 90 per cent. for the boiler-stokers, 102 per cent. for the carmen, and 99 per cent. for the coke-wheelers. The stokers now receive 5'50 frs. for eight hours work, against 4'50 to 5 frs. for twelve hours in 1900; while 4 to 4'50 frs. is paid in Brussels for twelve hours.

With regard to the figures reproduced in last week's issue from an interview which Signor Speroni (ex-Secretary of the Gas-Workers' Federation) had with "Il Secolo," it is pointed out to us that the statement as to the capacity of the gasholders at Milan is quite misleading. The capacity given is correct—viz., 223,300 cubic metres—and assuming a sale of 250,000 cubic metres per day, it is equal to 88 per cent.; whereas, by the contract, the Company have only to provide 75 per cent. Considering that in Milan a large proportion of the gas is used for cooking during the day, this gasholder capacity is far more than is necessary; and when the men suggest that the storage should be equivalent to 1½ days' consumption, they are asking the Company to expend a very considerable amount of capital in order to enable the men to neglect their work at such times as it may suit them to do so.

AMERICAN GAS INSTITUTE MEETING.

[COMMUNICATED.]

THE Fourth Annual Meeting of the American Gas Institute was held in Detroit (Mich.) from the 20th to the 22nd of October, under the presidency of Mr. Charles F. Prichard, of Lynn (Mass.). The proceedings were opened at ten o'clock on the morning of the 20th, in a large well-ventilated hall, free from the noise of street traffic, and in all respects admirably adapted to its purpose. It had seating capacity for 350 persons; and during the first session there were not fifty vacant chairs.

The annual report of the Board of Directors was the first business transacted. This showed a gain of about a hundred members (making the total membership 1333), an existing surplus of \$2000, and an estimated surplus of \$4000 at the end of next year. It recommended certain changes in the constitution, relating to the method of proposing and electing honorary members, and to meetings of the Board. It was adopted without amendment.

The First Vice-President (Mr. W. H. Gartley, of Philadelphia) took the chair during the reading of the President's Address. Its delivery occupied half-an-hour, and it commanded close attention. The President considered first the condition of the Institute itself, whose chief "reason for being" was to aid members

in the combination of efficiency and economy in all their work. This work comprised the three broad divisions of public relations, production and distribution, and sales. In the opinion of the President, the Institute had not attached sufficient importance to the questions arising under the first division; the second had received thought, with very good result; but the third—the commercial side of the business—had been neglected to such an extent that the National Commercial Gas Association had been formed to supply the need. The work of the Institute had been rather too largely performed by the members belonging to the syndicate companies; and those who represented individual companies should, for their own sake, as well as for that of the Institute, no longer hold back. The President then discussed the gas industry; premising his observations by the remark that he would show how little truth there was in the statement that the use of gas had reached its height. The increase in sales throughout America for 1908 over 1907 was 5 per cent. In his own town, served by one Company supplying both gas and electricity, and giving to the public what they asked for, or, where advice was wanted, the form of light that was best suited to the case, the sales of gas had in ten years increased 81 per cent., and those of electricity 59 per cent. Comparing prices in America with those in England, he said recent statistics gave 157,000 million cubic feet sold, at an average cost of 85 c. per 1000 cubic feet, compared with 173,000 millions at 84½ c. in England. The relative capitalization was \$6'37 and \$5'26 per 1000 cubic feet. In addition to higher capital charges, there was in America a *per capita* consumption of 5500 cubic feet, compared with 8737 cubic feet in England; these figures being taken from a number of cities of similar size. They could hardly expect to lower their price until they decreased their capital charges by increased sales. The President apparently overlooked the fact that gas in America has 10 per cent. greater heating value, and even more, than it has in England. The third division of the address consisted of an indication of the various papers and reports on the programme, and a reference to members deceased during the year. According to custom, the address was referred to a Committee.

The Nominating Committee reported their recommendations, which were all adopted; and the following officers were declared elected:—

President.—Mr. W. H. Bradley, New York City.

First Vice-President.—Mr. R. B. Brown, Milwaukee (Wis.).

Second Vice-President.—Mr. John C. D. Clark, Chicago.

Secretary and Treasurer.—Mr. A. B. Beadle, New York City.

Committee reports were next in order. The Committee on Electrolysis, of which Mr. A. G. Glasgow is the Chairman, presented a memorandum from Professor A. F. Ganz, on "The Protection of Underground Pipes from Electrolysis." The author maintained that the only sure cure for this trouble was the installation, by the electric roads, of proper return feeders; and it was stated that in most cases the cost would not be prohibitive. Bonding of mains to rails was, in a general way, unwise. Cement joints throughout would usually make a line of pipe of such high resistance as to be safe from attack.

The Unit of Light Committee reported that the way was now clear for the adoption by the Institute of the proposed international standard; and this was done. Then the Committee on Benzol Enrichment presented some valuable data, "the confirmation in practical work of Dr. Bunte's figures, showing the varying enrichment value realized from benzol in candle-feet per gallon, depending upon the quantity of benzol carried by the gas." The Committee on the Utilization of Gas Appliances asked for written suggestions covering model specifications for gas-ranges and water-heaters; stating that it would be to the interest of user and maker alike if construction could be standardized and not departed from, except after careful consideration.

These matters brought the morning sitting to a close.

The afternoon sitting began with a paper on "Sliding-Scale Regulation of Prices and Rates of Dividend for Gas Companies," by Mr. A. E. Forstall. The author argued for the adoption of the sliding-scale principle in America; and he then detailed the steps necessary in applying it to any company. The discussion was limited to a statement of some of the obstacles met with in Massachusetts in attempting to secure the adoption of the sliding-scale. Mr. Irwin Butterworth presented another of his admirable reviews of "Technical and Mechanical Progress in the Gas Industry during the Past Twelve Months." Dr. E. P. Hyde delivered a most interesting address on some of the problems remaining to be solved in regard to the production and utilization of light; emphasizing the necessity of a better nomenclature for the units used in illuminating engineering. Mr. Norman Macbeth presented by title a paper on "Practical Applications of Illuminating Engineering." He also showed many lantern slides of various types of stores efficiently illuminated by gas, and discussed both the problem presented and the solution in each case. His paper furnishes very valuable information to anyone who is required to plan illuminating lay-outs. There was unfortunately time for only a few moments' joint discussion of the Hyde and Macbeth papers prior to the adjournment.

For the second day of the meeting, a double programme was provided. Mr. W. H. Gartley, the First Vice-President, presided over Section A in the meeting-room used on Wednesday; while Mr. Donald McDonald took charge of Section B, which met in a commodious room three floors below. This division into sections was forced upon the management by the lack of available time, in the two days devoted to the meeting, to consider all the papers

if presented before one assemblage. It was the first real trial of sectional meetings; and it was so successful that a resolution was passed by Section B asking that the custom should be continued, because a more general and instructive discussion was possible when subjects were presented before a comparatively small audience, all of whom were interested and competent critics, than could be expected when, as has hitherto been the case at Institute meetings, only a portion of the several hundred listeners knew or cared about what was being told them.

The first topic considered in Section A, before an audience of about two hundred, was the "Use of Tar on Roads," by Mr. Arthur D. Little. It gave a brief survey of the necessity for better road construction due to automobile wear, of the value of oil and of tar, and methods of applying them. A number of lantern slides accompanied the paper. In the ensuing discussion, which lasted half-an-hour and was then cut off for lack of time, there was clearly manifest the widespread interest aroused among gas companies by the possibilities of this new market for tar. There was also plenty of evidence that water-gas tar was as good as coal-gas tar for road work.

A paper entitled "A Pound of Coal," by Mr. Charles D. Lamson, of Worcester (Mass.)—being a description of a year's operation of his new retort-house, containing one stack of ten benches of eight horizontal retorts each—had been awaited with the keenest interest, on account of the excellent results being obtained. The retorts are \square shaped, 16 in. by 26 in., 15 feet long, and open at both ends. They are being operated on seven-hour charges of 900 lbs. to 950 lbs., and produce per pound 5.95 cubic feet of 17-candle gas, as measured by a Sugg old "D" argand burner at a 5-feet rate.* At the conclusion of the paper, "A Report on Vertical Retorts," by Mr. W. G. Africa, was called for. It described experimental work on a vertical installation at Manchester (N.H.), subsequent to the report on the same bench made by Mr. J. H. Taussig at last year's meeting. After a five months' test of various sizes of retorts, one 10 in. by 14 in. at top, 15 in. by 21 in. at bottom, and 18 ft. 6 in. long, gave the best result; and plans had been made to fill two benches with retorts of this size. The yield per pound obtained with eight-hour charges was 4.82 cubic feet of 16.08-candle gas, measured against a flat flame.

In the joint discussion of the Lamson and Africa papers, Mr. Taussig pointed out that had the gas from these vertical retorts been compared with the candle-power standard used at Worcester, the yield in candle-feet would have been practically the same. Many of the speakers who referred to the Worcester retort-house had seen it in operation; and they bore unanimous testimony to the fine engineering talent evinced in its construction, and the careful attention devoted to every minor detail of its operation. Hence its undoubted success. Great will be its effect on future construction in America.

Lack of time before the adjournment of the morning sitting deterred Mr. E. C. Jones from attempting even to abstract his paper on "The Development of Oil Gas in California." But in a very interesting ten minutes' talk he told of lamp-black troubles that had been successfully overcome, and of the value of the oil-gas process in allowing safety of operation with a holder capacity less than one-fifth of the daily output.

In Section B, Thursday morning was devoted by upwards of a hundred members to three commercial papers, "Gas in the Modern Kitchen," by Mr. G. W. Thomson; "Commercialism," by Mr. C. M. Cohn; and "The Solicitor," by Mr. Karl A. Schick. The discussions were very generally participated in, and when printed will add largely to the value of the papers. Want of space here prevents consideration of them in detail.

On Thursday afternoon, Section A considered a paper on "Sulphur Compounds in Illuminating Gas," by Mr. Charles J. Ramsburg. It was a plea for the abolition of some existing unnecessary requirements as to the sulphur and hydrogen sulphide content of gas. He gave a brief history of English legislation on the subject, stated the present legal requirements in America, and advocated allowing one grain of hydrogen sulphide per 100 cubic feet of gas. This would reduce purification expenses, and involve no harm to any gas user. The author's views were borne out by the discussion, notwithstanding two curious statements, made by men who ought to know better, in regard to the necessity of removing all hydrogen sulphide. A paper on "A Rapid Method for the Identification of Gas Oils," by Messrs. F. E. Park and L. E. Worthings, elicited little discussion; the subject being one familiar only to a trained chemist. A communication on "Power Plants for Gas-Works of Medium Size," by Mr. C. D. Robison, appealed to many gas-works managers, though, as the discussion showed, some of his conclusions as to the adoption of electricity and the use of motor drive were differed from.

On Thursday afternoon, Section B considered first a paper on "Automatic Oiling Meters," by Mr. T. D. Miller, describing a device for oiling meter diaphragms from above, as compared with oiling from below through capillary action—a system now in successful use for nearly half-a-million meters in America. The new device has been tried on only 600 meters; and it will need further trial before its value can be determined. The discussion brought out the fact that the trend in America is towards leaving meters in until decreased consumption indicates possible meter defects. "The Acceptance and Interpretation of Data," by Mr. R. O. Luqueer, gave many illustrations of mistakes arising from failure to verify, and ignorance in interpreting, data. It

closed with the opinion that, in the regulation of gas prices, the maximum-price method has been more successful in England than the sliding-scale. No discussion was allowed on this paper, owing to lack of time. A paper on "A Booster System" at Rochester (N.Y.) was read by Mr. F. H. Hellen. The author told how, by the isolation of an existing 10-inch main and the installation of an electric motor and a Sturtevant fan, an investment of \$3200 accomplished results for which \$30,000 in a low-pressure main would have been required.

After a few remarks on this paper, Section B adjourned to meet with Section A, where the discussion on Mr. Robison's paper was ending. At its conclusion, Mr. Gartley resigned the chair to the President, who called for the report of the Committee on the next place of meeting. They spoke favourably of Atlantic City, but asked permission to make later a definite recommendation to the Board of Directors. It is hoped to hold a joint meeting with the National Commercial Gas Association; and its ideas as to a meeting-place are to be ascertained. There was no report ready from the Committee to award the Beal Medal for the best paper submitted last year. The Committee on the President's Address commended it, and concurred in its recommendations, especially the one for the appointment of a Commercial Committee to procure papers on commercial subjects; thus relieving the Technical Committee of the commercial portion of the programme.

A belated recommendation from the Directors, covering the acceptance of original work done by the affiliated Associations, was then adopted. The Committee on Calorimetry presented their report, which covered a number of operating details supplementing the report of last year. Among these details were a study of thermometers for use with the calorimeter, and an investigation of variations in heating value caused by a difference in temperature between inlet water and the room. The report of the Wrinkle Department having been presented by title, the President announced the constitution of the two important General Committees for the ensuing year. With a vote of thanks to the Arrangements Committee and to all others who had worked for the success of the meeting, the business was closed.

On Thursday night there was a "smoker" for the men. Friday was devoted to a trip by steamer up the Detroit River to Lake St. Clair, then down to Lake Erie to visit the work in progress at the Livingston Channel, which, by means of a coffer-dam, is being blasted out in the dry for a length of 4000 feet, a width of 300 feet, and a depth of 22 feet. On returning to Detroit, a stop was made at the coke-oven plant of the Solvay Process Company, producing daily 825 tons of coke; the surplus gas being sold to the Detroit Gas Company. One of the interesting sights at the plant was a long stream of briquettes being carried by conveyor steaming hot from the press and delivered direct to the freight car.

The ladies, of whom there were more than a hundred, formed a pleasant feature of the boat trip. During Wednesday and Thursday, they were entertained at luncheon, at the theatre, and by automobile rides; and they undoubtedly regarded the meeting as an unqualified success. But from a man's standpoint, it was hardly this. The opportunity always exists to make a meeting stand far above its predecessors. This opportunity was missed at Detroit, as it has often been missed before, and for about the same reasons. The attendance was very good; probably some 500 members registered. Nearly 400 of them were present at the opening sitting; and thereafter the attendance averaged between 200 and 300. Why did not these men get the utmost good from their attendance? Because, first, the writers of the papers and the reports were so late in sending them in that they were not received in printed form by many members prior to the meeting. Secondly, and partly because of the first, there was no insistence on the abstracting of papers; and consequently every important discussion had to be cut short for lack of time. Of the time devoted to reading and discussion, reading occupied seven hours and discussion only four-and-a-half hours, of which about two hours were devoted to relatively unimportant commercial papers. The time of the meeting could just as well have been lengthened by a sitting if only there had been proper co-operation with the Arrangements Committee.

To conclude, the meeting was a good one, and if any one who went was not benefited, it was his own fault. But the Institute is now so large that some improvement on existing methods is needed to produce a meeting fully worthy of the expense represented by the attendance.

Institution of Civil Engineers.—The first meeting of the Institution for the present session was held last Tuesday evening, at Great George Street, Westminster. In the absence of the President (Mr. J. C. Inglis), the annual address was read by the Secretary (Dr. J. H. T. Tudsbery). In the course of it, the President referred to the want generally felt for improvement in the present professional status of the civil engineer, and explained the steps taken by the Council of the Institution to remedy the deficiency. He dealt with the present state of the labour question and its effect upon the work of the engineer, and declared that the evils of to-day caused by the constant friction between capital and labour could only be remedied by the encouragement of the mutual co-operation of the two. Legislation which protected labour interests to the point of partiality, and which did not at the same time pay due regard to the interests of those who had to initiate enterprise and dispose of the products of labour, was proceeding on a course which could only have one ending.

* This paper is, in part, reproduced elsewhere to-day, see p. 392.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS & MANAGERS.

The General Meeting of the Association was held last Thursday, at the Hotel Cecil, Strand, W.C. The PRESIDENT (Mr. James Paterson, of Redhill) occupied the chair; and there was an excellent attendance of members.

MINUTES OF LAST MEETING.

On the suggestion of the PRESIDENT, the minutes of the previous meeting were taken as read, and confirmed.

NEW PRESIDENT AND VICE-PRESIDENT.

The PRESIDENT said it was with very great pleasure indeed that he proposed that their friend, Mr. C. S. Ellery, of Bath, should succeed to the office of President. Mr. Ellery had acted last year as Vice-President; and he was certain they would all welcome him very much as their President.

Mr. A. E. BROADBERRY (Tottenham) seconded the motion, remarking that he was sure the members were to be congratulated on Mr. Ellery having accepted the office, and in him they would have an excellent President.

The motion was unanimously carried.

Mr. ELLERY (who was received with applause) said that he very much appreciated the honour, although it was with very grave misgivings he had accepted the kind invitation of the Committee. He did not usually carry a grudge against anyone; but he did feel that in this matter their Hon. Secretary had brought an undue influence to bear. He appreciated the kindness of the members very much indeed; and he would do his best to fulfil the duties of the office to the satisfaction of the members.

Mr. S. CARPENTER (Dorking) had much pleasure in moving that Mr. H. C. Head, of Winchester, be elected Vice-President for the coming year.

Mr. FRANK LIVESY (Maidstone) seconded the motion; and it was cordially agreed to.

Mr. HEAD thanked the members for the honour done him. He assured them that he much appreciated it; and anything he could do for the benefit of the Association, he should at all times be glad to do.

NEW HONORARY SECRETARY.

Mr. W. E. PRICE (Hampton Wick) said he supposed he ought to begin by saying that he had great pleasure in making his present proposition. But he could hardly say that; and he would explain why. It was because the proposal he had to offer was that they should have a change of Secretary. This was hardly a matter for pleasure, when he thought of the Secretary they were leaving. When, however, he came to the Secretary they were to adopt, then the pleasure began. He was sorry he had to propose a successor to Mr. Browne; but the Committee did all they could to again press Mr. Browne into the post, but he was adamant against all persuasion. Last year he said he would take the office for another twelve months; and he would not continue it after for another year. They were all very sorry Mr. Browne had relinquished the position. Now he had to propose that Mr. James Paterson, of Redhill, should be appointed Hon. Secretary and Treasurer for the coming year, and, he hoped, for long after that. He was sure they could not possibly have a better man for the position. He had already done what no man had done before—he had been both President of the Association and Organizing Secretary of their Commercial Section at one and the same time. He was the sort of man who seemed the more that was put on his back, the better he was able to bear it.

Mr. J. TYSOE (East Greenwich), in seconding, said he was sure all the members would join in the regret Mr. Price had expressed at the relinquishing by Mr. Browne of the position of Honorary Secretary and Treasurer. He had held the office with great credit to himself, and with the best results to the Association. But from what he (Mr. Tysoe) knew of Mr. Paterson, he would fulfil the duties appertaining to the position in a manner equal to those gentlemen who had gone before him. He had had excellent predecessors in the office; and he (the speaker) was sure they would find in Mr. Paterson an Honorary Secretary and Treasurer second to none.

The motion was heartily carried.

The PRESIDENT, in acknowledgment, said he would do his best in his new position to serve the Association. He thought the members would realize, as he was sure Mr. Browne did realize, that the Honorary Secretary and Treasurer of the Association was a sort of permanent official head, who helped, with arduous work, Presidents, Committees, and the whole body of members through the passing years. He was speaking from what he knew the Secretary had had to do in the past year. He thanked the members for the honour conferred by the election, and hoped that he should in no way fall from the high standards of efficiency and competence that Mr. Browne had set up.

OTHER OFFICIAL ELECTIONS.

The PRESIDENT mentioned there were three members of the Committee to elect on this occasion—Mr. Broadberry having consented to take office for one year, through the vacancy caused by the retirement of Mr. Riley, of Swindon. There was to be an

amendment of a rule which would make formal provision for such vacancies occurring in future.

Mr. R. BEYNON (Torquay) proposed that Messrs. A. E. Broadberry, A. F. Browne, and J. W. Helps be elected new members of the Committee.

Mr. B. R. GREEN (Mitcham) seconded the motion; and it was unanimously carried.

On the proposition of the PRESIDENT, seconded by Mr. A. F. BROWNE, Mr. J. L. Chapman and Mr. A. Dougall were reappointed Auditors.

NEW MEMBERS.

Moved by Mr. C. F. BOTLEY (Hastings) and seconded by Dr. H. G. COLMAN (London), the following gentlemen were added to the roll of membership: Mr. W. H. Bennett, of Dartford; Mr. P. C. Cleasby, of Guildford, and Mr. W. Doig Gibb, Chief Engineer of the South Metropolitan Gas Company.

The PRESIDENT gave a hearty welcome to Mr. Doig Gibb, and congratulated the whole Association on having enrolled him as a member.

RULE ALTERATIONS.

Mr. H. C. HEAD (Winchester) moved to add to Rule 4 the words: "The Chairman of the Commercial Section shall be *ex-officio* a member of the Committee." He remarked that, under the constitution of the Commercial Sections, everything they did was to be brought up for the approval of the Committee of the Association. They could do anything they liked so long as they did not fall out with the Committee, and then they got into trouble. Under the circumstances, he did feel that it was of the utmost importance that the Commercial Sections should have a defender present when they were going to be "sat upon" by the Committee. That was the reason why the Committee, in their fairness, did not think that even a Commercial Section should be condemned unjudged; and so it was suggested to the members that the Chairman of the Commercial Section should be *ex-officio* a member of the Committee. He had additional pleasure in proposing this, because, at the last meeting of the Commercial Section, Mr. Price was elected Chairman. He was quite sure the members would agree with the section that in electing Mr. Price they had done the best thing they could both for the section and for the Association in general. The section, too, could not have a better man to represent them on the Committee, the members of which would have the utmost confidence in listening to Mr. Price in any matter he brought forward, and would give careful consideration to his statements.

Mr. H. W. WOODALL (Bournemouth), in seconding, remarked that they could not have a better representative than Mr. Price; and he therefore hoped the Association would approve of his election.

The PRESIDENT said the Committee as a body felt that it was a serious thing proposing alterations in the rules; and they had some reluctance in doing so. But this was merely an alteration called for by the new organization which had sprung up in their midst.

The motion was unanimously carried.

The PRESIDENT remarked that Rule 5 provided that two members of the Committee should retire annually in rotation, and be ineligible for election during the following year. A position of affairs, however, cropped up in connection with the Committee, owing to retirement, or to loss from any other cause, of gentlemen who had been elected to serve on the Committee; and this required rectifying. Although the Committee had, according to ordinary procedure, elected a gentleman to serve the remaining period of time on the Committee, they thought it well to have the power formally agreed to, and adopted by the members at their general meeting. He therefore begged to propose the addition to Rule 5 of the words:

"In the event of an elected Member of Committee prematurely vacating his seat, the Committee may appoint a successor for the unexpired term of office."

Mr. S. CARPENTER (Dorking) seconded; and the motion was unanimously carried.

PAPERS AND DISCUSSIONS.

The papers read were taken in the following order:—

"Some Notes and Experiences on Gas Lighting," by Mr. H. N. CLARK (see p. 395).

"Capital—an Aftermath," by Mr. D. T. LIVESY (see p. 398).

"High Temperature Carbonization—Its Difficulties and their Cure," by Mr. W. B. RANDALL (see p. 401).

At the close of the discussions,

Mr. ARTHUR VALON said the best thanks of the members were due to the authors; and when papers were of such excellence as those that had been brought before them that afternoon, the least they could do was to carry the vote by acclamation.

Mr. D. H. HELPS seconded the motion; and it was carried in the manner suggested by the proposer.

This concluded the business proceedings. Before the members separated, "high-tea" was served.

GAS MAKING WITH WESTMORELAND COAL IN HORIZONTAL RETORTS.

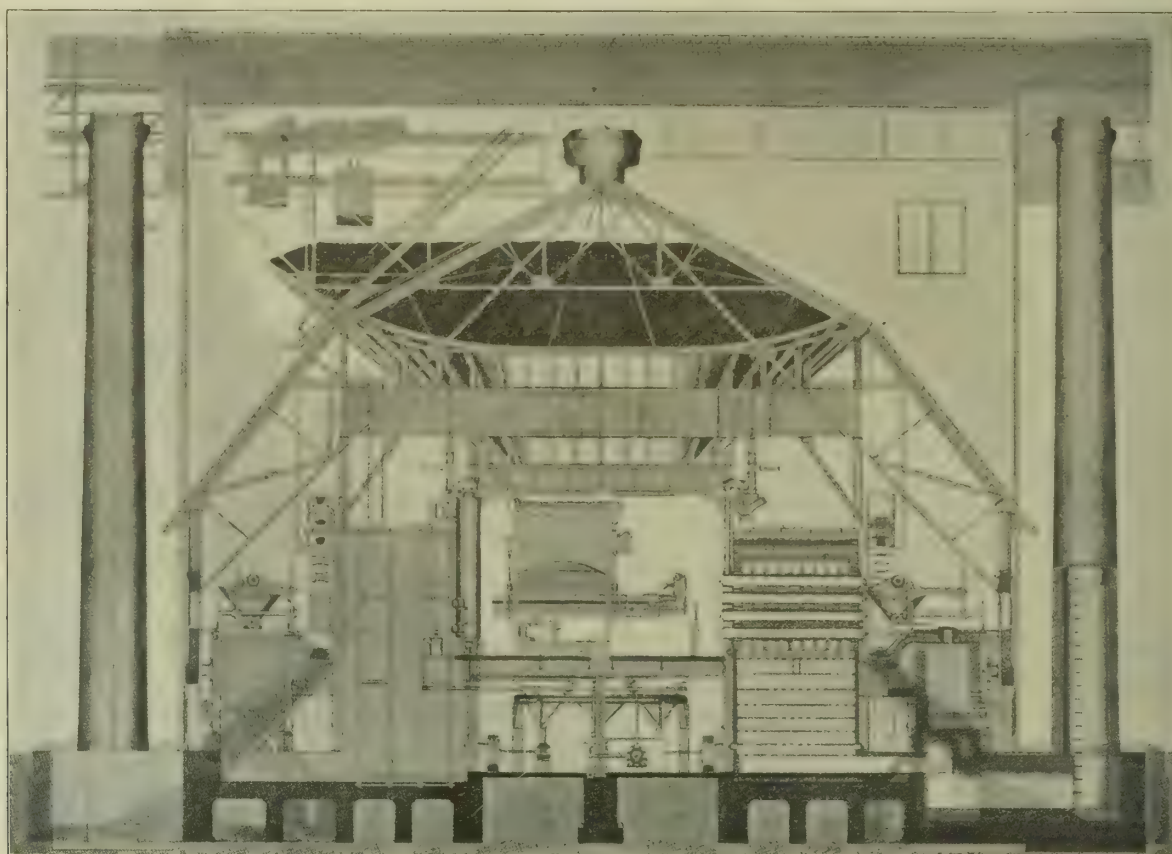
At a recent Meeting of the New York Society of Gas Lighting, a paper bearing the title of "A Pound of Coal" was read by Mr. C. DUDLEY LAMSON, the President and General Manager of the Worcester (Mass.) Gas Company. By request of the Technical Committee of the American Gas Institute, the author read the paper at the annual meeting held last month, a notice of which appears elsewhere. Mr. Lamson has sent us a print of his communication, from which we make the following extracts.

At the outset, Mr. Lamson explains that he decided to give his paper the title it bears rather than "A Description of a Retort-House," though it is in reality an account of his new house and its equipment, accompanied by some of the results obtained in practical working—results which, he says, increased, almost from the start, his respect for the "pound of coal," and led him to wonder and regret that gas engineers had so long been contented, in these later days, when the study of economies is so much in vogue on every hand, with 4.75 to 5 cubic feet of 14 to 14½ candle gas per pound of coal, when 5.9 to 6 cubic feet of 16 to 17 candle gas can be obtained from the same quantity. In other words, why they have been contented with 75 to 80 candle-feet, when from 95 to

100 candle-feet—possibly even more—not only may be, but are daily, obtained in the new retort-house at Worcester. He then proceeds as follows to show what can be done with a pound of coal carbonized in horizontal retorts; prefacing his results with a few particulars as to the plant employed in obtaining them.

In the purchase of coal, it is generally required that it shall yield 4.9 to 5 cubic feet of at least 15-candle gas per pound; and while plenty of coal men would claim this, or even more, for their product, we all know that coal which would produce these results, or even a candle less, in continuous working has been very hard to find. In the Worcester Gas-Works, for the past eight or ten years, we have had good retort-stacks with half-depth furnaces, and clay retorts 16 in. by 26 in., and 10 feet long. The results from these stacks, when in good order, have averaged 4.9 to 5 cubic feet of 14 to 14½ candle gas to the pound. There were times when the results were a little better, and times when they were not so good. The coke has been good, and the tar fairly good. I think I am justified in saying that this has been considered generally a fairly good average result. It is in consideration of these facts that I am led to write this statement of the results we have obtained during the past three years in our new retort-house. In the old one, the pound of coal gave (say) 4.95 cubic feet of 14-candle gas—practically 70 candle-feet; in the new one, it gives 5.95 cubic feet of 17-candle gas—practically 101 candle-feet.

As we have used Westmoreland coal almost exclusively in our works, I decided to use this coal in all my experiments. It has



The "Standard Retort-House" at Worcester, Mass.

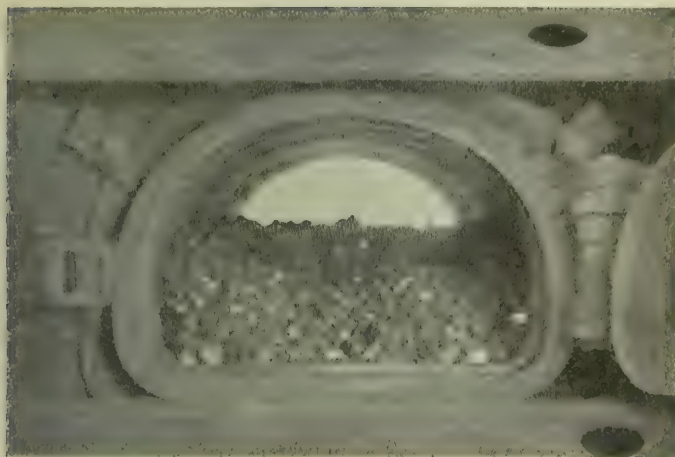
seemed to me best to employ only one standard coal of well-known value, and thus avoid any comparison of coals mined by various companies. During the past few years, I have been able to receive my coal "all rail." It is never disturbed after it is put into cars at the mines until it is lifted from the cars in our store-house by a large grab bucket. The bucket, in depositing its coal, is lowered to the top of the pile, and the coal is allowed to slip out. It is never dropped, and therefore it is laid down in the coal-store in as nearly as possible the same condition as when put into the cars at the mines. It is not again disturbed until it is placed into the crusher on its way to the coal-bunker in the retort-house. I believe in keeping gas coal dry and in as large lumps as possible until the time of using.

More than three years ago, I began to consider building new coal-gas plant. I visited many of the larger and newer works in America, and spent some time abroad in looking into the better and more modern forms of retort-houses in use. I made a very careful study of the various forms of horizontal retorts and settings, charged by hand and by machinery; also of a great variety of inclined-retort installations and vertical retort plants, both in England and Germany.

I have always been somewhat prejudiced in favour of horizontal retorts; and my investigations have not altered my preference for them. The new retort-house of the Lowell Gas Company, in Massachusetts, seemed to me to have some excellent features; and I decided early that the general plan of retorts and methods

of charging in use there should be adopted in my own retort-house. The Lowell house was built by the Riter-Conley Manufacturing Company of Pittsburg, Pennsylvania. They had done a good deal of work for us, and it had all proved satisfactory. I therefore asked them to make me a proposition for a retort-house for our works. It was agreed that the general design of the stack used in the Lowell house should be adopted, but that the retorts should be 15 feet long, instead of 13 feet. It was proposed to use in this stack a new fire material—"Ricon"—which will be spoken of later. It was agreed that the house should be ready to make gas on Oct. 1, 1908; and this was done.

The general form of the retort-house is novel, and has worked out exceedingly well in practice. The house is designed for two retort-stacks of ten benches each—one stack on each side of the house; but only one stack is built at the present time. The ground on which the house is erected being somewhat uncertain, piles were driven for the whole structure. Upon these piles there is a very heavy concrete foundation. The house is built of structural steel. Along each side of the lower storey are placed the large pressed steel doors, two in front of each pair of producers. The main columns of the steel frame are encased in concrete; thus forming pillars between each set of two doors. The second storey of the house is of brick, built into the ironwork. Above this the structure is concrete and expanded metal on the iron frame. The roof is covered with tiles. The building is exceedingly well lighted. There are large windows of glass tile in the



The Coal as Charged into the Retort.



The Coke before Discharging.

roof. A line of windows 5 feet high extends entirely round the house. A series of large low doors on the working floor level, and a set of large ventilators in the roof, tend to give most excellent ventilation in the house.

There is a large coal-bunker, with a capacity of 600 tons, in the roof space. It is filled from the coal-store by means of a man trolley and a large grab bucket, which passes over a covered bridge from the store. The coal is carefully broken to small size, the largest lumps not larger than $1\frac{1}{4}$ -inch cube.

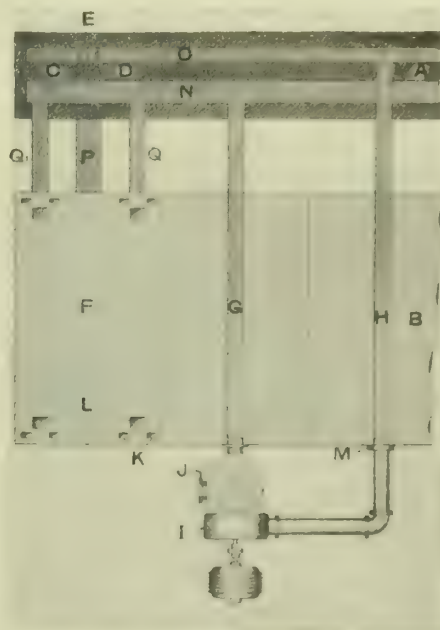
The stack of retorts consists of ten benches of eight retorts each. The retorts, as arranged, are 15 feet long, open both ends, \square shaped, 16 in. by 26 in. They are block or sectional retorts of "Ricon" material. There are duplicate charging-machines, fitted with two parallel scoops of peculiar design. Each machine has a coal-pocket of 20,000 lbs. capacity. From this pocket the coal is drawn into the scoops for a charge of 900 lbs. to 950 lbs., as desired. The machines are worked entirely by electric automatic machinery. As the scoops, loaded with coal, are pushed into the retort, the coke of the former charge is pushed out. The scoops turn over and are withdrawn, leaving the charge very evenly distributed over the floor of the retort, and also leaving it quite full. When the coal is heated, the space for the passage of gas above the coal is quite small. [See photograph showing the hot coke in the retort when the charge is only half pushed out.] The time taken to charge and discharge a retort is very small. When the coke is pushed from the retort, it drops on to the conveyor, and is carried out of the house.

Since my early connection with the gas business, I have always wanted to try some form of producer operated somewhat after the Siemens plan—that is, having the producer detached and apart from the retort-stack, making gas and sending it forward into the benches to unite with air in combustion under the settings. The plans for the retort-stacks in this house embodied this principle; and I was very glad to adopt it. There are two producers for each bench. They have large grate area; and a depth of 7 ft. 3 in. of fuel. They are located at the back of the stack, and 7 feet away from it. The fuel is coke; but any other form of cheap fuel may be used. They are furnished with rocking grates, kept in slow motion by an electric motor. Some of the gases from the main flue of the retort-stack are returned underneath the grate-bars of the producers. We have been running these benches steadily for a period of eleven months, and, so far, the producers have never been opened to clinker them. Most of the waste from these fires is in the form of a fine brownish-yellow dust. A very small amount of partially burnt coke drops through the moving grates; and it is screened out and returned as fuel. Once in 24 hours the doors underneath the grate-bars are opened,

and the fine dust is removed with a hoe. The gases from these producers are carried through proper ducts into the retort-bench underneath the retorts, there uniting with the regulated amount of heated secondary air.

In recent years, to obtain large capacity with any one of the new forms of retort-stacks, it has been considered necessary to have fairly large retorts, carrying large charges of coal. To work off the gas from these charges, it has been necessary to employ high heats. Some furnaces have been constructed which would produce the necessary heat; but it has been more or less difficult to control it in such a manner as would ensure an even distribution throughout the whole setting and about the retorts. Further it has been exceedingly difficult to obtain fire-brick material that, would stand the extremely high heats for any length of service. The contractors, in their plans for our house, proposed to use the new fire material already mentioned—"Ricon." They at first proposed that they must not carry a heat of over 2500° Fahr.; but later they notified me that I might, if I cared to do so, carry the heat several hundred degrees higher than this without fear of damaging the settings.

Having arranged for a liberal supply of the best gas coal, delivered into our store in the best possible condition, and having established a thoroughly equipped retort-house with the best possible apparatus for working it, I think we may feel that we are well fitted for the problem we have before us—that of obtaining the best results from the carbonization of our pound of coal. The figures which I shall give are for a period of eleven months' practical working. It has really been a long series of very interesting experiments. It has also been a period of hard work for everybody; and I therefore wish in this paper to give everyone his due meed of praise.



A—Furnace stack. B—Retort stack. C & D—Twin producers. E—Dampers from return flue to producers. F—Bench of eight retorts. G—Flue from main flue to blower. H—Flue from blower to return flue. I—Blower. J—Primary air inlet. [On inlet to blower.] K—Secondary air inlets. L—Stack dampers. M—Pressure regulating damper. N—Main flue to chimney. O—Return flue. P—Oxide flue. Q & Q1—Flues from bench to main flue.

Diagram of Retort Bench, Producers, Flues, &c.

Most of the time we have been running seven benches of eights, or 56 retorts. The yield per pound is from 5.9 to 6 cubic feet of gas of 17-candle power, or upwards of 100 candle-feet. The coke from this stack is unusual. It is clean, clear, and hard—more like "oven coke" than any I have ever seen. We make practically no fine coke, for several reasons. First, the coke is very strong, hard, and dense; and then the coke-conveyor is of such a design that it makes practically no breeze. Our method of quenching and drying also helps to this end. In the working of our former retort-houses we made a large quantity of breeze. In practice, we used this as fuel underneath our steam-boilers, and still much was left over; so that when we started our new retort-house we had a large amount of breeze stacked in our yards. After the new house was started, this soon disappeared, and we were obliged to purchase a regular supply of slack coal for our boilers. The tar from the stack, as it has been running for the past six or eight months, with seven-hour charges, has been very satisfactory. It is clear and limpid, and easily cared-for in all our hydraulic mains, pipes overhead and underground, drips, &c. The make of tar per ton of coal carbonized is practically between 13 and 14 gallons.

The Riter-Conley Company, in their contract for the retort-house, agreed to run the stacks during the first two months. They proposed to charge the retorts with 800 lbs. of coal every five hours, at a yield of 5 cubic feet of gas per pound; producing

20,000 cubic feet per retort, or 160,000 feet to the bench, in 24 hours. They very soon not only reached this capacity, but far exceeded it. The producers seemed capable of generating with ease any amount of heat that was required; and the recuperation was perfect. Feeling confident in the durability of their "Ricon" material, they looked forward to reaching very much higher results. They produced at one time as high as 187,000 cubic feet of gas per bench, and hoped to be able to reach 200,000 cubic feet in 24 hours. But there were attendant troubles. Everything in the coal was turned into gas. There were no oils or thin tar in the gas to lubricate it on its way through the apparatus on the works. The stand-pipes, hydraulic mains, gas-mains, and drips gave much trouble. We were running, I think, with a temperature in the settings of 2850° Fahr. There was no longer any question of the stack as a gas-producer; but, to me, less gas and a quieter method of running was more agreeable.

When we took possession of the stack, we tried many experiments with different methods of running, and finally settled down to seven-hour charges, with from 900 lbs. to 950 lbs of coal per retort. This, of course, reduced the yield per bench; but we were compensated for this loss by other advantages. My "pound of coal" was induced to give up very nearly the full value of the stock of gas contained in it, and that gas was of very excellent quality. The tar behaves itself in a satisfactory manner, and flows through the pipes and apparatus as it should do. The ammonia results are very much improved, and we hope eventually to get a large yield. The average heat in the settings at the present time is 2450° Fahr. The average heat inside the retorts is 2000° Fahr. The evenness of the heat throughout the settings is remarkable. It must be seen to be fully appreciated.

I have given a description of the house, and a statement as to its practical working for a period of eleven months, during which time we tried many tests of every kind. This work has been done by our own chemists, as well as by experts from Boston and New York. We have tried to prove our figures before making any statements. The paper is not to be considered as a final statement. We have carried out many experiments, and are constantly developing new results. We will, therefore, call the paper a "Report of Progress." I feel that I have demonstrated what I set out to do—i.e., proved that there is much more value in the "pound of coal" than any of us have given it credit for. I hope others will continue on these same lines of work and add to the results.

Summary.—The stack is capable of producing a very large amount of gas. In five-hour charging we have reached as high as 187,000 cubic feet per bench in 24 hours; and at our present rate of charging (seven hours) we make 150,000 cubic feet. The coke is extremely good; and there is practically no breeze. The tar is excellent—clear and limpid. The yield of gas per pound of coal is from 5.9 to 6 cubic feet; and 5.95 cubic feet multiplied by 2240 lbs. gives 13,328 cubic feet per ton of coal. The illuminating power is 17 candles. This is an average obtained from an innumerable number of tests made by different people. The burner used is a Sugg old "D" argand, burning 5 cubic feet of gas per hour. The test of the gas by the "Metropolitan" No. 2 argand gave an average of 18.57 candles. Corrections were made for all the figures in the paper for temperature (60° Fahr.) and pressure (30 inches barometer). Candle-feet, $5.95 \times 17 = 101.15$. Specific gravity, .440. Calorific value, 627 B.Th.U. At this year's meeting of the Institution of Gas Engineers, I saw it reported that the gas made in the Woodall-Duckham plant, also that made in the Young and Glover system, is tested by the "Metropolitan" No. 2 burner. I think that this is as it should be. The gas should properly be tested by the burner best adapted to it, though the Gas Commission seem to think the gas should be tested with a Sugg argand burner, consuming 5 cubic feet of gas per hour. If we use the "Metropolitan" burner in our experiments, as stated above, expert tests show 18.57 candles. This, with a make of 5.95 cubic feet per pound of coal, would give 110.49 candle-feet. The coke used in the producers is 15.3 lbs. to 15.4 lbs. per 100 lbs. of coal carbonized. The labour required to operate the house is very small indeed; and the ease with which the house is worked is in every way remarkable.

The following analyses of the gas were made by Mr. C. W. Hinman, a former State Inspector of Massachusetts:—

	Per Cent.	Per Cent.
Illuminants	5.59	4.85
Marsh gas	36.12	33.36
Hydrogen	49.23	51.14
Carbonic oxide	6.31	7.39
Nitrogen	1.52	1.95
Carbonic acid	1.23	1.01

Formula of hydrocarbon equivalent to illuminants:
C 2.56, H 5.32; C 2.75, H 5.04.

[The author added results of tests of coal, coke, and tar, carried out in the laboratory of the Worcester Gas Company.]

The large yield of gas per pound of coal is due to perfectly legitimate methods of carbonization. First of all, the gas is in the coal. It has been the experience of all gas engineers that if the coal is left in the retort long enough, the yield could be obtained. The charges are left in seven hours, exposed to a heat that will not injure the candle power. The heats are uniform throughout each square foot of retort floor. The charges of coal are very uniform and evenly laid. The retort material has more than 20 per cent. more conductivity than ordinary clay material. We are thus able to get necessary heat into the retort without

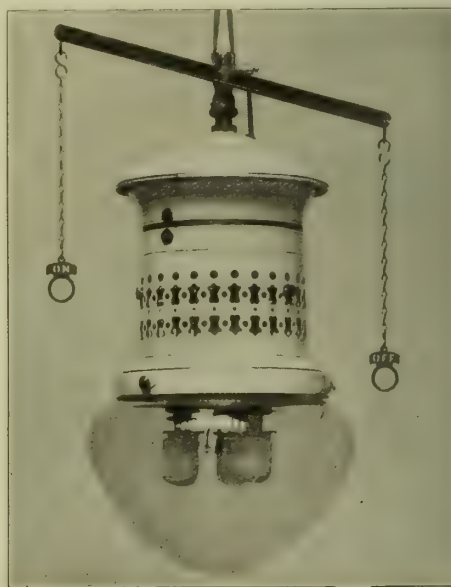
having an excessive temperature on the outside, in the setting, and in the combustion chamber. The retorts show a difference in temperature between the inside and outside of 200° to 250° Fahr., depending upon the amount of carbon in the retort. These desirable conditions are obtained, and uniformly maintained, by having large grate area, large producer capacity, and a uniform condition of fuel bed.

The high candle power of the gas may be explained as follows: The large charges of coal leave a minimum amount of retort surface to act upon the gas as it is generated, yet enough heat is given to the gas to make the hydrocarbons permanent gases. Not only is the relative amount of retort surface decreased by the small space above the coal, but the rate of flow is faster, and consequently the time that the gas is exposed to the heated surface of the retort is shorter—all of which tends to decrease the dissociation of the hydrocarbons. This is further controlled by the comparatively low heats we are able to maintain, and yet carbonize the coal in seven hours, due to the "Ricon" fire material. The foregoing are positive reasons. We see by the analysis that the nitrogen is very low, and that carbonic acid and carbonic oxide are no more than come from the distillation. These results are accomplished by keeping as low a pressure in the retort as possible, and yet having the pressure at all times slightly more than that in the setting—4.10ths in the retort and 1.10th in the setting is what we maintain. The dissociation of the hydrocarbons is further prevented by the fact that the heats are uniform throughout the entire retort surface. Each retort is evenly heated its entire length; and there are no points or spots of high intensity.

The rest of the paper is devoted to the subject of making producer gas for the heating of retorts.

THE "FARRINGTON" INDOOR LAMP.

Though in connection with gas-lighting appliances cheapness is not the only—or, indeed, the most important—point to take into consideration, a lamp which is so simple in construction that it can be produced at an extremely moderate cost, and at the same time secure good duty for the gas consumed, is certain to enjoy a due share of popularity. Of such a character is the "Farrington" lamp for indoor lighting, which Messrs. J. & W. B. Smith, of Farrington Road, are placing upon the market.



The "Farrington" Indoor Lamp.

An absence of complicated parts is the keynote in the construction of this lamp—which, in fact, is so simple that there is hardly anything to be said about it that is not clearly shown in the illustration. It is made for either two or three lights, and will take any inverted mantle. The gas consumption is about 4 cubic feet per burner per hour; and the approximate lighting power per burner is stated to be in the neighbourhood of 125 candles. It will be noticed that the burners are not provided with glass cylinders; there being a metal cone fitted over the top of them. There are in conjunction with the burners easily get-at-able gas-adjusters and air regulators; and the lighting and extinguishing are accomplished by means of a bye-pass lever cock. The lamp (the length of which is 24 inches over all) is very neat in appearance, having a white enamelled steel case, relieved with gold lines.

The Lead Wool Company, Limited, of Snodland, Kent, send one of their mounted charts, illustrating two methods of jointing pipes with lead wool, and giving the weights of pipes, dimensions of sockets, and particulars of lead wool joints, with weights of lead wool and yarn sufficient for pressures up to 500 lbs. per square inch. The diameters of the pipes range from 2 inches up to 48 inches.

SOUTHERN ASSOCIATION PAPERS.

NOTES AND EXPERIENCES RELATING TO GAS LIGHTING.

By HERBERT N. CLARK, of West Ham.

During recent years, the gas industry has experienced remarkable advancement in the supply of gas for other than lighting purposes—the general application of gas for the heating of water, its increasing popularity for cooking, and perhaps more especially the great strides it has made for warming, owing largely to the more scientific construction and greater efficiency of the gas-fire. But we find that, with all this and other uses, the lion's share of our commodity, in spite of all modern competition, is still used for illumination.

This question of gas lighting has, since the invention of illuminating gas by Murdoch, naturally received much attention by the gas engineer, and many papers have been read by men whose names have been honoured ones in the world of gas. It is, therefore, difficult to say much that has not already been said, or to do justice to so important a subject; but, on the invitation of our President, I venture to give a few notes and experiences relating to gas lighting, which I trust may prove interesting to the members.

The subject being so large, I purposely propose not to touch upon public lighting, as most of us are cognizant of the great strides and improvements that have been made in street lighting by the inverted burner on the low or high pressure systems—one of the latest achievements being the lighting of the extension of Blackfriars Bridge; and given a fair field and no favour, gas is well able to hold its own against all comers for the lighting of our public places and streets.

Shop lighting, both interior and exterior, should be secured by the gas engineer. The exterior, in my opinion, is perhaps the more important of the two, both from the company's and the consumers' point of view. We at West Ham, who have had to face keen electrical competition, have, like many other gas undertakings, supplied for years gas-lamps for shop-lighting on the hire-purchase system, and have some thousands in use at the present time based upon terms similar to the following:

Hire-Purchase.

One three-light "Eclipse" lamp, cost to Company	£1 17 0
30 per cent. added, Company's profit	11 1
	£2 8 1
25 per cent. payable in advance by consumer	12 1
6 Quarterly payments at 6s. per quarter	1 16 0
	£2 8 1

Fixing fees, as per estimate, payable in advance.

Owing, however, to the ever-increasing competition that has to be met with from the different Corporations' electrical undertakings, we thought it advisable, about two years ago, to put out gas-lamps on hire, so as to be in a position to compete with the Corporation scheme for supplying flame arc lamps on the clock system—that is to say, for the sum of £2 1s. per quarter, the Corporation supply and fix a flame arc lamp of 3000-candle power (so called), including the current and maintenance for 800 hours. If the lamp in burning exceeds the 800 hours, a charge of 2½d. is made for every additional hour. Our experience is that 1000 hours is a better average time for shop lighting. In addition to this scheme, the West Ham Electricity Department have the following:

Conditions under which the Corporation will Supply upon the Hire System, Wiring, Incandescent Lamps, &c.

The Corporation supply, fix, and maintain wiring, clean and renew lamps, and supply current for 1000 burning hours per lamp per annum, 30-candle power Osram lamps, 3s. 10d. per quarter per lamp.
 50-candle " " " 4s. 9d. " " "
 100-candle " " " 8s. 6d. " " "

The hours of use per annum are measured by an hour meter calibrated for 50-candle power lamps. Thus the registered hours differ from the burning hours as follows:—

1000 hours' use of one 30-candle power lamp— 600 hours recorded by meter and payable by consumer.
 1000 " " " " 50 " " " —1000 hours recorded by meter and payable by consumer.
 1000 " " " " 100 " " " —2000 hours recorded by meter and payable by consumer.

For every hour registered on the meter in excess of—

600 for each 30-candle power lamp per annum
 1000 " " 50 " " " "
 2000 " " 100 " " " "

a charge of 1d. is made for every five hours or fraction thereof.

It is most essential that the gas-lamps to be put out on hire must be well constructed and able to last at least four years without wanting any radical repair. Two, three, or four burner lamps, either upright or inverted, made by Messrs. Sugg, Edgar, and Colbran, we find answer most admirably. The following are the terms and conditions we employ.

Lamps on Hire at 6s., Average Rate, per Quarter.

Rates of hiring include repairs during term of hire, replacement of globes, maintenance of mantles, and cleaning globes.

Average cost of lamp to Company	£2 2 6
Rent for four years, at 6s. per quarter	£4 16 0
Less 3s. per quarter for four years for maintenance, cleaning, and repairs, including replacement of globes	2 2 0
	£2 8 0
	2 2 6
or 13 per cent. profit to Company	0 5 6

Fixing fee as per estimate, payable in advance.

The gas is, of course, paid for by meter. An agreement to keep the lamp for 18 months is entered into by the consumer. It must be understood that in every case of hire the charge per quarter includes maintenance. This is most important, as the lamp, being the property of the Company, is always under the supervision of its servants; and lamps and burners being always kept in a highly efficient state insures satisfaction to the consumer. The figure of 3s. per quarter, or 12s. per annum, we find a fairly generous allowance for maintenance. The majority of the lamps out on hire being three-burner ones, the average cost of the globes to us is 4s. 1d. each; and the number of breakages per lamp during the last twelve months amounted to 0.43 globe per lamp. This means that out of every 12s. for maintenance 1s. 9d. is spent on the replacement of globes; leaving 10s. 3d. for the maintenance of the burners, globe cleaning, &c. We find, after an experience of two years, that the lamps have been in use for this period are in a very good state of preservation, and to all appearances will last another two years or more; while the lamps that come back to us at the expiration of the 18 months' agreement, or through other causes (which has only amounted to 80 in all), have in every case been renovated at a small cost and been sent out again.

This scheme has certainly worked satisfactorily and enabled us not only to retain, but in very many instances to reclaim and convert back to gas again consumers of electricity. We have already over 1200 lamps out on hire, and are supplying them at the rate of over 20 per week at the present time. Hire schemes are not as a rule looked upon by the gas engineer with much favour. To my mind, however, there is no doubt that, when shop lighting has to be pushed and competition is keen, lamps on the hire system will be found an acquisition; and I think that the above scheme is quite as financially sound as, if not more so than, most of the present hire schemes for gas cookers, fires, &c.

A comparatively new field for gas lighting is the illuminated gas sign, which is a matter of considerable importance in these days of advertisement, owing to the rapidly growing need among the business community of our consumers for some means of advertising by night. Electricity has up to the present had the larger share of this class of consumer; but there is no reason whatever that just as effective designs should not be adapted for gas as well as for electricity. We have not done much up to the present in the way of supplying flashing signs, but have some very effective ones working at our show-rooms, made to our own designs by Mr. William Edgar. One of them is 16 feet long by 2 ft. 6 in. high, made of thin sheet iron; while the front of the sign consists of fifty spaces or frames, the size of each being 12 in. by 6 in., into which fit glass letters of the same size. The letters are white on a black background, or black on a white background, and can be placed in any order; so that it is a simple matter to change the inscription on the sign when required in a few minutes with such sentences as "Cookers on Hire from 1s. 6d. per Quarter," or "Everyone's Friend, the Gas-Cooker," and so on. The mechanism is a simple clockwork contrivance with an easy adjustment for regulating and altering the period of the flash. These signs have attracted much attention in their respective neighbourhoods, and have produced many inquiries.

Perhaps in the matter of lighting, high-pressure gas is at present more particularly engaging our attention; and some very remarkable results are obtained by securing more complete combustion of gas. Many gas undertakings have been busily pushing various forms of plants and lamps for high-pressure lighting, and justifiably so, considering the much greater candle power obtained per foot of gas consumed.

All high-pressure gas plants, unfortunately, necessitate some means of motive power—either water-motors, hot-air engines, gas-engines, or electric motors. We have not had much experience of water-motors in our district, owing to the irregularity of the water pressure; but I have it on good authority that the cost of running a 500 cubic feet per hour plant, pumping gas at 12 inches to 16 inches water pressure in London, is about £4 10s. per annum, plus about 10s. meter rent. Hot-air engines are, undoubtedly, the simplest and most reliable means of creating small powers—in fact, we have many of these driving both Sugg and Keith lamps at pressures of 12 inches to 16 inches, which have been working without stoppage or breakdown of any kind from three to four years, and giving complete satisfaction to the consumer.

Gas-engines are considerably more economical as regards fuel, for the same power developed, than the hot-air engine, and, of course, when the pressures are required for anything approaching 4 inches of mercury, hot-air engines would be useless. With the gas-engine naturally, being a little more complicated, special supervision should be given by the maintenance fitter at regular intervals to attend to the lubrication and inspect and clean the inlet

air adjustments, owing principally to it being more sensitive to the varying conditions of pressures. These faults can, as we know, be easily overcome by suitable governing and adjusting carried out by skilled workmen. But it is to the inverted burner and its future improvements that we must look if we are still to keep the premier position in the world of illumination, and to do this, the responsibility not only of retaining our lighting consumers, but of achieving a still greater advancement in the field of gas lighting, rests on the maintenance department. Does it not come to the question of whether the maintenance should be done at a less charge (inclusive charge) to the consumer than is made at present? In either case, the deficit could be charged to "advertisements" in the Company's account, which, to some fractional extent, would keep up the price of gas. It is not the general wish in the gas industry to undersell the ironmonger and small tradesman; but a scheme similar to that which is in force in some of the London Companies, of co-operating with the ironmongers and making them their agents, with a fair commission, would no doubt compensate them for any loss they might sustain through the increased activity of the maintenance department, resulting in the mutual benefits to all concerned.

The science of gas lighting is still in its infancy; for it is quite within the range of probability that before long the same efficiency that is now obtained by gas when under a pressure of 54 inches will be obtainable under similar conditions at the burner-head by low-pressure gas. Even when this is achieved, the fight for supremacy will still be waging, to the ultimate benefit of all consumers of light.

Discussion.

The PRESIDENT (Mr. James Paterson) heartily congratulated Mr. Clark upon the very interesting and instructive paper on the subject he had chosen. The paper bristled with points that might be taken up by the members—such as the question of maintenance, not only with regard to lamps, but the general maintenance of consumers' burners and fittings. The more progressive companies were going in for what was known as "free maintenance"—at any rate, for the supply of the labour for the purpose, charging only for the material used. There were some who thought they would have to come to the point, in competing with electricity, of supplying everything, including gas and the maintenance of burners, at an inclusive price.

Mr. JAMES W. HELPS (Croydon) said he must congratulate Mr. Clark on the skill he had shown in getting together the necessary particulars for making this very excellent communication to the Association. He felt sure Mr. Clark had thoroughly appreciated, as all present had done, the importance of paying strict attention to the distribution department. This importance was growing every day. There were one or two statements that Mr. Clark had made to which he (Mr. Helps) would like to draw attention. He mentioned the importance of showing what gas could do in connection with shop lighting and their advertising signs. Those who attended the Business Exhibition at Olympia would have recognized on one of the stands there that gas was capable of doing just as much as electricity could do in that department. Not only were the signs at the exhibition quite as effective and striking as those worked by electricity, but they were just as artistic, and not quite so harmful to the eye. If anyone wished to have further particulars as to these signs, he would be glad to furnish them. Then Mr. Clark dealt with the comparative cost of supplying certain factories with gas lighting as against electricity. It so happened that in Croydon lately they had been called upon to give competitive estimates for lighting up two factories; and notwithstanding that in one of these instances they had to compete with the statement that electricity could be produced on the premises at 1d. per unit, they showed that with gas they could give a light, of some 9000 candles, for 5d. per hour, as against a cost of 11d. with Osram lamps. The figures in regard to cost bore out the statement made by Mr. Clark where he said a total illuminating power of something like 45,000 candles was obtained for 2s. an hour; the comparative cost being about two to one in favour of gas. He supposed Mr. Clark was taking electricity at 3d.; while in the Croydon case to which he (Mr. Helps) referred, they were taking it at 1d. The difference was due to the fact that Mr. Clark was dealing partly with arc lamps; while they at Croydon were dealing entirely with Osram lamps in the interior of the building. One most important point Mr. Clark referred to was the system of maintenance. Croydon had been mentioned on more than one occasion in connection with this matter; and the inference would naturally be that they were the leaders in the alteration that was being made in this respect. He wanted to disclaim this. There were many other companies who had adopted the system of giving maintenance labour free; and only charging for the material at a profit or at cost price. The matter was discussed recently, when he gathered that several companies—Tottenham, for instance—had adopted the principle, and they had found it a great improvement. He went back and reported upon the matter to his Directors. The result was the change from making an inclusive charge to that of giving the labour free, and charging only for material at a fair profit. Within a month of the change, the number of consumers on the maintenance system (as mentioned by Mr. Clark) was doubled; so that it would be seen that the change of system was satisfactory to the consumers. As might have been expected, there were some who did not like the change. There were the proprietors of public-houses who said that they did not want to go on this

system; and, from what he had seen, they were right in their claim. But, in a matter of this sort, they could not make flesh of one and fowl of another. Regarding the matter of trying to do something so as not to fall foul of the ironmongers trading in a town, they were at Croydon in the forefront in making arrangements with the ironmongers; and though the scheme was not entirely satisfactory, still he thought it was a system that was well worth attention. At Croydon, they gave several facilities to the ironmongers of the town; and in return the Company felt they were at perfect liberty to treat their business as if they were ordinary traders. He should not like to tell the members the amount of work they did in their show-rooms in dealing in fittings; but the Company would not sell anything under a profit of 30 or 33 per cent. They felt that, in making this stipulation, they were not unduly competing with tradesmen. He was afraid, however, it must be acknowledged in these very progressive days that the ironmongers did not always get the sort of men who were capable of giving satisfaction to the consumers. They did not keep up to date with the various kinds of burners, stoves, and other things with which they had to deal. He did think it was most important for gas companies, in spite of a chance of possible friction with the ironmongers, to undertake this work themselves.

Mr. A. E. BROADBERRY (Tottenham) remarked that the importance of the maintenance system was undoubtedly growing greater and greater every day. They used to charge at Tottenham on the per burner per quarter system; but they did not find it went very well, nor that it gave a great deal of satisfaction. About four years ago, having heard from Mr. Price, of Hampton Wick, that he had adopted the free maintenance system, so far as labour was concerned, he, after careful consideration, gave it a trial at Tottenham. It had been growing in popularity ever since. They now had over 15,000 ordinary consumers; and very nearly 2000 of them were on the free maintenance system, and the number was increasing month by month. He thought this would show Mr. Clark how he could get at more of the 94 per cent. of consumers with whom he had not yet got into touch. So far as hiring lamps were concerned, it seemed rather a risky thing to let lamps out on hire. It might involve a great deal of expense; but at the price Mr. Clark was charging for the hire of lamps, he showed it could be made to pay. This was why he (Mr. Broadberry) was naturally surprised that, at this high price, the system had gained so much favour as the author told them it had done. As to high-pressure lighting, perhaps some of their experiences at Tottenham might be of interest to members. About twelve months ago, he decided in one locality—Harringay—where there was a large cluster of shops, to try a joint system for outside lighting, putting up the lamps free of cost, including brackets, fittings, and everything complete. He put in a small compressor station, and supplied light during the dark business-hours for a rent of £1 per quarter for a 600-candle power Keith lamp. The system became very popular; and during last winter about sixty shops adopted it. It had been noticed by other localities on the district; and the Company had had appeals for similar installations. In one part of Wood Green, they had put in recently a similar installation, but giving six nights of lighting instead of five as at Harringay, and charging 22s. per lamp per quarter. In the locality, it had now become so popular that they had already rather more than 123 consumers on the system. From another part of Wood Green had come a petition for a similar installation; and two or three other districts were now considering it. The Company had also put in a fine installation of the Keith light at Alexandra Palace. This was giving a great deal of satisfaction. They had a small compressor station in the Exhibition Hall, placed so that any visitors to the Exhibition could go and look through the glass partition, and see the working of the plant. This caused a great deal of interest. If any gas engineer was in the locality, it would interest him to go to the Alexandra Palace and see the neatness with which Keith's had fitted up the switch-board, for operating the various sections of the Palace independently of each other. It was far neater than any electrical switch-board could possibly be; and the Palace authorities were delighted with the result. They were saving a great deal of money as compared with the old low-pressure system of lighting, and had now extended the high-pressure system into the grounds. Mr. Clark mentioned that in one shop he had put in a stand-by plant driven by an electric motor. So far as the Tottenham Company were concerned with their high-pressure installations, he (Mr. Broadberry) set his face entirely against water or electric motors for driving the compressors. He held that the gas supply was quite sufficiently reliable to depend upon itself; while water supply was not sufficiently dependable for them to adopt; and much the same thing applied to electric motors. Suppose there were a failure of the electric supply of a district, all the establishments with electrically driven high-pressure gas plants would also be deprived of light; and this would make them, as gas engineers, look particularly foolish. In regard to switching off in case of trouble on to the electric motor, Mr. Clark mentioned that the lights would be immediately turned on again. He (Mr. Broadberry) would not speak definitely, but he rather fancied that Mr. Clark would have a certain amount of difficulty. The Keith lamp was fitted with a thermostat. In the event of a breakdown with the gas-compressor, and the lights going out, the thermostat would be hot; and if the electric motor was switched on immediately, without having the thermostat cool, the lamps would light-back. If Mr. Clark had any system of overcoming this,

he (Mr. Broadberry) would be interested in it, because of a little difficulty they had had to contend with at the Alexandra Palace. In the Central Hall they wanted to have a bioscope show, and desired to turn down the high-pressure lights; while as soon as the bioscope show finished, they wanted to turn the lights up again. It was found, however, that it took at least ten minutes for the thermostats to cool, before they could switch on again. He should be interested in learning if Mr. Clark had experienced this difficulty, and, if so, how he had overcome it.

Mr. W. J. LIBERTY (London) remarked, in regard to the duplicate plant for the high-pressure lighting being on the electric system, he should not have thought that was by any means necessary. He understood that it would not do for the shops in question to be out of lighting for a moment. In Fleet Street they had a thoroughfare that was certainly equal in importance to these shops. If the lights in Fleet Street were to fail, the whole world would hear of it. There they had no electrically driven stand-by. They had duplicate plant with four engines in all—two in each section; and it was only a question of turning a handle to get the other section into running. He did not think that in connection with high-pressure lighting they need have recourse to electricity at all.

Mr. W. E. PRICE (Hampton Wick) said, with reference to the question of so-called free maintenance, he thought perhaps some members might like to have a little more information on the method that was at work. He did not wish to take credit for the method; it had merely been passed on from one to the other. His first association with it was in conversation with his relative at Walton-on-Thames; and he was not sure it had not been adopted before that elsewhere. It was adopted by them four or five years ago; and his experience of it had been the same as that of other speakers. The method followed was to circularize the consumers, saying the Company were prepared to maintain the burners in their houses free of charge, simply charging for the material. There was no charge for labour, and no fixed charge. He found a number of consumers complained about a fixed charge, on the ground that it was the habit of gas companies to take all the burners in a house. Naturally consumers objected to a burner in a room which might be used very little—perhaps only once a week—being charged for at the same rate as burners used every day. The method he adopted was therefore to charge for material only at market rates, and not for labour. The result of this was that they found the profit on the material about half covered the cost for labour. The balance for labour, which was a loss, was put into the distribution account, and represented but an infinitesimal portion of 1d. per 1000 cubic feet of gas sold; and he did not think it would be long before they would give the maintenance free of all profit on the material used. He did not, however, fancy it would be a good plan, because he thought it would probably lead to abuse. He had found a little difficulty even under the present system, for some people objected to paying the charges for material, especially mantles; and the Company had lost a few consumers off maintenance, because they objected unless the Company provided the material. However, the Company got over this by saying they were prepared to use the consumers' own mantles; but, in that case, they should make a charge of 1½d. per mantle for doing the work. It was found in some cases the consumers were satisfied with this; but, as a rule, they soon got back to the original plan.

Mr. J. H. CORNISH (Bridgwater) said he had adopted the system of free maintenance. In 1908, he circularized the consumers, notifying them that the Company were prepared to maintain their burners free of charge, and would supply also the necessary mantles, chimney rods, &c., at nominal charges. He was surprised that in a district like West Ham such a small percentage as 5·6 of the consumers should be on maintenance. In the small country town that he represented, out of some 1330 consumers they had just about 600 on maintenance. He thought this might be a useful figure for managers of small undertakings. As to labour cost—that was, the cost of what the Company gave the consumers free—it worked out to about 2s. 6d. per consumer per year. Taking an average of ten burners in each house, this meant 3d. per burner per year, so that it did not really amount to a serious matter. The tendency of the day was free maintenance without materials, or with them at cost price.

Mr. C. F. BOTLEY (Hastings) congratulated Mr. Clark on this paper on important matters in distribution work, or arising out of distribution. He thought the point had been lost sight of that Mr. Clark was faced with the keenest electrical competition in the country. Last year he fancied the West Ham Corporation sold current at an average of 1d. per unit; and they were supposed to have made a profit of 0·7d. This was a factor to be taken into account in considering what Mr. Clark was doing at West Ham, and so successfully. With regard to the figures for flame arc lamps of so-called 3000-candle power, he took it the price was at per quarter; and, if this was so, the price worked out to 2·2d. per hour. As to the lighting of the Keith lamps, he must confirm what Mr. Broadberry had said as to there being a difficulty there; but, in his opinion, the lighting did not take anything like ten minutes. They had had an interesting experience at Hastings in connection with the lighting of one of the piers in competition with electricity. A firm had come into the town, and leased St. Leonard's Pier—Americans, who said that there was nothing like electricity for lighting. A scheme was prepared for lighting the pier throughout, using something like 4000 8-candle power lamps; and for these carbon lamps would necessarily have to be

employed. The price at which the Corporation offered current, 2½d. per unit, represented a cost of 25s. an hour. The Gas Company, however, had now got the pier lighted with gas, using high and low pressure gas-lamps, or employing gas in engines for generating electricity for decorative purposes; and the pier enjoyed a larger amount of light than the Corporation would have given. But the total amount of gas which was used per hour for every purpose was 2600 cubic feet, which, at the Gas Company's price, was something like 8s., against 25s. on the Corporation terms for electricity. The installation had been very successful from every point of view. It, of course, meant a lot of work for the distribution department; but they sold the gas for the purpose, and that was their main business. In regard to free maintenance, he believed Hastings had been given the distinction by some of their friends of having adopted it. Their scheme was this: Ever since the advent of the new Welsbach burner, it had been their practice to keep in touch with every burner fixed by them; and they had therefore a very large proportion of their consumers directly or indirectly connected with them in this way. But the maintenance had always been done on co-operative lines. He objected to a fixed charge on the principle that it was not fair to the consumer. In some cases the consumers would be careless; and in other cases the careful consumer did not reap the benefit of his care. So they had always done this work at book cost, which in a sense meant free maintenance. There was a little profit on the mantles; but they might state they did the work free in regard to labour. It certainly cost the Company a little money; but it was not a considerable amount. It was, however, well worth doing. They had also lamps out on hire, at rates varying from 12s. to about 45s. each, according to whether they were inside or outside lamps. Some of these were let out twelve years ago, and were still hired by the same consumers. They had also the hire-purchase system; but it was not very popular in the town. Local conditions had an important bearing on this subject. What would succeed in Mr. Clark's district would not necessarily succeed in another.

Mr. CLARK, replying to the discussion, thanked Mr. Helps for his kind comments on the paper. But in reference to the charge he mentioned, he should like to point out that the light was considerably increased. They were putting in 150-candle power lamps against 100-candle power metallic filament lamps, which made the ratio greatly to the advantage of gas. With regard to Mr. Broadberry, he (Mr. Clark) was interested to hear what he had had to say about maintenance at Tottenham. In reference to the electric motor and gas-engine, the reason they put in the former was the facility for easy starting. They had a very small gas-engine for the compressor which was not one of the best known makes; and at the commencement of the installation, they had a little trouble through the valves sticking and through bad lubrication. As to Mr. Liberty's criticism, in the case he mentioned he had two gas-engines which might be up to about 10 brake-horse-power, and then he had an attendant on the spot all the time. They could not afford to keep attendants constantly looking after these shops; and the people who were there did not know much about gas-engines. At present they had not succeeded in making these outside lamps light up with thermostats. If there was any trouble, they got sufficient low-pressure gas to keep the 115 inside lamps going, and to give the shop a very good illumination, for the minute or so occupied by an attendant switching on the electric motor. He had been greatly interested in Mr. Price's statement as to free maintenance. As to electrical competition, Mr. Botley was similarly placed to himself with regard to keen electrical opponents. At West Ham they had had large deficits on the electricity undertaking, and these had come on the rates. The Gas Company, being the largest ratepayers in the borough, had had to suffer. It was interesting news to him to learn from Mr. Botley of lamps being on continuous hire for twelve years. He was glad to hear these lamps would last so long, as they would reap the benefit at West Ham. He had allowed four years; and he thought they had selected some of the best constructed lamps there were on the market.

CAPITAL—AN AFTERMATH.

By D. T. LIVESEY, of East Grinstead.

The right application and judicious disposition of capital lies at the root of all sound commercial enterprise in these days of eager and pressing competition. It may be true that where monopoly is dominant, the pressure is neither so great, nor the necessity for acumen in the employment of funds so imperative, as where a severe rivalry is in full force.

The days which the vulgar mind imagines, or assumes to believe, to be still in vogue, when gas concerns can lay any claim to the privileges and profits of an invincible monopoly, are surely past. With up-to-date improvements in oil-lamps, which, notwithstanding incandescent mantles, still hold a place in the illuminating world; the application of chemical knowledge to volatile hydrocarbon vapours, rendering them, in conjunction with so cheap a commodity as atmospheric air, of utility as illuminating agents in an inexpensive and practical form; the use of acetylene gas; and last, but not least, the modern improvements and economies in electric lighting—all proclaim that coal-gas

companies no longer by any means possess a monopoly which the public are of necessity dependent upon. Hence the advisability, on the one hand, of greater insight into the needs for, and larger forethought in the application of, capital expenditure; and, on the other hand, the need for the removal of all barriers and impediments which, however desirable and even essential in the public interest, where monopolies proper are involved, can only act detrimentally to the interests of suppliers and supplied where competitive business is concerned. It seems therefore to the writer that the time has come when freedom from legislative chains is the consummation devoutly to be wished, and should be the order of the day, rather than that any forgings of additional legislative impedimenta should be sought after.

There is probably no department of our profession in which this sentiment is of more general application than in the raising and application of capital. The writer makes no claim to possessing special fitness for dealing with so important a subject. He fully realizes that "masters in the art and craft" have already dealt with it from many sides of the question, with defter hand and larger experience. A recent discussion in "another place" led him to examine more closely some points of the question, and constitutes his excuse for this paper.

It is no part of the writers intention to discuss *in extenso* how far and to what extent Parliament should interfere with capital employed in gas undertakings as such. One or two points, however, are quite clear to the least observant taking any interest whatever in these matters at the present time. The character of the flotations of certain city houses, which have attained an unenviable notoriety for the largeness of their prey upon so many innocent victims of their sharklike swallowing powers, shows clearly that parliamentary control is a mere myth in those directions wherein its functions would seem to be most desirable. When unscrupulous persons can buy for £2350 a small village gas-works, and, by parliamentary sanction, ask a confiding public for £50,000 for the same, and actually obtain £29,000 in cash for the privilege of sharing in the possession of such a works, parliamentary control becomes an alluring "will o' the wisp" of a most dangerous character. For while it justifies the public in assuming that there is some ground for their investment, in its having given authority for the money being raised, it deludes them, and denudes them of their means, while sheltering their deceivers.

Here is one case in point, in which the writer had some experience. Two small gas-works with a joint capital of £10,786 (in one case most probably not all expended) were "promoted" in a very real sense, by one of the houses above referred to. The first balance-sheet issued by the promoted company, under parliamentary authority, showed not £10,786, but £34,616 of capital expenditure. Of this, evidently something like £20,000 had disappeared into the promoters' pockets during the transformation of the company, and for which no assets could be shown. Yet the same ring have been able to repeat the same game again and again, and in almost every case by "parliamentary authority." Manifestly in this direction there is need for some change in the mode of authorizing the raising of public capital, and providing for a more just application of it.

While, however, these cases may be regarded on the one hand as unfortunate excrescences, on the other hand the possibility of their being practised is a striking testimony to the general healthy condition of capital investments in gas undertakings. Yet in the normal application of gas investments, after eliminating all such questionable flotations as above referred to, there are considerable discrepancies manifest on comparing the capital accounts of ordinary companies. From time to time, comparisons have been made as between company and municipal finance in this respect. But, unfortunately, there are so many side-issues and local circumstances to consider, that direct comparison is difficult and oft savours of the proverbial "odium."

The parliamentary returns—the chief source of statistics—are very incomplete, and omit some of the most salient items needed to a just comparison. Capital raised, by share, stock, or loan is given, but not the actual capital expenditure, which we all know is not necessarily the same thing. The distinction between actual capital raised and the increment due to consolidation of stock, is incomplete. In the returns of local authorities, the loans raised on capital account seem to be indecisive; for in one case the amount borrowed, "not including the amount repaid," is less than the sum given as "total amount of loan repaid, &c.," and in many other cases the latter item approximates so near to the former as to leave very little for working capital, assuming the whole of the expended capital to have been wiped out. Again, there is nothing to show to what extent the purchase of companies' undertakings has affected the capital charges. Strict comparison is therefore at the best but doubtful, and can only be of an approximate character. Further, in listening to discussions of this nature, it has occurred to the writer that a general comparison of total capital expenditure of all companies or all local authorities does not sufficiently discriminate. Necessarily the small concerns will have comparatively larger capital expenditure than the medium or larger concerns. And as things can only be compared with comparable things, so the relative size, and the relative number of each size, becomes an important factor; and comparisons which ignore these are of little use. The following tables attempt to differentiate in this respect.

Table I. treats only with the total amount borrowed by local authorities, and therefore assumes that this item has all been spent on the undertaking, as also does Table II. assume that the

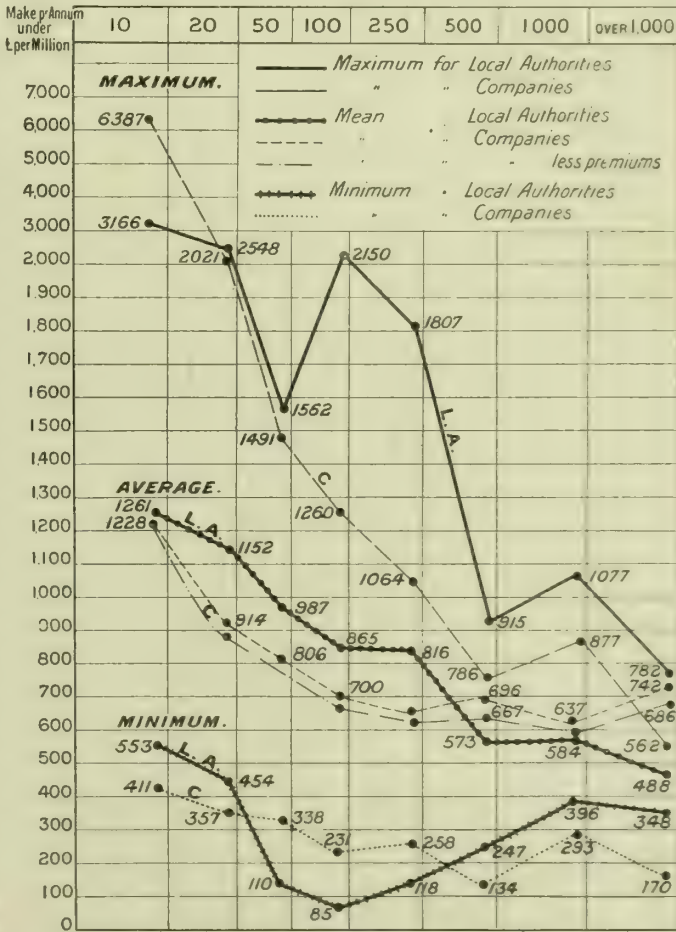
TABLE I.—Local Authorities.

Size, Millions per Annum.	Total Number of Works.	Capital Expended per Million Annual Make.		
		Maximum.	Minimum.	Average.
Under 10	17	£ 3166.6	£ 553.6	£ 1261.3
" 20	30	2548.2	411.2	1228.7
" 50	48	1562.2	119.5	977.9
" 100	36	2150.7	85.2	813.9
" 250	43	1807.4	118.7	716.3
" 500	20	915.2	217.8	573.4
" 1000	11	1077.9	396.7	581.7
Over 1000	9	782.0	412.5	458.2

TABLE II.—Companies.

Millions Annual Make.	Total Number of Works.	Capital Expended per Million Annual Make.		
		Maximum.	Minimum.	Average, Deducting Premiums.
Under 10	58	£ 6387.2	£ 411.0	£ 1228.1
" 20	72	2021.8	357.0	914.0
" 50	111	1491.5	338.8	806.6
" 100	79	1260.9	231.4	700.9
" 250	62	1064.1	258.5	667.3
" 500	34	789.8	144.1	606.1
" 1000	13	877.1	293.4	617.0
Over 1000	20	562.3	170.4	712.9

share and loan capital raised has been similarly spent. The gas and water combined companies have been eliminated as not being comparable. In calculating the maximum and minimum expenditure per million cubic feet of gas made, those companies whose capital has been consolidated have not been taken account of, as evidently they cannot be compared with ordinary capital raised in the usual way. The following diagram shows these comparisons at a glance.



The averages do, however, include consolidated stocks, as the incomplete nature of the returns prevents exact discrimination. This accounts partly for the apparent rise in cost per million cubic feet in the larger companies; but doubtless the exigencies of the conditions of the larger cities and towns play an important part in the amount of capital expenditure.

It would be a bold venture to attempt to account for the vast differences between the maximum and minimum costs as revealed by the above figures and shown on the diagram. To allocate the responsibility would also be invidious to attempt. Some light on this question was thrown across the path of the writer in his early experience in a works during its transition period. Somewhat neglected in maintenance, and outgrown by natural development of the district, the manager pressing the need for extensions upon

the attention of the directorate for years, the time came when prompt action was absolutely necessary to avoid total failure of supply; and only then did the directorate move. The lines of motion were as extravagant as the motion had been tardy. A celebrated London engineer was entrusted with the work, with the following results in expenditure:—

	Gas Made.	Capital Expended. £	Rate of Dividend. Per Cent.
Year before extensions commenced—	4 . 63,385,000	48,959	10 & 7
" " " "	5 . 61,381,000	70,539	5
" " " "	6 . 68,177,000	95,001	5½ & 4½
" " " "	7 . 78,587,000	105,363	6½ & 5½

The expenditure was thus increased by 115 per cent. within three years—a splendid example of how not to do it. The writer has a vivid recollection of a pitiable interview with a clergyman's widow dependent upon her dividend for her livelihood, when in one half year the returns fell to 1½ per cent. after a period of ten years regular 10 per cent. The lack of foresight, and neglect to take time by the forelock when markets were favourable for the work, compelled an abnormal expenditure, which was considerably augmented by extravagant plans; and for many years the shareholders and consumers have had to wallow in the shallows and miseries of low dividends and high-priced gas, as a result of neglect to take the tide of affairs at its proper flood.

Another example within the purview of the writer, on a smaller scale, was a village gas-works with a capital expenditure of £3533. An able engineer of a large works was called in to advise, with the result that the capital expenditure was immediately increased by £2727, or nearly doubled, although the district, being two miles from the nearest railway station, is stagnant and morbid, with no signs or prospect of any advancement. This struck the writer as a case in which one accustomed to think in tens of thousands could not descend to think in tens. These cases may be typical of many others where large capital burdens prevail. It is well to remember "prevention is better than cure;" indeed, cure in such cases can only be effected by time and by a judicious attention to future expenditure and its allocation.

An illustration of a different nature came within the cognizance of the writer. A small gas-works was approaching the time of utmost manufacturing capacity; some departments being already strained during the period of maximum make—the annual production being 20 millions. A general plan of extensions and renewals was prepared, and the time for execution allocated to extend over five years. Purifiers, the most urgent requirement, were first of all provided, then followed on in succession, washer, scrubber, and house (all being under cover); exhausters and engine and house; meter and governor and house; and, finally, the extension of retort-house, which more than doubled the productive capacity. The cost of capital account averaged less than £750 per annum, the total charge being £3764. The present make is nearly doubled; and the works are capable of producing 75 per cent. further increase (gasholder room excepted) without any additional capital charge.

This reconstruction added less than £100 per million cubic feet capacity of enlargement; and during the time the work was in progress, a reduction of 4d. per 1000 cubic feet was made in the price of gas sold to the public. Immediately following the completion, the dividends to the shareholders were increased from 7½ and 5½ per cent. respectively to 9 and 6½ per cent.; and a still further reduction of 4d. per 1000 cubic feet in the price of gas has since been made. It is quite true this was accomplished by the responsible engineer keeping a weather eye upon the advertisement columns of the Gas Journals, and an attentive ear open to those sometimes useful "birds of passage" the commercial travellers, whose going to and fro oftentimes bear useful seed-pods of knowledge of disused apparatus in other works where necessary extensions are required by expansion of business, rendering the possibility of a "bargain" sometimes available, when judicious care is taken in selecting really good and useful plant. The policy of employing second-hand plant has its limits; but when this is exercised with due care in small and medium-sized works, it may do much to modify capital charges, although, with recent advances in certain classes of apparatus, it may become "penny-wise and pound-foolish" if not exercised with due regard to a knowledge of improved and up-to-date apparatus.

Where the duty of maintaining the productive capacity of the works from revenue is fully recognized, the usual normal increase in business will greatly accelerate the efforts to attain a normal capital account.

The principles embodied in the provisions of the present parliamentary "Model Bills and Clauses" under this head, will, in the writer's judgment, facilitate the maintenance of a more uniform standard of capital expenditure. These are as follows:—

Special Purposes Fund:—"In any one year the directors of a company may appropriate from revenue any sum not exceeding 1 per cent. of the 'paid-up capital, including premiums;' and this may be applied to, (a) 'expenses incurred by reason of accidents, strikes, &c.,' or (b), 'to replacement or removal of plant or works,' other than expenses requisite for maintenance and renewal of plant and works."

This fund may be accumulated to the extent of one-tenth of the paid-up capital of the company, and may be invested or applied for the general purposes of the company to which capital is properly applicable. As this may be "appropriated out of the revenue account" as "part of the expenditure on revenue account," it virtually constitutes a means of modifying capital expenditure

to those companies which are overburdened. To many, however, the hard, dry fact remains, that they are heavily penalized by a large abnormal capital account to fight against; and, like Sisyphus, they find it an enduring occupation. For, just as there is no "royal road to learning," so there is no royal road to clearing off the superincumbent capital arising from past incapacity, ignorance, or other less creditable causes. In such cases, the sins of the fathers necessarily descend upon their successors; and nothing but time, patience, a sounder judgment, and a wiser application of present-day knowledge and means in the management, can be expected to redeem such concerns. No quack nostrum can effectually deal with such cases, either legislative or otherwise, without inflicting much greater evil than it is employed to cure. Patient perseverance in well-doing can, however, accomplish much, even in this hard practical matter-of-fact business. But law is as absolute and adamant in this as in other departments of human and physical experience—it can only work out its salvation by the mutual purgation in which, as in all other directions, the innocent must share the punishment with the guilty in high-priced gas and low dividends until the curse is purged by "time and the man."

Discussion.

The PRESIDENT remarked that the members must feel very grateful to Mr. Livesey for bringing forward a most interesting paper. He believed he was divulging no secret when he said that the paper arose out of the discussion that took place on an instructive contribution to the subject of capital, as between companies and corporations, at the Institution meeting last June. He should be glad if Mr. Valon, who was the writer of that paper, would open the discussion.

MR. ARTHUR VALON (London) said the title of the paper appealed to him very much when he saw it, on account of its literary flavour. It was a somewhat unusual title for a technical communication; and so much so that he took the trouble to look up the exact meaning of the word "aftermath," and found that it meant a second crop, or mowing, of grass in one season. [Laughter.] In this case he thought the soil must be very productive, and the climate very favourable, because he rather fancied there had been more than one previous crop; and, as they might expect under the circumstances, this one included other allied vegetation, besides grass. It was rather the fashion at the present time to inveigh against statutory restrictions of any kind. All of them had suffered inconvenience at times from their existence; and it generally made for popularity to protest that they were quite unnecessary, and indeed undesirable. But they all remembered that besides restrictions, or in return for them, gas companies did receive very real powers, and very valuable protection. It was, he considered, a sophistry to contend that gas companies did not enjoy a monopoly because there were other means of light, heat, and power. What would be thought of a man who had the sole right to sell bread in any district who complained that it was not a monopoly because it did not include cake? Most gas companies, he agreed, would probably study the interests of their consumers whether or not they were restricted by Statute, just as the larger part of the population would behave decently without laws. But there were others. And he thought they could probably point to undertakings belonging even to popularly elected bodies which were examples of very efficient statutory control. He did not think that they would require the abolition of statutory restrictions. But they did require that the restrictions that were proposed should be suitable to present-day needs, and not be relics of a somewhat remote past; and they should, while effectively restraining those who were guided only by the letter of the law, at the same time not hamper more go-ahead undertakings who were desirous of enlarging the uses of gas, and making gas more extensively serviceable. A little later on in the paper, the author did complain that the legislative control was not sufficient to prevent unscrupulous promoters from preying on the unsuspecting British public. He (Mr. Valon) did not think the author was right when he said that the majority of the undesirable promotions had been under statutory authority. The Kent County Company to which he referred (though not by name) was a non-statutory company; and the majority of cases with which he (the speaker) was acquainted were also non-statutory. But there had been cases in which the companies had had statutory authority; and it was no doubt very desirable indeed that some means should be taken to prevent this kind of promotion from receiving any statutory authority whatever. It was a difficult thing to know how to prevent this, because while there were fools in the world, there would always be rogues to prey upon them. The only thing one could do was to see they did not do this within the four corners of the law; and if they went outside it, they must be adequately punished. If there were some efficient method of providing the parliamentary authorities with a competent opinion on unopposed promotions, it might result in such Bills as the one referred to being thrown out at the very beginning. Now getting away from the allied vegetation, and down to the grass. The author objected to the shortcomings of the Board of Trade returns. They all admitted that the returns were defective; and perhaps one of their worst defects was that they were not issued until half their value had gone—that was to say, some eighteen months or more after the end of the financial year dealt with in them. But Mr. Livesey was not quite fair when he said that one could not obtain from the returns the amount of the increment of conversion in the case of companies who had consolidated

their capital into stock. The details were very fully given; but he confessed they were not supplied in a very convenient form. One had to plough through the returns, and work out the figures. He went through the returns completely (though not the last ones, because they were not available at the time) for his paper in June, and succeeded in getting out the increment of conversion in every single case. Then the author objected that one of the local authorities had actually, or apparently, repaid more money than the total borrowed. If this case were carefully investigated, he (Mr. Valon) thought that probably it would be found that the apparent discrepancy was due to the authority having paid into a sinking fund (which was included under the head of repayments) amounts for depreciation and for future renewals. And possibly this might be technically looked upon as repayments in advance, because the money would be available for capital uses on the maturing of the sinking fund. Then Mr. Livesey objected to figures being dealt with (this was rather meant for him, Mr. Valon) without discriminating between small companies and large concerns. He would admit at once there was something to be said for this view; but he also submitted that, where the figures were used to show tendencies, and tendencies alone, it was quite legitimate to use the totals or the averages derived from the tables. The small companies where the largest differences occurred did, he agreed, differ considerably among themselves, and from the larger companies. When, however, these were brought into an average, they affected it very little indeed, inasmuch as the total quantity of gas to which they applied was very small in comparison with the total quantity dealt with in the average. The difficulties of dealing with the returns in any other way, and of attempting to discriminate between companies of different sizes, had been very well shown by the author's own tables. He (Mr. Valon) had not had time to investigate the diagram; but still, judging from the tables, he should say Mr. Livesey had got into more difficulties than he had avoided by dividing up the figures. For instance, what was the use of a comparison which was based in one case on the maximum and minimum amount of capital used—the total cost—after having left out all the companies who had consolidated their capital, when the companies who had so treated their capital comprised most of the largest and important companies in the kingdom? The result was seen in the bottom line, where the author got a maximum of £562 per million, and an average of £742. And in any comparison between companies and local authorities, they must take into consideration that the latter did in time pay off the whole of their capital. With the author's views on capital expenditure generally, he very largely agreed; but he thought it was somewhat unfair of him to take as examples of extravagance (and perhaps he might say rather awful examples) two specimens for which engineers specially called in were responsible. He (Mr. Valon) had seen a large number of cases of waste in different parts of the country; and they were not all, or even chiefly, attributable to (in the absence of a better term) consulting engineers. What Mr. Livesey did show by these examples was that, for a judicious expenditure of capital, not only engineering ability but business acumen was required. As was said recently, "an engineer is a valuable member of the community, and a business man is valuable; but an engineering business man is invaluable." The third example given was no doubt an excellent way of carrying out extensions to meet future requirements; but Mr. Livesey seemed to have overlooked that it was not applicable in such a case as he mentioned above, where the works had been run to ground, where the site had become overcrowded, and where they were already face to face with a total cessation of supply. Under such circumstances, damage was bound to fall on someone; but he was not at all sure that it was a bad thing that the shareholder should feel it in his dividend. After all, he had had in the past dividends to which he was not strictly entitled, and what had not been properly earned; and his responsibility was not altered because he acted by an agent, and not personally. He was responsible for seeing that the men who conducted the undertaking—the directors—were trustworthy and capable; and if he neglected this duty, he (Mr. Valon) for one had no sympathy to waste on him when calamity ensued.

The PRESIDENT observed that they must all realize that Mr. Livesey had brought forward an interesting review of the relations of capital and gas-works administration; and he was very pleased indeed that Mr. Valon had been able to deal in the way he had done with the points that had been raised in the paper. It was obvious that Mr. Livesey only wished to place certain facts before the members, and get certain questions answered. With these points he thought Mr. Valon had, to a large extent, dealt; and therefore he would ask Mr. Livesey to reply.

MR. LIVESSEY said, as time pressed, he would not say much in reply. He differed entirely from Mr. Valon in his statement that the Board of Trade returns did give full information. He (Mr. Livesey) had gone through the latest copy, and he could point to a number of companies where the increment from the consolidation of capital was not given; and it was only after three months' careful perusal of the returns that he was in a position to compile the tables he had included in the paper. With reference to the tables, a point that needed consideration in discussing these matters was that local authorities had only 95 cases in which under 50 million cubic feet of gas were supplied per annum; while the companies had 241. When they put the 241 against the 95, it would be seen what a large proportion of companies had small works as compared with local authorities. There was yet another matter that Mr. Valon referred to in

connection with the tables and the average. He (Mr. Livesey) tried to emphasize it when speaking, and it was just one of the things that brought out his own point, that the average showed a larger amount than the minimum—that was, when the companies were excepted who had consolidated their stock. The largest Company of all—the Gaslight and Coke—showed £1162 of capital per million. But they all knew the Gaslight and Coke Company had consolidated their stock, although the details were not in the Board of Trade returns, and so they could not see from them the difference due to consolidation. The Gaslight and Coke Company had also had to abandon many of their old works, and had to go out further; and they were all aware how this would add to the capital cost. Therefore Mr. Valon was scarcely right in saying that exact information could be obtained from the returns which showed this point. With regard to the cases of engineering expenditure to which he had referred, they were cases within his own experience. The Company alluded to first was the one in connection with which he had his earliest experiences. What happened there was not the fault of the resident engineer, and that was one of the points he wished to emphasize. For many years the resident manager did his best to get the works extended, in proper order, and in the way it should have been done as the Company grew. But the directorate would not do it. The fault in that case was that of the Directors, who would not move with the times in accordance with the advice of their own engineer. Then the second point was that the engineer who got the work into his hands afterwards was extravagant; the result being that a Company who had £48,000 capital one year had £120,000 in five years' time; so that the capital was nearly trebled. Still the increase in consumption was very moderate. That was the point. As to the paper generally, the President was entirely responsible for it. He pressed him (Mr. Livesey) to do something; and so he gave it as an "aftermath"—another crop of the same thing. He was quite prepared to admit it was Mr. Valon's paper at the Institution meeting that led him to look into the matter.

HIGH TEMPERATURE CARBONIZATION, ITS DIFFICULTIES AND THEIR CURE.

By W. B. RANDALL, of Waltham Cross.

As Engineer and Manager of a medium-sized gas-works of 80 millions per annum, my carbonizing experience has been confined to horizontal retorts, heated on the regenerative principle, and operated solely by manual labour, or shovel charging. In regard to the term high carbonizing temperatures, we aim to keep the retorts at a bright orange colour—say, about 1900° Fabr.—when they are drawn and ready for charging; the temperature of the combustion chamber will be about 2600° Fabr., and the chamber dazzling white, necessitating blue glass to inspect it; and finally the last waste-gas flues will be almost black, about 700° Fabr. Under these circumstances, we average about three years of actual working life per retort and seven years per regenerator. This, it may be urged, is a short period, but our chief object is to obtain the highest yield of gas per ton of coal carbonized consistent with a satisfactory illuminating power, which is possible in a medium-sized works without machine stoking.

Whether working at high or medium temperatures, the producer and regenerator portions of a retort-setting do not present much contrast in structural working, results, or maintenance; therefore it was the retorts which began to show the effects of high carbonizing temperatures, by deviating from their correct shape and level. This was specially noticeable in the two centre retorts over the producer in beds of eight retorts; but the two bottom ones always kept in good condition, although nearly as hot as the others. To obviate this defect, we are now using brick or segmental retorts, which, although more expensive in first cost than hand or machine made retorts, are more reliable and keep a better shape in working, and are far easier to repair either when at work or standing.

The joint between the retort and the cast-iron mouthpiece soon claimed attention; and it was found that the $\frac{7}{8}$ -inch steel retort-bolts were burnt through, and only the binders were supporting the mouthpiece and its connections. This we have overcome by building the front wall 15½ inches thick, or, a 9-inch wall, then a 2-inch cavity filled with non-conducting composition, and a 4½-inch wall, which is built after the mouthpieces are fastened to the retorts, and is flush with the flange of the mouthpiece, so that the binders, which are of railway section, 75 lbs. to the yard, are fixed to meet the flange of the mouthpiece and 4½-inch front wall.

Up to the present, we have not had any trouble worth mentioning in regard to melting, fusing, or settlement of materials in the settings; Ewell and silica bricks being used in the combustion chambers, and ordinary Stourbridge fire-clay materials in other parts of the beds.

Having briefly dealt with what may be termed structural matters, I now propose to mention some of the incidental results in carbonizing with high temperatures, and would commence with choked ascension pipes, which are without doubt the most common source of trouble in a retort-house. After numerous experiments and failures, we find the best remedies for avoiding choked ascension-pipes are, firstly, to use an auger almost the full diameter of

the ascension-pipe before every charge; secondly, to draw off the thick tar from the bottom of each hydraulic main by means of a 6-inch steel pipe flanged on to the bottom of the hydraulic, and curving towards and diagonally downwards in front of the beds between each setting, attached to the buckstave, and with a 6-inch valve fitted about 3 feet from the floor-level, thus forming a vertical tar column, which we empty every four hours, and so prevent heavy tar or pitch from forming in any of the connections and mains; and, lastly, to allow water to drip into the interior of each ascension-pipe, as described by Mr. James L. Chapman, of Harrow, to this Association 24 years ago (Nov. 12, 1885).

Naphthalene used to choke our condenser, scrubber, washing plants, and connections to purifiers, &c., besides forming inside the outlet-pipes of the gasholder, and falling *en masse*, without a moment's notice, to the bottom of the pipe at the most inconvenient time. But I am pleased to record that for about two years past we have not been seriously troubled with this insidious enemy—the remedy being to circulate water-gas tar instead of ammoniacal liquor over the tower scrubber. Portions of this oil or tar are mechanically carried forward by the gas into the Livesey washer, and help to give deep foam from 1 inch to 2 inches deep, and also carry on to the Kirkham-Hulett washer, to such effect in both instances that the vessels have been kept clean and free from undue back-pressure for two years past—thus avoiding the expense of cleaning the bundles, sieves, &c., which we formerly had to incur every few months.

Our experience in oxide purification is worth recording, as for several years we were supplied with oxide free of cost, and received $\frac{1}{2}$ d. per ton of coal carbonized on account of the large percentage of "blue" or ferrocyanide arrested by the oxide, to the extent of 5 per cent. in the spent oxide. In several instances, the purifiers have been charged with new oxide, and have absorbed 50 per cent. of sulphur before the boxes were emptied; and for many years we have had to empty and fill only two or three vessels in each twelve months. One of the purifiers was filled when erected eight years ago, and has not yet been emptied of its first charge of oxide.

The high percentage of sulphocyanide, amounting to 0.7 per cent. in the ammoniacal liquor, entails an equivalent loss of yield of ammonia for the sulphate plant, and also renders the spent liquor from the sulphate of ammonia plant detrimental to bacteria beds on the local sewage works, so that it has been necessary to instal a special plant to purify the waste or spent liquor before it is admitted to the sewerage system. This plant consists of a small tower fitted with a coke fire, above which the whole of the gases from the outlet of the superheater of the sulphate of ammonia plant are conveyed; thus making sulphurous acid gas, which is arrested in additional scrubbers over which a small stream of water is passing. This solution, together with sulphate of copper in solution, is added to the spent liquor, with the result that sulphocyanide of copper is formed, and deposited as sludge in a tank. The effluent liquor from the sulphate plant can be reduced from 0.7 ammonium sulphocyanide to 0.12 per cent. by this treatment, and looks almost like clear water, as will be observed from samples on view.

The bacteriologist in charge of the local sewage farm is now satisfied with the effluent; and the expert in sewage bacteriology acting for the Company advises that the effluent has now a beneficial effect on sewage bacteria. This surmounting of a difficulty will be recognized as an important matter where the spent liquor from a gas-works is received into a sewage bacteria works whose effluent finally reaches a river which may be used as a source of supply for domestic purposes.

I believe similar spent-liquor purification plants are working with satisfactory results at Sutton, St. Albans, and Brighouse.

In conclusion, it will probably be asked, in view of the difficulties of high-temperature carbonizing as compared with the smoother routine of working at low or medium carbonizing temperatures, what, if any, is the ultimate benefit to be obtained. The old adage "Circumstances alter cases" undoubtedly applies to this question, and in some instances it may pay better to be content with carbonizing temperatures giving 10,000 to 11,000 cubic feet of gas per ton of coal carbonized; but in our own case it is found advisable to obtain the highest possible make of gas per ton of coal.

For a considerable number of years, using second-class South Yorkshire coal, we have made about 12,000 cubic feet of 14-candle power gas (No. 2 burner) per ton of coal used, and sold about 10½ cwt. of coke; but by means of heavier charges per retort, and extending from six to eight hours' duration, I think we shall average 13,000 cubic feet per ton for the balance-sheet—a result which can be more readily obtained from South Yorkshire coal if the retorts are nearly filled and a discharging-machine is available to push out the coke. At the present time, however, we are not in a position to instal such machinery, and must obtain results with hand drawing and charging.

Discussion.

The PRESIDENT (Mr. James Paterson) said the paper bristled with controversial points. It was due to Mr. Randall to explain, as he had not done so himself, that he (the President) asked him a considerable time since if he would read a paper dealing with the effluent from his sulphate plant; but, owing to circumstances over which he had no control, he was unable to prepare a paper on the subject. Rather than disappoint the Secretary and himself, Mr. Randall offered a paper on the lines of the one read that

day. He should like to personally thank him for the trouble he had taken in meeting his (the President's) request. He must congratulate him on the eight years' purifier, which must constitute a record.

Mr. C. F. BOTLEY (Hastings) said he should like to know the size of the purifiers.

Mr. RANDALL: 20 feet square.

Mr. BOTLEY: And the size of the retorts? He noticed there had been difficulty with the high temperature carbonization. He should like to know if the author had considered the question of having socketed mouthpieces, which were used in some works very successfully. With regard to South Yorkshire coal, the author was probably in the happy position of having the No. 2 burner, which more of them would, he (Mr. Botley) hoped, have before long. Perhaps then they would be able to emulate the results quoted better than they could do at present with the No. 1 burner.

Mr. P. P. CHANNON (Haywards Heath) asked whether Mr. Randall found the trickle of water down his ascension-pipes affect the strength of the liquor that he was able to produce from his sulphate plant.

Mr. G. M. GILL (Poplar) said he noticed the author used non-conducting material built into the front of the walls of his settings. At the Wapping works a little while ago, they started to build in this composition; and he was surprised to notice the effect it had. They were able to carbonize more coal from the time this form of insulation was started; and it kept the part of the retort nearest the mouthpiece a good deal hotter, and so increased the make per mouthpiece. Their method was to build in an 11-inch wall, made up of two 4½-inch walls, with a 2-inch space between. Into this space they put the non-conducting material, and stiffened the wall with a header placed here and there. With regard to stopped ascension-pipes, they had had little trouble since going in for heavy charges; but some months ago, when carbonizing six-hour charges, they found the best remedy for stopped pipes was what Mr. Randall found himself, using large augers—almost the same size as the pipe itself. They used augers 5 inches diameter for 5½-inch pipes; and it certainly made the work much easier for the men. At the time they were having trouble, they used 4½-inch augers; and these were not discarded until they measured about 4 inches, and then they were full of trouble. At the present time they put about 13 cwt. of coal into 22 in. by 15 in. by 20 feet through retorts; and, carbonizing in this way, a very thin tar was made, which undoubtedly helped to keep the pipes clear. The specific gravity of the tar averaged about 1.15. Then with regard to naphthalene, they used the same remedy as Mr. Randall—water-gas tar in a tower-scrubber; and they found it would take out the naphthalene to about 75 per cent. He should like to know whether Mr. Randall found the same effect, or whether the naphthalene was all taken out in his case.

Mr. D. H. HELPS (Reading) inquired what was the depth of Mr. Randall's purifiers, and the depth and number of the layers he put in. The oxide was in for such a long time that the purifiers might be made of some material that was elastic. [Laughter.]

Mr. RANDALL: It is the oxide that is elastic.

Mr. D. T. LIVESY (East Grinstead) asked in what order the author worked his purifiers?

Mr. S. CARPENTER (Dorking) pointed out that Mr. Randall had styled his carbonization as high-temperature. It appeared to him (Mr. Carpenter) as somewhat low. He believed 2200° was the old idea in the retort; and 2600° in the combustion chamber seemed somewhat high for this temperature. For a long time past, they had at Dorking found it possible to get 13,000 cubic feet with a temperature somewhat lower than Mr. Randall's 1900°. As to stopped pipes, they had had no difficulty with these. With naphthalene they were not troubled in the district, although not altogether free on the works, but still this easily came down in the condenser. Mr. Randall he noticed was using South Yorkshire coal. He (Mr. Carpenter) believed he was right in saying that, with this coal, it was possible to get something between 14,000 and 15,000 cubic feet of gas per ton of a quality of 13 candles. [Laughter.] Perhaps the author would tell him if this was correct. At the same time, he thought it would be found that, when the retorts were quite full, the calorific power would be maintained at something like 530 to 540 B.Th.U. for 13-candle gas.

The PRESIDENT said he should like to ask one or two questions. Mr. Randall said that "whether working at high or medium temperatures, the producer and regenerator portions of a retort-setting do not present much contrast in structural working, results, or maintenance." In his (the President's) own works at Redhill, he did not think he could claim—and he did not want to claim—that he worked at what were known as high heats. His heats were distinctly of a medium character; and taking the rough-and-ready test that Mr. Randall had laid down as regarded the inspection of the combustion chamber, it was possible to look into his combustion chambers at Redhill in his new retort-settings without any need for the protection of blue glasses. His temperatures were rather on the moderate scale than on the high scale the author had referred to. Mr. Randall also said that the structure of the retort and settings should not, or did not in his opinion, vary with working either at high or low temperatures. He could not help thinking the author was dealing rather hardly by his settings, judging by the amount of repairs and the life of the settings he was using. He told them he renewed his retorts on an average of about three years' actual working life. This was perhaps a working life to which a good many of them were accustomed, though he (the President) did not suggest that the retorts

always wanted to come out then from any point of view, but that they had lost their level a little. Mr. Randall informed them that his regenerators had an actual life of seven years. He (the President) thought that by regenerators he meant the settings up to the floor-level, or, at any rate, up to the level of the main arch of the furnace wall. That life, it seemed to him, was decidedly short. All the settings, in his old retort-house at Redhill, were put in by his predecessor; and they had been in six years during his own residence there, and four or five years possibly during his predecessor's time. This brought them to eleven years; and he saw no reason why the regenerator parts should not go on for another eleven years. He really could not understand why Mr. Randall said it was necessary, and found it was necessary, to renew the regenerator part of the settings every seven years. Mr. Randall must have an amount of unnecessary heat and wear and tear that he (Mr. Paterson) apparently avoided. He could go on and say that another setting—a modified Klönne setting—of which he knew, had been working for the past 25 years; and its regenerator parts had not been renewed during the whole time. That was a life something like four times that of Mr. Randall's regenerators; and the settings would go on working for a number of years to come. The author claimed that there was no difference in the construction and maintenance of settings under high temperature carbonization. If the result of his working was that he must renew his regenerator parts every seven years, he (the President) humbly maintained that he was certainly increasing his maintenance and working charges in regard to the upkeep of the settings. This brought to mind the point he (the President) raised in the argumentative paper read last year on the subject of the cost of high temperature working. Undoubtedly Mr. Randall's case was one in point, where high makes, if obtained from high temperature working, were directly bringing with them high maintenance and repairing charges.

Mr. RANDALL, in reply, said, in answer to Mr. Botley, that the purifiers were 20 feet square, and 5 feet deep. Two layers of oxide were placed in them; and there was a space equal above the layer to the thickness of the layer itself, so the purifiers were only practically half full. The reason they were able to obtain so much sulphur in the oxide without changing, was due to the fact that they were using a patent chemical oxide, which was evidently a greedy material; and if they could overcome the difficulty of back-pressure, there was no doubt they would get a greater quantity than 50 per cent., even 60 or 70 per cent., of sulphur into the oxide. The material was so active that, when first put in, they had to mix with it 50 per cent. of sawdust, in order to stop its avariciousness for sulphur. He thanked Mr. Botley for his suggestion regarding socketed mouthpieces. It had had some consideration; and by means of tying the retort mouthpieces on, they got over the difficulty. The steel bolts, he found, were completely burnt away; and they would probably try the socketed mouthpieces. He wished they had the No. 2 burner. At the present time his Company were taking part in the Joint Bill that was going forward; and by this means they hoped to get the No. 2 burner. At present he must plead they were anticipating it. The trickle of water down the ascension-pipes, they had not found weakened the liquor. It was merely a drip of water; and undoubtedly operated to keep the ascension-pipes cool. Regarding the non-conducting material, he was glad Mr. Gill had confirmed his experience. The great difference in regard to radiation from this particular bed was surprising. As to the naphthalene question, they did not take all out with regard to the district; and with regard to the works, they had no trouble with their washers or scrubbers. They had gone on for two years without bye-passing them. Mr. Carpenter had remarked on a production of 14,000 to 15,000 cubic feet per ton of coal. He (Mr. Randall) had not the impudence to go to that length on this occasion. But they were going to claim 13,000 cubic feet in their balance-sheet this half year; and that was quite enough to go on with. As to the producer, he had not been fortunate enough to have had the sagacity to put in one that would last 25 years; and a producer with such a life might not really be an economical one. During the last 25 years, there had been many improvements; and, even in periods of seven years, they were getting new producers. Finality had not by any means been reached in regard to regenerators. The settings they had put in recently were remarkably efficient compared with those that were put in seven years ago; and any cost in installing the regenerators would be well recouped. But if they were to go on for 25 years, they would not give the patentees much scope.

Municipal Council Elections.—We are pleased to find that the result of the elections for members of Borough Councils on Monday last week was the return of several gentlemen connected with the gas industry. Mr. Jacques Abady (Messrs. Alexander Wright and Co.), Mr. T. Berridge, Mr. C. G. Grimwood, and Mr. S. Y. Shoubridge are members respectively of the Westminster, Leamington, Sudbury, and Lewisham Councils.

Illuminating Engineering Society.—The opening meeting of the Society will take place on Thursday, the 18th inst., at 8 p.m., at the premises of the Royal Society of Arts, No. 18, John Street, Adelphi, when a brief report of the progress of the Society will be presented by the Hon. Secretary (Mr. L. Gaster), and the Inaugural Address will be delivered by Professor Silvanus P. Thompson, D.Sc., F.R.S., the first President of the Society.

MANCHESTER JUNIOR GAS ASSOCIATION.

Address by Professor Harold B. Dixon, M.A., F.R.S.

The members of the Manchester and District Junior Gas Association met in Manchester last Saturday afternoon, and after a visit to the gas-meter testing-station in London Road, and an inspection of the new Corporation fire-station in the same thoroughfare, proceeded to Owens College to hear a lecture by Professor Harold B. Dixon, M.A., F.R.S., on "The Chemistry of Flame." The party included the President (Mr. J. Taylor), several members of Council, and the Hon. Secretary (Mr. J. Alsop).

At the gas-meter testing-station, Mr. S. Dyson, the Chief Inspector, and Mr. H. Collier, his principal Assistant, explained to the party the working of the department, and how the plant is utilized; and to these gentlemen a hearty vote of thanks was accorded. At the fire-station, Superintendent F. Baylis and his men treated the company to a turnout with engine and fire-escapes, followed by a demonstration of how the brigade tackle a big fire. It was an interesting display.

THE CHEMISTRY OF FLAME.

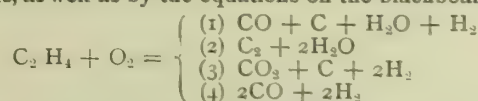
The address delivered by Professor Dixon at the University covered a good deal of the same ground as his lecture on "The Mechanism of Combustion," given before the Institution of Gas Engineers at the annual meeting held in London in 1904,* though, as he explained, his views on certain points had since been modified as the result of continued investigation. The address was illustrated by many experiments and lantern slides, with photographic analysis of explosion flames and the velocity of a sound wave in the flame of exploded gases.

At the outset, and after expressing the pleasure it gave him to address a body of gas engineers in what he might call his own "theatre," Professor Dixon went on to say that, having regard to the great changes that have taken place in gas manufacture in recent years, and the revolution in the processes for developing light from gas, much might be gained from a minute study of the chemical processes in flames, or, as he called it, the mechanism of combustion—a subject of very great interest, but intricate and difficult. Consequently, the experiments he had made and would be able to show must be of interest to a body of professional gas engineers such as he was addressing.

Dealing with Davy's experiments on the extinction of flame in gases passing through metallic gauze, which led to the construction of the miner's safety lamp, Professor Dixon said that, though Davy's explanation of the air-gas flame was correct in the main, it was not complete. It ignored the effect of the diluent nitrogen in preventing the separation of the carbon. Blockmann demonstrated that mere dilution, apart from oxidation and from cooling, could destroy the luminosity of the flame; and Weibel showed that mere cooling, apart from oxidation and dilution, could also do so. These views were illustrated by the dilution of a flame of coal gas by carbonic oxide, which destroyed the luminosity, though it raised the temperature, and by the cooling of a luminous flame by adding water to a crucible suspended in it. It might therefore be said that there were three causes which destroyed luminosity by preventing the separation of carbon in an air-gas flame—viz., the oxidation effected by the oxygen, and the dilution and the cooling effected by the nitrogen.

The theory of Davy of the cause of luminosity in hydrocarbon flames was challenged, firstly as to the fact of the actual separation of solid carbon, and secondly as to the mode by which the separation is effected. Frankland, founding his opinion on his experiments on combustion under diminished and increased pressure, considered the luminosity might be due to heavy hydrocarbon vapours in the flame; but Herrmann proved conclusively, in his (Professor Dixon's) opinion, that solid particles of carbon were present in the flame, and were adequate to produce the luminosity. It was Faraday, he believed, who "started the hare" of the preferential combustion of the hydrogen; attributing, as he did, the separation of the carbon to the supposed fact that, of the two constituents of the hydrocarbons in the candle flame, the hydrogen had a stronger affinity for oxygen than the carbon had—the hydrogen therefore breaking off from the carbon to unite with the oxygen; leaving its former partner "out in the cold," as it were. On what experimental basis Faraday founded this statement he (Professor Dixon) could not discover. Some two generations were brought up on this doctrine. About ten years ago, however, Professor Smithells and he did venture to dispute it; and, as the result of experiments, he had reason for saying that the text-books were not to-day so dogmatic on the subject as they used to be.

What facts, asked Professor Dixon, were known concerning the incomplete combustion of such a hydrocarbon as ethylene? If they made a mixture of equal volumes of ethylene and oxygen, and fired it in a strong vessel, the oxygen had the chance of dividing itself between the carbon and the hydrogen, or of combining preferentially with one or the other, as he showed by experiments, as well as by the equations on the blackboard, thus—



* See "JOURNAL," Vol. LXXXVI., p. 745.

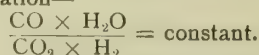
This experiment was first made in 1891; and he was surprised to find that equation No. 4 almost exactly represented the change. Instead of finding a large contraction of gaseous volume, owing to the formation of steam and the deposition of carbon, the volume was almost exactly doubled, and an inflammable mixture of equal parts of carbonic oxide and hydrogen formed. The final product, therefore, whatever might have been the intermediate changes, afforded no evidence of the preferential combustion of the hydrogen, but exactly the opposite.

It had been urged that the argument drawn from the explosion of ethylene and oxygen was not valid with regard to the reactions going on at a much lower temperature in ordinary flames. His answer was that the final products found had cooled down from the very high temperature of the explosion until they ceased to react; and since changes in gases at high temperatures took place with great rapidity, the products finally left were the result of interactions which proceeded through a whole scale of descending temperatures. Again, when steam was passed over red-hot carbon, the latter took the oxygen from the hydrogen; and this happened at a temperature below that of ordinary flame. There appeared, then, to be no evidence of the preferential combustion of hydrogen; and the incomplete combustion of a hydrocarbon at a high temperature seemed to give carbonic oxide and hydrogen—this applying to ethylene and acetylene, but not to paraffin.

Professor Dixon asked his audience to bear in mind that he did not say that no steam was formed at any stage of the incomplete burning of a hydrocarbon in explosions, as it was highly probable that some of the liberated hydrogen molecules reacted with the oxygen molecules when they met in collision; but, if so, the steam molecules formed were reduced again promptly when they met with the carbon. Again, he did not say that in a luminous hydrocarbon flame the hydrogen of any given hydrocarbon molecule did not burn first. He believed that it generally did so. The hydrocarbon being decomposed by heat, the hydrogen formed a highly mobile gas, the carbon aggregating into solid particles. The hydrogen molecules endowed with their own enormous rapidity of motion, might soon reach the outer air; the solid carbon particles being carried slowly by the upward-spreading gas stream. What he denied was that the carbon was separated because the hydrogen was burnt preferentially.

If a hydrocarbon burnt in a limited supply of air to form carbonic oxide and free hydrogen, and any further oxygen present divided itself between these two gases, the combustion in the inner flame of a bunsen burner—for there were two distinct flames, as he demonstrated—would be of this kind: The carbonic oxide and the hydrogen, formed and only partly burnt in the inner flame, burning when they reached the surrounding air, and producing the outer flame. The separation of the inner from the outer flame was best effected in Professor Smithells' arrangement of two tubes, one of which would slide over the other. The inner flame struck-back until it was arrested at the mouth of the smaller tube; while the outer flame continued to burn above. The gases formed in the inner flame might be syphoned off from the space between the two flames; and the analysis of these gases showed that they formed a mixture of partially burnt carbonic oxide and hydrogen exactly analogous to that found when a mixture of carbonic oxide and hydrogen was exploded with a small quantity of oxygen. With ethylene, for instance, it was found that the reaction in the inner flame might be expressed by the same equilibrium equation as he had shown governed the division of oxygen between carbonic oxide and hydrogen in explosions. This result was most easily explained by the hypothesis that in the inner bunsen flame the simpler hydrocarbons were burnt first to carbonic oxide and hydrogen.

Proceeding to deal with Bunsen's theory of discontinuous combustion, Professor Dixon said Bunsen considered he had proved that Berthollet's Law of Mass was modified by a special tendency to form compounds in simple ratios. He fired mixtures of gases in which one gas (oxygen) had to divide itself between two others (hydrogen and carbonic oxide) in the explosion, and thought he observed that the compounds steam and carbonic acid formed did not vary regularly with the relative quantity of hydrogen and carbonic oxide present, as Berthollet's law stated, but that the ratio $H_2O : CO$ altered in sudden jumps from one simple ratio (e.g., 1 : 1) to another simple ratio (e.g., 1 : 2). Bunsen's theorem was the starting-point of his (Professor Dixon's) own investigations in 1876. He found that Bunsen had neglected a very important factor in the experiment—namely, the reaction between steam and carbonic oxide at the high temperature of the explosion. The gases used must be dry, not wet, as Bunsen had used them; and, moreover, if the steam formed in the explosion were allowed to condense on the cold walls of the vessel during the passage of the flame, the final products were profoundly affected. By keeping the walls above the condensation point of the steam, it was possible to test the Law of Mass as Bunsen proposed; and it was shown that the final products depended upon the equilibrium being reached between two opposite chemical changes—namely, the action between carbonic oxide and steam to form carbonic acid and hydrogen, and the reverse action between the carbonic acid and hydrogen to reproduce carbonic oxide and steam. Whatever the initial quantities taken, the final products agreed with the equation—



This equilibrium, which Professor Smithells found also held good for the gases produced in the inner flame of the ethylene air-

burner, represented, of course, the final state reached as the products of the explosion cooled down.

Having performed experiments illustrative of the influence of aqueous vapour on combustions, presented the result of his attempts to measure the rapidity with which an explosion is propagated through gases, submitted a photographic analysis of explosion flames, and dealt with the velocity of a sound wave in the flame of exploded gases—taking somewhat the same line as he did when discussing these matters before the Institution of Gas Engineers in 1904—Professor Dixon referred at length to the initiation of the explosion wave. He said that photographs taken of the whole flame, starting from the firing-wire, showed that the flame starts slowly, gathers pace and intensity, and finally sets up the explosion wave which proceeds with a perfectly uniform rate and intensity. He said the explosion wave started suddenly, throwing back a wave he called the wave of "retonation," and leaving a dark space of cooled gas at the point of starting. But when, as is usual, the gases were fired by wires sealed into the tube a few inches from one end, the flame which travelled to the near end sent back a reflected wave which passed through the ignited gas more quickly than did the original flame. This second (reflected) wave might catch the primary flame and modify its motion and intensity, as shown by the photographs. The rapidity of inflammation and the quickness with which the explosion wave was set up depended largely upon the point of ignition, and whether the flame could get this "kick-off" from the end of the tube. When the gas was fired at the end, the flame, as he had demonstrated, travelled much more slowly. This he thought was a point which deserved the attention of all who were engaged in designing internal combustion gas-engines.

Professor Dixon went on to say that when an explosive mixture in a tube was fired by a spark, the suddenly-ignited gases must expand and transmit a compression wave in both directions. This travelled with the velocity of sound in the unburnt gas, and would be reflected from the end of the tube. The propagation of the flame from the firing-point was in most gaseous mixtures less rapid than the velocity of sound in the unburnt gas; but the rate of propagation of the flame augmented much more rapidly in some mixtures than in others. If the tube was a long one, the flame would overtake the sound wave after a more or less prolonged chase, according to the nature of the mixture. But if the tube was short, the sound wave might reach the end of the tube, and return as a reflected wave to meet the flame which was still advancing. This seemed to be the origin of the "return wave," which crossed and checked the primary flame.

Pictures were shown on the screen giving in outline the movements of the flame, and also demonstrating the great influence exerted on it by the sound waves. These and other photographs submitted showed, said Professor Dixon, how entirely erroneous was Oettinger's interpretation of his photographs. The true explosion was not invisible; the flame could be easily photographed throughout its whole course. But in the initial stages the flame travelled slowly, and was of small intensity; it only became brilliant when the explosion wave was set up, or when a retonation or powerful reflected wave traversed the burning gases. In the initial stage, the combustion was taking place slowly; only a few among the total collisions occurring were chemically fruitful. In the detonation or explosion wave, the combustion was taking place with intense rapidity; the great majority of the collisions being chemically fruitful. The explosion wave might be made to meet a flame in the initial stage. It could be seen to pass through the already ignited gases with hardly any check on its velocity and intensity. It was very evident from this and from a study of the reflected waves, that combustion could not be complete when these waves traversed the gases. The spread of the flame was not synchronous with the attainment of maximum temperature or with complete combustion.

Following his last experiment, Professor Dixon pointed out that the burning of a highly-explosive gas mixture was one of the best means of developing light from gas; and he hinted that gas engineers might well consider that coal gas and air would indeed not "detonate," but that coal gas and oxygen when mixed together would do so.

GAS ENGINEERS AND THE UNIVERSITY.

At the close of the lecture,

Mr. D. V. HOLLINGWORTH (Salford), in moving a vote of thanks to Professor Dixon for his address, said the members would recollect the valuable help he rendered them when he presided at the debate which they had with the Manchester electrical students on the subject of gas v. electricity for lighting. He was sure it was as much a pleasure to the Professor to address them as it was for them to listen to him; and this led him to say that if there was a closer union between gas engineers and the University it would be greatly to the benefit of those engaged in the gas industry. At the University they had men who were in a position to give them enlightenment on many points; and he was certain that such enlightenment would be gladly afforded. He put it forward as a suggestion that a closer union should be established between gas engineers and the University, being perfectly satisfied that it would yield excellent results.

Mr. W. BUCKLEY seconded the motion, which was supported by Mr. S. FAGG (Preston); both speakers referring to the advantages to be gained by gas engineers from such a lecture as that they had just listened to, particularly as to the utilization of coal gas for lighting and heating purposes.

The PRESIDENT, in putting the motion, remarked that Professor Dixon was regarded as the "practical gas man's professor."

The motion having been carried by acclamation,

Professor DIXON, in reply, said he was struck with the suggestion of the mover of the resolution that there should be a closer connection between those engaged in the manufacture of gas and the University; and he heartily reciprocated the desire. There was nothing that would please him more than to see a body of men like those present having an organic connection with the University. He did not know how best this object could be attained; but he would heartily welcome any proposal that would bring them together, for he was satisfied they had much they could tell him, and he had something he could tell them. He was sure they would be much better off by a closer intercourse, which might be regularized in some way. In his address that afternoon, he had just told them enough to whet their appetite. He was carrying out a number of experiments which would be of interest to them. One set related to the ignition-point of gases; another to the specific heats of gas at high temperature and velocity. These were, he thought, subjects of interest to gas engineers.

This concluded the proceedings.

SCOTTISH JUNIOR GAS ASSOCIATION.

Western District.

A Meeting of the Western District of the Scottish Junior Gas Association was held in the Technical College, Glasgow, on Saturday evening—Mr. D. CURRIE, of Stirling (the President), in the chair.

PRIZES FOR PAPERS.

The PRESIDENT intimated that Mr. Alex. Smith, Manager of the Tradeston Gas-Works, Glasgow, had offered a medal to be awarded to the reader of the best paper in the current session, and that the Council had accepted Mr. Smith's medal, with thanks. Also that Mr. W. Grafton, of Glasgow, had offered to provide a second prize, in the form of a book, for the second best paper read this session. The Council had accepted this offer—in fact, the Secretary already had the book in his possession. Mr. Grafton had further forwarded a sum of money, to inaugurate a fund to provide a second prize every session. It now lay with the generosity of members and honorary members to add to the fund from time to time.

CARBONIZATION FIFTY YEARS AGO.

Mr. T. ORR (Motherwell) read a paper on this subject, in the course of which he said:

I have to ask your kind forbearance with me while I take you back fifty years to the pioneers of the gas industry. Mr. Hislop, in his Presidential Address to the North British Association of Gas Managers in 1907, said: "It is a matter for surprise that, considering the improvements which have been effected in nearly every other portion of a gas-works plant, the methods of carbonization have remained the same as were in use fifty years ago." It has been repeatedly stated that the ways and means of producing gas from coal have not been so progressive as those of other industries. Ever since Murdoch sat ruminating at his fireside in Cross Street, Redruth, and saw the jet of pale brown smoke issuing from the glowing coal, and conceived the idea of converting his "churchwarden" into a gas-retort by applying heat to it, coal has been destructively distilled by heat. Murdoch's first retort was a clay pipe; our retort of to-day is also a clay pipe. The same may be said of steam. Since Watt observed the puff of vapour issuing from his mother's kettle till now, steam has been generated from water by heat.

Those of us who have had the privilege of seeing gaseous-fired boilers, must admit that progress has been made in the ways and means of producing steam; and the same may be said of coal gas. As we look around one of our modern retort-houses, we see tier upon tier of retorts. Where are the furnaces with which a former generation were so familiar? These, we know, have given place to the regenerators underneath the charging floor; leaving clear space for other operations. Truly, there are new departures in coal carbonizing. In no section of a gas-works is there more sign of change at the present time than in the retort-house.

Practically speaking, the gas-retort may be regarded as a sealed book, because of the hidden and complex character of its contents, and of the chemical changes which occur during the period of from three to six hours devoted to carbonizing. But in the abstract, it is not difficult to infer that its full duty is far from being entirely developed, or that complete efficiency is obtained; for, as a matter of fact, the condition of the bye-products amply testifies that the ordinary systems of distilling into gas are carried on at a serious waste and sacrifice of material, involving superlative mechanical power and human fatigue out of proportion to the benefits derived. The art of properly and economically conducting the progress of carbonization has been, and will always continue to be, an object of primary importance in every gas-works. The quantity of gas which can be obtained in a given time from any given quantity of coal, the consumption of fuel requisite for the production of that quantity of gas, and the degree of deterioration to which the retort is subjected, have all depended upon the manufacture being conducted with a due regard to scientific principles.

All retorts were formerly made of cast iron, 1½ inches thick, 7 feet long, 14 inches high by 20 inches wide, and weighing about 15 cwt. Fire-clay retorts latterly came much into use; and owing to their greater cheapness and durability, they rapidly supplanted those made of iron. Of fire-clay retorts there were several kinds. Some were made in one piece; others in separate sections luted together; while others were built up of fire-bricks and tiles like coke-ovens. The relative merits of iron and clay retorts were, fifty years ago, a subject of great contention. In the issue of the "JOURNAL OF GAS LIGHTING" of Jan. 10, 1851, we read:—

There are now [January, 1851] at work at the South Metropolitan Gas-Works, Old Kent Road, two benches with five clay retorts each, which have been uninterruptedly in action for upwards of seventeen months. They are Δ shaped, 20 inches wide by 12½ inches high and 7 feet long, and are calculated to have produced up to the present time at least 1,800,000 cubic feet of gas per retort, with an expenditure of fuel not exceeding that of the iron retorts used on the same station; and there is every prospect of each retort making upwards of 2,000,000 cubic feet of gas before it is worn out.

The opposition to the introduction of clay retorts at that period affords an additional instance of the many difficulties to be encountered when it is attempted to substitute a new invention for established plans. One practical point has to be observed—that clay retorts of small dimensions were less economical than those of a larger size, owing to the greater percentage of fuel required to keep them at a proper temperature. Notwithstanding this, the testimony about fifty years ago of Mr. James Reid, the Manager at the Montrose Gas-Works, may prove interesting to us nowadays.

We have had clay retorts in operation for the last three years; and from the great difference in price, compared with that of iron retorts of the same size, and from the immense superiority over metal in working them, we have entirely given up the use of the latter. I tried the clay retorts in the shape of an ellipsis, in the Δ , and in the circular form, and find the cylindrical to be the best adapted for carbonizing the coal effectually. The size I find best adapted to all purposes is 8 feet long, 14 inches diameter, and 4 inches thick. Such a retort costs about £2 6s. The pillars or columns for supporting them are 6s.; and each retort finished costs £3 4s. The mouthpieces are cast metal, and fastened to the end of the retort by bolts and flanges, as in the ordinary description, and jointed with fire-clay and iron cement. The retorts are made in two lengths, and are jointed by a body of fire-clay well diluted with water. The most economical plan for erecting them is to set them three under one arch, heated by one fire. Their only drawback is that, when the heat is let down, they contract unevenly on cooling, and are liable to leak when again required for distillation. They generally last two years.

Alas, this drawback is still with us!

I have pleasure in submitting to your notice the first four designs of retorts that are known to us; and, strange to say, these represent the various types of retort-settings that gas engineers of to-day are trying to improve—Nos. 1 and 2, the vertical retort; No. 3, the inclined retort; and No. 4, the horizontal retort. I regret that time will not allow me to give more than a passing glance at the various systems. However, I have classified them as briefly as possible.

Following the first-mentioned retorts (which, by the way, were made of iron), we come to the ear-shaped retorts, which were constructed concave at the bottom and rounded at the corners. The great objection to them was that the bottom bends were liable to become filled with hard carbon; and when this was the case, they invariably cracked.

Next followed Lowe's reciprocating retorts, the invention of Mr. George Lowe, which were intended to produce a larger quantity of gas, and of greater illuminating power, by submitting the vapour and gas that first escape to the action of heat in another part of the same retort.

Then came Clegg's revolving web retort. This type of retort was really a great advance on any of its predecessors. It was arranged so that the coal was acted upon in a thin stratum, and converted into gas at once. The chemical advantages were supposed to be many. All the elements of the coal were liberated at nearly the same time, and united with one another in such proportions as to form gas of the best illuminating quality and in greater abundance than when the coal was carbonized in mass. The action was as follows: All coal was ground and screened, so that no lumps remained; and a 24-hours' charge was thrown into the hoppers and secured by a luted cover. The charging disc, which was 9 inches in diameter, with six arms, was made to revolve uniformly with the drum below it at the rate of four revolutions per hour. For this purpose, two shafts ran the entire length of the retort-beds, on one of which the drums were fixed. On the other side, the charging discs connected at one end by a strap. The diameter of the hexagonal drums was so regulated that the coal falling on the web from the charging lip was at one revolution passed the entire length of the retort. About 15 minutes was the time required to convert the coal to gas. Each link of the iron web was 14 inches long by 14 inches broad, having a surface of 336 square inches, upon which the contents of one partition of the disc was distributed—viz., a little more than 124 cubic inches of coal in a stratum less than ½-inch thick. Each successive link received the same quantity; so that in one entire revolution of the disc and drum 745 cubic inches of coal (equal to 21 lbs.) was distributed over a heated surface of 2016 square inches, and converted into gas. It therefore followed that in 24 hours about 18 cwt. of coal passed through each retort. Mr. Clegg claimed

that his process was one of the greatest economy, and by far the most scientific process adopted for gas making. It required no attendance, except that of keeping up the furnace and charging the hopper once in the 24 hours. The minor advantages which he claimed were that his process occupied less space; the "stokers" might be spared that name; the heat would not be felt more than in a boiler-house; and the retort-house would be kept perfectly clean, wholesome, and free from any suffocating vapours. The web could be repaired at any time, or even made in the first instance, by a handy man. Another point which he advocated was that, after it had been at work for some time, the plates of which it was formed, by their contact with carbon at a red heat, were converted into excellent steel, and could be sold for a sum at which a new web could be constructed.

The next was Brunton's discharging retort, introduced by Mr. Brunton, at that time the Engineer of the West Bromwich Gas-Works. It was fed with coal from a hopper, and discharged its coke into water by the action of a piston working through a stuffing-box in the lid. Notwithstanding the important claims by Mr. Brunton, these retorts were, on his retirement from his position as Engineer at West Bromwich, discontinued, and were never tried elsewhere. One great drawback they had was the unsaleable condition of the residual products; for, as the coke fell into the tar, it was unfit for general fuel.

The foregoing were all iron retorts. We now come to the stage of clay retorts, which, as I said before, were introduced into the South Metropolitan Gas-Works, Old Kent Road, about 1851, and made their way into Scotland immediately afterwards. Then arrived what was known as Spinney's brick retorts, the invention of Mr. Thomas Spinney, of the Cheltenham Gas-Works. These were built up entirely of fire-clay tiles and bricks. The bottom and sides were formed of Newcastle fire-tiles, and the crown of fire-bricks composed of Stourbridge fire-clay mixed with about 10 per cent. of sharp river sand and pipe-clay, which addition prevented the bricks from cracking, and improved them in other respects. The interior dimensions were 3 ft. 2 in. wide, 8 inches to the springing line of the arch, and from thence to the crown 6 inches.

Afterwards followed Mr. Clift's (of Birmingham) retorts, which were composed entirely of fire-bricks, with cast-iron front-plates for attaching the mouthpieces and for binding the brickwork together. They were made of any length, width, and height. In a paper read by him before the Institution of Mechanical Engineers in 1852, he claimed to prove, in opposition to previous assertions to the contrary, that as large a quantity of gas could be generated with a given weight of fuel with clay retorts as with those made of iron.

In consequence of the high temperature at which it is necessary to work a bed of clay retorts, the air that escapes from the flues carries away a large amount of heat that may be rendered available for other purposes. It occurred to Mr. Lowe to apply this waste heat to carbonize coal in iron retorts, which required a lower temperature; and to effect this object, he combined several clay and iron retorts in the same oven. He obtained a patent in 1839 for working his iron and clay retorts together.

About fifty years ago, the great quantity of gas tar thrown on the market so far reduced the price that it became more economical to burn it than to sell it to distillers. Mr. George Anderson patented a furnace specially adapted to the burning of tar with the best effect. It consisted of an inclined plane of brickwork, terminating within a few inches of the back bridge, and corresponding to the tar space in an ordinary furnace. The tar was admitted at the front or higher end of the inclined plane in the usual manner, through a spout. It caught fire immediately it touched the heated brickwork, and trickled down blazing, always presenting a fresh surface; and it was thus completely volatilized before it reached the bottom of the inclined plane.

The difficulties attending the accumulation and removal of carbon in retorts troubled the managers of half-a-century ago as much as now. Mr. Grafton, of Cambridge, was one of the number who tried to solve the problem. Many and varied are the methods that have been adopted and patented to remedy this evil. As yet, we have not reached the ideal, but much has been accomplished by the introduction of apparatus similar to Meldrum's patent scurfer.

The difficulties connected with the introduction of anything new, especially in a branch of manufacture so entirely domestic in its resources and application as gas lighting, must not be all set down to the opposition, the prejudices, or the indifference of the public. There were hindrances and causes of embarrassment fifty years ago which are entirely unknown at the present day. There is a sense in which it might now be truly said that everything may be obtained for money. It was not so fifty years ago. Were it possible to look at, and ponder over, what can be done in bringing into existence the whole, or some of the most important parts, of a gas establishment, with the thoughts and feelings and impressions of the men who occupied the foremost rank in this kind of work fifty years ago, we should find it difficult to believe that so much has been accomplished in what we might term a single lifetime.

Discussion.

Mr. A. SMITH (Tradeston) thought Mr. Orr should be thanked for putting on record this interesting account regarding carbonization fifty years ago. It was certainly the experience of the pioneers; and it ought to be of weight, in the light of what was taking place in the present day. He did not know what odds those gentlemen

had to work against; but there was no doubt the operations they carried out in their time had benefited the present generation. To those who were working in the carbonizing department, it was interesting to hear about the different forms of retorts which had been in use. He would have liked Mr. Orr to have gone a little further, and spoken about present-day carbonizing. There was a revolution going on in this department of gas making. There was no doubt that the vertical retort of Murdoch, and its adaptation to the form of an inclined retort, showed the ingenuity which Murdoch had in his thoughts with regard to carbonization. He himself was not very old in the gas profession; but he could remember seeing three iron retorts in an oven, and it was considered that nothing could be adopted which would be better than iron retorts. This was in a small gas-works in the North of Scotland. The difficulty with clay retorts was the same then as now—the letting of them down (say) on Sundays. On account of the contracting of the clay, it was difficult to get them to keep tight; and their experience was that, when they did stop for a time, on Sundays, in the first charge a considerable quantity of gas passed through the retort, until the carbon filled up the spaces. The advantage with iron retorts was that they admitted of letting down. Mr. Orr's remarks about the removal of carbon from the retorts were to the point. Many methods had been tried; and they needed some system yet, for the satisfactory removal of the carbon. It would be better if carbon were not formed at all; but it did form, and was one of the things which they had not yet been able to get over.

The PRESIDENT said that Mr. Orr's paper did not lend itself to criticism; but he wished to thank him personally for coming forward with such an interesting contribution. Many of them who were juniors, and students in the gas profession, ought to look at what was being done at the present time, giving heed to the advantages of the new methods of carbonization. But it would do no harm if they went back (say) fifty, or a hundred, years, and studied the methods which were in use then. Everyone who read of the progress of the manufacture of gas, since it was first carried out, would find it interesting, and would also see that a great many of the methods adopted at the commencement, as shown by Mr. Orr, were, to a certain extent, in use at the present time. For instance, Mr. Orr had shown them sketches of vertical retorts; and the principle of those retorts was identical with the principle and the working of the verticals of to-day. Of course, there was a little alteration in the design and the working method; but this was due, to a great extent, to the technical knowledge which had been gained during the last fifty years. Fifty years ago engineers had not the same facilities for acquiring a knowledge of the chemistry or the engineering of gas manufacture. At the present time they had all these advantages; and no doubt this was what the progress in the plant and methods of carbonization was due to.

Mr. ORR said that, like the President, he had not expected much discussion. Many things which occurred fifty years ago they must take for granted; but he had come across much matter which, as it were, threw a side-light upon the subject. He regretted he had no official figures as to what was done fifty years ago—such as the make of gas per ton, the quantity of tar and liquor obtained, and the illuminating power. But in going over some figures to which he had had access, he was surprised at some of the items. For instance, going back to 1873, high prices were paid for coal. Contracts ran from 26s. 6d. to 39s., and some as high as 47s., giving an average price of 33s. 9d. per ton. He did not think many managers would care to buy coal at 33s. 9d. per ton now. Of course, the gas made per ton of coal was very high—from 10,000 to 11,000 cubic feet. An old stoker said to him that, if they did not get 10,000 cubic feet, they heard of it. Lime in 1873 cost 17s. per ton, and spent lime fetched 2s. 6d. In 1875, retorts costs about 62s. 6d. each; in 1877, they were 45s.; in 1878, 40s.; and in 1879, the same retorts were 35s.—a drop of 27s. 6d. in four years. Another item which attracted his attention was the fluctuation in the tar and liquor market. From 1873 to 1876, tar realized 6s. 9d. per 100 gallons; between 1876 and 1879, it rose to 9s. 3d.; in 1880, it was 9s.; in 1881, 9s. 9d.; in 1882, 10s. 6d.; in 1883, 14s. 7d.; in 1884, 16s.; in 1885, 10s. 4d.; in 1886, 2s. 3d.; in 1887, 2s. 2d.; and in 1888, 4s. 7d. Many of them would be delighted to sell tar for 16s. per 100 gallons now. The charges in the early days were from 2½ cwt. to 3 cwt., with four hours in the retort. The illuminating power was also higher—from 28 to 30 candles being the average. Of course, the price of gas was much more than now. In 1859, it was 7s. 6d. per 1000 cubic feet. Coke realized 6s. 8d. per ton. The building-in of the retorts in those days cost about £1 per mouthpiece. There was no cutting-down of prices then.

On the motion of the PRESIDENT, Mr. Orr was formally thanked for his paper.

Gas Consumption in the United States.—According to the last report of Mr. E. W. Parker on the mineral resources of the United States, the total production of gas in the past year amounted, in round figures, to 183,388 million cubic feet, made up as follows: Coal gas manufactured in gas-works and bye-products coke-ovens, 56,945 millions; gas made in retort-ovens, 16,206 millions; and oil and water gas, 110,237 millions. The total value of the gas is returned at \$136,128,605, or about £27,225,721. The total make in 1907 was 180,899 million cubic feet, valued at \$129,766,255, or about £25,953,251.

CALORIMETRY AND THE CALORIFIC STANDARD.

At the Meeting of the London Section of the Society of Chemical Industry, at Burlington House, on Monday last week—Dr. J. Lewkowitsch in the chair—Mr. J. H. COSTE, F.I.C., of the Chemical Department of the London County Council, read a paper on "Technical Gas Calorimetry." Until the paper is printed *in extenso* in the Journal of the Society, we are only permitted to publish a digest of the contents.

The author first pointed out that the steady increase in the use of gaseous fuel and the introduction of systems of lighting not depending upon the incandescence of the carbon particles have rendered necessary some other criterion of the quality of gas than that of illuminating power. The obvious requirement is the determination of the heating value of the gas. He described the differences between gross and net calorific power, and, in passing, mentioned that the results of tests expressed in calories can be converted to B.Th.U. by multiplying by 3.968. He referred to the work of Thomsen and Berthelot on the calorific power of pure gases as enabling one to calculate the calorific power of mixtures of known composition; the principal difficulty being the adoption of a working convention as to the nature of the unsaturated hydrocarbons. He remarked upon the great differences there are between the calorific powers of the unsaturated hydrocarbons—quoting, among others, the gross and net figures for ethylene, propylene, and acetylene. These show great differences; so that it is a matter of considerable importance, in regard to the adoption of a good working standard for gauging calorific power by this means, to know the nature of the unsaturated hydrocarbons. It has been found to be a good working convention to regard their average calorific power as equalling that of propylene. He illustrated this by showing on the screen two tables—one giving results calculated in this way, and the other the results of tests made directly by calorimeter. It was seen that, on the whole, there is a fair agreement between the gross and the net calorific powers so calculated and those directly determined. There were a few cases in which the agreement in the gross figures was not good; but generally the assumption as to propylene representing the average calorific power of the unsaturated hydrocarbons has been found a useful working one. But this indirect method of assessing the calorific power, depending as it does upon the accuracy of the analysis of the gas, which can only be undertaken by a skilled worker, cannot be considered so satisfactory as the direct method.

Referring to the general forms of calorimeter that have been designed for the purpose of determining the thermal value of gas, the author said in the one type a small quantity of gas is allowed to burn, and to heat a fixed amount of water; and in the other type, the gas is allowed to burn at a measured rate, and to heat to an observed temperature a constant stream of water. In the author's opinion, there is no doubt the flow type of instrument is the better. Several readings of the temperature of the water—inlet and outlet—can be taken; and the average temperatures computed for both inlet and outlet with a high degree of accuracy. The amount of water, too, condensed from the products of combustion can be gauged with sufficient accuracy to determine the net calorific power. For technical purposes, both Hempel's and Simmance and Abady's portable calorimeters can, if carefully adjusted, be used to give results with a fair degree of accuracy; but only gross calorific power is determined in these instruments. The author named the several inventors of calorimeters; and then, by means of sectional views thrown on the screen, as well as actual examples before him, he explained their construction and methods of working. He first described Hempel's apparatus, which is more suited to purely laboratory work than to the practical requirements of every-day testing. Simmance and Abady's portable calorimeter, he mentioned, gives results which are moderately accurate; and on the whole it is a fairly convenient apparatus, and well devised.

In the class of flow calorimeters, the author considered two examples—Junkers' and Boys'. While the former is the better known, the one devised by Professor Boys has been adopted by the Metropolitan Gas Referees for the official testing of the gas in London. The instrument has stood a practical test for over three years in the nineteen testing-places in the administrative area of the London County Council; and it has given a good account of itself. One serious difficulty has been the leakage from the unions of the coils. These leakages can be tested for by placing the calorimeter *in situ*, permitting it to drain well, and then letting the water flow at the usual rate. A leakage at the top, where the coils are joined to the inlet, is due to the decay of the washers. If care were taken to replace the washers from time to time, many of the complaints would not occur. It seems improbable any other calorimeter would stand constant usage as well as this does when fairly treated; and no other calorimeter can be so easily taken to pieces, repaired, or inspected.

The following sources of error are likely to affect flow calorimeters:

1. Heat is lost if the exhaust gas is cooler than the inlet air. The gases leaving the calorimeter are frequently cooler than the air of the room. [Official correction is made for this. See "Notification of Gas Referees," p. 8.]
2. Heat loss or gain by the condensation or vaporization of the water during the passage of the air through the

calorimeter. [This under any likely conditions of the atmosphere affects the gross calorific power only (not the net) to the extent of ± 1.6 calories.]

3. Loss by radiation.
4. Errors due to the assumption that 1 litre of water weighs 1 kilogramme. [From -0.26 to $+1.16$ calories, affecting both gross and net.]

It is difficult, the author said, to conceive any instrument so well devised as this one of Professor Boys, having the cooling water entering the outside coil, and allowing an inappreciable loss by radiation or conduction. It seems, having regard to the construction, extremely improbable that radiation loss can be at all serious. Both the Junkers and Boys instruments may be regarded as two most useful calorimeters, and both are fairly portable; but the Junkers is the superior in this respect. The Boys instrument, however, is easier read, owing to the two thermometers being placed on the same level. Generally speaking, there appears to be no reason to suppose that the average thermometer reading in either case does not represent the average temperature of the outlet water. The Junkers has certainly the defect that the thermometers show spasmodic jumping, owing to slight variations in temperature. The Boys is superior in this respect. In the Boys instrument, it is very necessary to see that the inner vessel is accurately centred. Of course, both instruments may be expected to give the best results when working under laboratory conditions. The author threw on the screen the results of a number of simultaneous readings with (using the same gas), in one case a Junkers and a Boys calorimeter in comparison, and in another two Boys instruments. The results were fairly concordant—in fact, the author described them as "very good indeed." In regard to the suggestion that has been made, that the combustion of the gas is not perfect in the Boys instrument owing to the use of flat-flame instead of atmospheric burners, the author described a number of tests made with the exhaust gas, which proved that fears in this respect are groundless.

Next, Mr. Coste considered the question of the relation of calorific power to illuminating power; showing how the old belief as to a relationship existing is not well founded. A gas that is made under conditions in which a large proportion of methane is produced, should have a higher calorific power than one where the temperature of carbonization tends to the production of a large amount of hydrogen, and the exhaust to a large quantity of carbon monoxide. The use of blue water gas also lowers the calorific power. The variations that exist in gas manufacture produce so many anomalies that no real relation can be established between calorific power and illuminating value. The author gave a number of figures to illustrate the point—some of them being for coal gas made in a small works using clay retorts and no exhauster; for coal gas supplied by one of the Metropolitan Gas Companies; for mixed gas also supplied in London; and for the gas from Glover-West vertical retorts (examined by Dr. Colman). It would, the author said, be noticed that, although 21-candle gas showed a marked superiority in heating value, the nominal 14 to 16 candle gases do not differ greatly in calorific power among themselves.

In concluding his paper, the author said it is impossible to assign to a gas of known candle power a definite calorific power on mere *a priori* grounds. Calorific standards can only be fixed by a long series of tests; and pure coal gas will always be found to have a higher calorific power than a mixed gas of the same candle power. The average calorific power of 14 to 15 candle coal gas is about 130 calories net; while mixed gas of the same illuminating power is about 125 calories. And 16-candle coal gas is not more than about 2 calories above 16-candle mixed gas. It is probable that calorific power will be the future standard for gas, and that illuminating power will lose even the restricted importance which it at present possesses. But it is quite clear that no standard for calorific power can be satisfactorily fixed for any supply unless the gas is thoroughly tested and determinations of the calorific power made over a period. In the Metropolitan, over the past three years, such tests have been made; and it is most desirable that gas authorities everywhere should institute regular testings for calorific power as has been done in the Metropolitan, so that a suitable calorific power standard may be settled when an appropriate occasion arises.

Discussion.

Professor C. VERNON BOYS (one of the Metropolitan Gas Referees) said that he felt the Society were much indebted to the author for giving them what was evidently the accumulation of a large amount of patient work. He had listened to the paper with considerable interest; and he might also say with a certain modified amount of satisfaction. Naturally, he had looked at the matter from the rather special point of view of the advantages and shortcomings of the instrument for which he himself was responsible. With regard to the tests the author had made, he (Professor Boys) need hardly say that many of them had been made by himself independently, though not published, but merely for information. There were a good many points raised in the paper to which he should like to refer; but he would limit himself to two or three. In the first place, there was the fundamental distinction upon which the author had dwelt between the Junkers and his own instrument, in that the water in the latter was small in quantity and took every part of the machine in series—all parallel parts being avoided. When calorimetry arose as a practical question, he made a good many tests with Junkers

and other calorimeters. With the Junkers, he found what the author had described as little jumps, which would make accuracy exceedingly difficult for a gas examiner who had to make day-by-day tests. What was required was that as much as possible should be done by the apparatus, and as little as possible should be left for the attention and judgment of the user. It seemed to him that these small jumps were undesirable, because it would be very difficult for a gas examiner in taking his observations—in fact, it would be very difficult for anyone, in taking observations, to avoid extremes—to know exactly what readings he ought to take when the thermometer column was making these little spasmodic jumps. It seemed to him that the outlet thermometer readings should be as smooth and even as those of the inlet water—indeed, if possible, it should be free from jumps of all sorts; so that when the examiner came to the routine that he had to follow, and simply took observations at stated times, there would be no question of him having taken a favourably high jump or an unfavourably low one. There ought to be no question at all. In order to obtain this result, it appeared to him that parallel flows of water through alternate channels would be sure to give rise to jumps, which no little mixing-chamber could possibly overcome. Because in the movement of water in a parallel flow scheme, the water would hang, and would then move on when a higher temperature caused it to pass with (if he might so describe it) some self-motive force. They had there an instability of condition which the small mixing-chamber, so he thought, could not possibly avoid. He therefore felt that it was much more important that the water should take every part of the machine in series; so that there could be no place where it would accumulate until it got hot enough to force its way and overwhelm the other stream which had taken charge of the thermometer hitherto. Then there was another point which did not refer so much to this particular instrument as to the whole question of calorimetry. It was the question of measuring the calorific power of gas either by its gross or its net value. Though he knew quite well there was an idea that the real scientific test was the net one, he was not sure himself that it was a very scientific one, or that it was reasonable. When the steam was condensed, and the heat abstracted due to that condensation, one got the heat that was caused—by what? Not by burning the gas, and letting the products cool down to the temperature of boiling water. It was a purely artificial measure, obtained by letting the permanent gaseous parts be cooled down to the outlet temperature of the instrument from which was subtracted the latent heat due to the condensation steam, and the specific heat due to the cooling of the condensed water down to the outlet temperature. That was absolutely artificial; it meant nothing. It might be a convenient means of judging of the quantity of heat present in the gas; but it was not scientific as a measurement of the heat value of the gas. It must be remembered that calorimetry was going on long before there was any question of the testing of gas in the Metropolis with a calorimeter; and it was obviously desirable in instituting any test not to go away from practice. He did not himself think the test was a scientific one or that it meant anything at all; but it was a test that was universally understood. So much for "gross" and "net." Then he should also like to say that he thought they were right in going on describing the calorific value by calories rather than by thermal units. That which was most conveniently measured was the calorie. Thermometers on the Fahrenheit scale could not be obtained so reliable or cheaply as on the Centigrade scale. All the apparatus for measuring was also on the metric system. The measurement of the heat on the metric scale was more natural to the scientific mind; and having measured it so, why should one not say so? He appreciated the author's point about centring the instrument in the casing. He had not previously noticed that the instrument could be given this small amount of movement; and so the centring was very desirable. It was, of course, advisable that the inner casing should not ride up against the outlet-tube. If it did not do that, the overflow would be fairly uniform; and the long time over which it was taken would get rid of any uncertainty on the score of regularity.

The CHAIRMAN mentioned that the Society had with them that night the President of the Institution of Gas Engineers; and they would be glad if he would speak on the paper.

Mr. J. W. HELPS said, as a gas engineer, he must offer to Mr. Coste his hearty thanks for the clear and excellent way he had brought this question of calorimetry before the meeting. He was sure that every chemical assistant in every gas-works would feel, when he obtained possession of the paper, that he had got information in it which would enable him to do his work better in the future than in the past.* The figures would settle many points with which chemical assistants had been wrestling for a long time. He (Mr. Helps) felt the days of illuminating power for gas were practically numbered. When it was known that nearly the whole of the illumination of their towns was carried out by means of incandescent burners, and that a great deal of the gas distributed was used for heating and cooking purposes, it was evident the question of illuminating power was not now of any great importance. Whether gas was used for lighting or heating or anything else, it remained a question of the first order for them to consider as to what degree of calorific power for gas was the best for the important but various work it had to perform. He agreed with what the author had said as to the absolute impossibility of being

able to calculate the calorific power from the illuminating power of a gas. Ten years ago, he (Mr. Helps) carried out some experiments; and the figures Mr. Coste had shown tallied very closely with those he himself obtained, in trying to find the ratio of illuminating power to calorific power in gases varying in their constitution. In these days when coal gas was sometimes made in vertical retorts, or in horizontals, or inclines, with light or heavy charges, when sometimes the coal gas was mixed with carburetted water gas or blue water gas, it was impossible to get to any direct ratio in that way. He felt sure it would not be long before every gas authority—company or municipal—would use calorimeters to a much greater extent than in the past; it would be absolutely necessary for them to do so. He did not quite see—though he quite agreed that gas undertakings should have a calorific test—the necessity for having an illuminating power one as well. Let gas undertakings have a calorific power test, and they would be satisfied; but he did not see the good of having, simultaneously, another test which was of practically no use at all. Whatever burner was used for testing illuminating power, the extent to which the reduction could be made was limited by the heating power of the gas; and as it was possible to vary the conditions under which gas was produced, so as to increase its calorific power while actually reducing its illuminating power, the infliction of a test for the latter really stood in the way of the customer being supplied with the most suitable gas for his various purposes. However, it would not be long, in his opinion, before the gas industry had a calorific standard substituted for the illuminating power one.

Mr. W. J. DIBDIN remarked that, although he had not had an opportunity of working with the Boys calorimeter, he had worked with other calorimeters a great deal; and from what he had seen and from what he had heard, there seemed to be no question whatever that they were now in possession of an acceptable instrument—that Professor Boys had placed in their hands a thoroughly reliable and trustworthy instrument, by means of which the calorific value of coal gas could be readily ascertained. That was a satisfactory position. The instruments they had had before were only more or less good; and, as Professor Boys himself mentioned, they had the peculiar knack of giving variations in the outlet temperature, which was a serious defect. Those who were accustomed to use the domestic geyser had no doubt, like himself, had extraordinary results with gas burning and water flowing through under precisely similar conditions—there were sometimes considerable differences in the temperature of the water running from the geyser. This was a gross and exaggerated example of, but it illustrated, what happened with calorimeters when they took the form of the ordinary domestic geyser. So that he was quite prepared to accept the statement that the older forms were not so reliable as the newer one. The method of working with the old instruments was to take a number of observations, and exclude any abnormal ones. That was really not scientific procedure. The Boys instrument was a marked step in advance. Against the calorific power test, they had the ordinary method of testing coal gas for illuminating power. He did not think, however, there was anybody in the room who would stand up and say he was satisfied, under all the modern conditions, that photometry supplied a satisfactory test of the value of coal gas for domestic purposes, as now consumed. The general idea of illuminating value had vanished. They had different burners and different methods of using them, as well as different standards. And the various conditions that had been introduced into modern gas manufacture had so complicated the problem that he, as an old gas photometrist, looked upon ordinary photometry as a thing of absolutely no value. He could, in fact, sympathize entirely with an observation once made by Sir George Livesey, who said: "I will not have any more tests—neither illuminating power nor calorific power." But he (Mr. Dibdin) believed Sir George came to the conclusion that the calorific power test was a trustworthy one. He hoped with Mr. Helps that the calorific power test would be the one reliable test of coal gas for ordinary domestic heating and lighting, because, though the old flat-flame burner was still largely employed, yet, compared with the quantity of gas used by other means, the amount consumed by the old-fashioned burners was a matter of insignificance. The time for change had now arrived. Some years ago they thought the flat-flame and argand burners important things; but clearly the heating value of the gas was now the important factor. The question had come fairly and clearly to the front; and the contribution of the author would therefore be of the utmost possible value.

Dr. H. G. COLMAN remarked that he was glad he had nothing, or practically nothing, to say in the way of criticism. Mr. Coste's figures were almost exactly the same as he (Dr. Colman) had obtained during the course of the past ten years. Practically the only point on which he had any bone to pick with the author was in regard to the calculation of the calorific power from analyses. According to his view, the figures quoted by the author were some 1·5 per cent. too high, compared with actual tests made with the Boys instrument. The calorimeter tests were made with a wet meter; and the gas was always measured moist at 60° Fahr. and 30 in. Bar., and contained something like 1½ per cent. of moisture. When calculating from an analysis, a dry gas was assumed, so that the whole of the figures obtained in calculating from analyses were, in comparison with the figures got from direct measurement, 1·5 per cent. too high. To put it the other way, instead of there being agreement between the tests with the calorimeter and the calculations from analyses, the former, in comparison with the

* An extended notice of the paper will be given in our columns when published in the Society's own Journal.—ED. J.G.L.

latter, were $1\frac{1}{2}$ per cent. too low. There was one other point on the question of the hydrocarbons. He quite agreed that, for ordinary practical purposes, one might take the saturated hydrocarbons as being represented by propylene with a sufficient degree of accuracy. But the newer methods of gas manufacture—the use of vertical retorts—did give a rather lower proportion of benzene vapour, and a higher proportion of ethylene in the unsaturated hydrocarbons. He trusted that the substitution of a calorific standard for an illuminating one would now come very rapidly, as there was no more unsatisfactory work than that of photometry. “May the day of the change of standard come soon!” He was glad Mr. Coste had given it a hand forward. He agreed with Mr. Helps that the double standard was to be deprecated, and was certain this would turn out impracticable, unless the one or the other was made so low as to be practically useless as a standard. Respecting Mr. Dibdin’s remarks as to the old calorimeters and the new, he thought that gentleman was a little hard on the Junkers. He (Dr. Colman) must confess he had not had an opportunity of making many tests with Professor Boys’ instrument; but he had worked with the Junkers for fourteen years, and must speak up for it as being an excellent instrument.

Mr. DIBDIN: My point was that the principle was not quite so good as that of Professor Boys.

Dr. COLMAN agreed with the point as to the slight jumps in the readings of the outlet thermometer to which Professor Boys had called attention. But in ordinary tests, he thought, as Mr. Coste had pointed out, there was practical agreement between the two instruments. In practical use, the chief inconvenience was the different levels of the two thermometers in the Junkers instrument, which necessitated the jumping up and down of the observer from the one to the other.

Among other speakers,

Mr. C. J. DICKENSON GAIR remarked that he could certify that excellent results could be obtained with the Simmance-Abady flow calorimeter. He agreed with other speakers that there was a great tendency for the outlet temperature to jump several fractions of a degree in working with the Junkers calorimeter; but with the Simmance-Abady flow calorimeter, this defect was not found. He had not had the opportunity of becoming very conversant with Professor Boys’ instrument, but had continuously used both the Junkers and the Simmance-Abady; and he had always found the latter the more satisfactory of the two. There was some difficulty in the Junkers instrument as to the condensed water. The flow of condensed water was more or less irregular; and, unless several cubic feet of gas were burned, one could not be sure of having the proper reading. In short, with the Junkers, one could not get snap tests so correctly as with the Simmance-Abady. It was a good suggestion of Mr. Coste’s to take propylene as the most correct hydrocarbon from which to calculate. It was also a good thing occasionally to calculate from analysis; but it was better to take the average calorific test itself.

Mr. COSTE, in replying to the discussion, said there was really little for him to comment upon. He was pleased to hear Professor Boys’ remarks, and was very glad he appreciated the point about centring the instrument. This was not an academic question. Some time ago, they found abnormal differences between gross and net; and careful examination of the instrument with which the results had been obtained showed that, by placing the calorimeter eccentrically in the outer case, these erroneous results were obtained, but by carefully centring it, the results became normal. Mr. Helps, representing the gas industry, Mr. Dibdin, and Dr. Colman generally agreed with him. He noted Dr. Colman’s point about moist gas. The fact remained that the figures as calculated did agree well for all practical purposes, though, of course, they all agreed, it was better to have direct tests. But these indirect ones from analyses were useful for the confirmation of observed results or for calculation of calorific power when a calorimeter was not available. He hoped it would be generally realized that he had said the Junkers calorimeter was an admirable instrument, and that the variations in individual readings did not affect the average outlet temperature.

NAPHTHALENE PICRATE, AND THE QUANTITATIVE DETERMINATION OF NAPHTHALENE.

At the Meeting yesterday week of the London Section of the Society of Chemical Industry, a paper was on the *agenda*, on the above subject, by Messrs. W. P. JORISSEN and J. RUTTEN. In the absence of the authors, Dr. H. G. Colman, at the request of the President, indicated the cardinal point of the communication. A short account of the system has been already published in the “JOURNAL” (Sept. 8).

The authors in the paper state that, having attempted to estimate naphthalene by Colman and Smith’s method, and finding that, owing to the decomposition of naphthalene picrate on washing, the results given were too low, they made an investigation of the equilibria existing between naphthalene picrate, water, and solid picric acid, and also extended their investigation to the behaviour of other solvents than water; the results obtained and their interpretation from the physical chemistry standpoint being given in the paper.

From the results obtained, it follows that, when gas containing

naphthalene is passed through a saturated solution of picric acid containing in addition solid picric acid, the naphthalene is directly obtained as naphthalene picrate, and is not, as in Colman and Smith’s method, partly dissociated into free naphthalene and picric acid; and they therefore recommend the use of such a solution in the determination of naphthalene—details of the exact procedure being given. Check tests made with known quantities of naphthalene showed close agreement with the actual amount taken.

Dr. COLMAN said that, in their original paper, Colman and Smith had already pointed out that, in testing for naphthalene by their method, the precipitate of naphthalene picrate obtained must only be slightly washed with water, as otherwise too low results were recorded, for the reason pointed out by Messrs. Jorissen and Rutten. In his present practice, he avoided washing the precipitate at all, the contents of the bottle, after heating and subsequent cooling, being poured into a measuring cylinder, the volume noted, and the whole filtered through a dry filter paper, rejecting the first few cc. of the filtrate—these being weaker than the rest owing to the adsorption of picric acid by the filter paper; 100 cc. or more of the remainder of the filtrate was then titrated in the usual manner with decinormal alkali; and from this and the observed volume of the original solution, the total quantity of picric acid in the latter was readily calculated. A slight error was introduced, inasmuch as the volume of naphthalene picrate was also measured along with the solution; but the magnitude of this error is very small.

Mr. C. J. DICKENSON-GAIR, commenting on the above, said the figures placed on the board by Dr. Colman, showing the accuracy of the method proposed by Jorissen and his fellow worker, were very little more in accord with one another than similar figures placed on record by Dr. Colman and Mr. Smith to prove their own method some years ago. Personally, he (Mr. Gair) had not found any great difficulty in the correct estimation of naphthalene by the customary methods in use in this country. As Dr. Colman had pointed out, the difficulty which had to be overcome was due to the fact that, when naphthalene vapour was passed into picric acid solution, pure naphthalene picrate was not precipitated, but a mixture of naphthalene picrate and naphthalene. The latter might sometimes be seen floating on the surface of the picric acid solution as a scum. Dr. Colman and Mr. Smith had got rid of this difficulty by heating the precipitate in vacuo—pure naphthalene picrate recrystallizing from the solution on cooling. Another method proposed by himself (Mr. Gair), in a paper read before the Society, to achieve the same object had for its basis the use of acetic acid as a solvent of naphthalene. The gas to be tested was passed direct into the acetic acid; the naphthalene going into solution, from which it was precipitated directly as pure naphthalene picrate by an excess of picric acid. In Colman and Smith’s method, and also the latter method, the naphthalene picrate was found to have a melting point of 146° C., as against the absolute one of 149° C. They could be relied on with ordinary care to give 98 per cent. accuracy. The indicator generally used in naphthalene estimations was lacmoid, which turned from brown to green with alkali; but he had found that with boiled solutions, phenolphthalein gave a much sharper and more delicate end reaction. The use of this indicator might lead to even greater accuracy, in naphthalene estimations, than had hitherto been the case.

VERTICAL RETORTS AT MANCHESTER (N.H.).

In the general review of the proceedings at the recent annual meeting of the American Gas Institute which appears elsewhere, reference is made to a report by Mr. Walter G. Africa, of Manchester (N.H.), on the working of the vertical retorts in the gas-works in that town. It may be remembered that last year two benches of nine retorts, 8 in. by 14 in. at the top, 12 in. by 18 in. at the bottom, and 18 ft. 6 in. long, were completed at these works; and they were described in the course of a paper submitted by Mr. J. H. Taussig at the meeting of the Institute twelve months ago, and noticed in the “JOURNAL” at the time. [See Vol. CIV., p. 493.] One of the benches was worked for a number of months during the year, with the result that the furnace and recuperators were found to be entirely satisfactory. As no vertical retorts had previously been tried with American coal, the size decided upon at Manchester was in the nature of an experiment. A small size was adopted in order to carbonize the coal in the shortest time possible, and obtain, through short charges, a greater capacity per bench per 24 hours. These retorts did not prove to be entirely satisfactory with the run-of-mine West Virginia coal used during the tests. The charges were burnt off in six hours, but would not discharge without some caking, at both the top and the bottom of the retorts. Tests were, however, made of screened coal of uniform sized lumps which worked much more satisfactorily.

In Mr. Africa’s report, he states that, in order to determine the best size of retort to carbonize American coal, the nine small retorts were removed, and replaced by five of different sizes and tapers, having a capacity varying from 1000 lbs. to 2200 lbs. of coal per charge. These experimental retorts were under fire for several months; and they demonstrated that a retort 10 in. by 14 in. at the top, 15 in. by 21 in. at the bottom, and 18 ft. 6 in. long, gives the best results; discharging entirely satisfactorily in

nine hours, and in a large percentage of the trials in eight hours—indicating that if the benches were fitted with retorts of a uniform size, and operated continuously and regularly, it would be safe to base calculation on eight-hour charges. The vertical retorts were under fire at the same time that the horizontal benches were in operation, and both gases were aspirated by one exhaustor.

In order to determine exactly what results were being obtained from the vertical retorts, a 5-foot station meter was connected in such a manner that the gas from them was pumped through it by a separate exhaustor. This test was made during the latter part of last June. A connection was made from the meter to the photometer-room, and a sample of the gas, purified by oxide, was passed through a 30-gallon mixing-tank, and thence to the bar photometer—a pentane lamp being used as the standard. For several days, hourly readings of the photometer were made.

The analysis of the West Virginia coal used at Manchester is as follows:—

	Per Cent.
Moisture	1.25
Volatile constituents	39.30
Fixed carbon	53.85
Ash	5.60

Sulphur	100.00
	0.76

Calorific value, 14,640 B.Th.U.

The following is an analysis of coke from a nine-hour charge:—

	Per Cent.
Moisture	0.10
Volatile constituents	2.40
Fixed carbon	89.20
Ash	8.30

Sulphur	100.00
	0.85

Calorific value, 14,329 B.Th.U.

The continuous hourly test gave the following results:—

Yield per pound of coal	4.82 cub. ft.
Illuminating power (with flat-flame burner)	16.08 candles
Candle-foot per pound	77.51
Calorific power	635 B.Th.U.

Carbonizing 45 per cent. of capacity of setting.

The yield of coke and fuel used in the furnaces was as follows: Percentage of coal carbonized used in furnace, 23; total coke made, 61 per cent. of the coal carbonized. The tar obtained was thin, and contained about 7 per cent. of free carbon. The coke is of a better quality than that obtained from horizontal retorts, and produces less breeze. The cost of labour per 1000 cubic feet will compare favourably with that of machine-stoked horizontal retorts.

Mr. W. Doig Gibb's "Greeting" to his Co-Partners.

As the new Chief Engineer of the South Metropolitan Gas Company—Mr. W. Doig Gibb—entered upon his duties early last month, it was only natural that he should take the first chance of getting into touch with the employees. An opportunity was afforded him by the Chairman (Mr. Charles Carpenter) of meeting many of them; but, as he could not reach all, he availed himself of the pages of the "Co-Partnership Journal." Mr. Gibb says:

I come among you as a stranger, proud of the position to which I have been appointed, but with a deep sense of the responsibility in following such men as the late Sir George, his brother, and our present Chairman. The latter has already explained why I was brought in; and I take this opportunity of saying that I believe in promotion from within whenever this can be done. It is only fair that, if the circumstances warrant it, the employees should be first considered when better positions become vacant. In my case, time, which waits for no man, did me a good service; but I recognize, with gratitude, that our various heads of departments are evidently to be the first in making me comfortable, and in giving me such information as will make me an efficient link in this large and important Company's machinery. To the workmen especially I would say that I have served five years as an ordinary apprentice in an engineering shop; and there I learned to esteem and respect working men. This apprenticeship and the teaching of a good father have made me a thorough believer in two things. The first—that esteem and courtesy and consideration are equally due to all who do their work well and conscientiously and to the best of their ability, whether this means a weekly pay or a monthly salary. The second—that every man has his own acute feelings, and that the one golden rule to follow in everything is to remember to do to others as you would that others should do to you. A long time must necessarily elapse before I know our Company's business and know all my fellow co-partners. But I firmly believe in co-partnership in its broadest sense; and I rely on that co-partnership of heart and hand to help me and to strengthen me to become efficient.

Mr. Gibb adds that in ordinary circumstances he need not have said more; but he was in a dilemma, because the workmen in Newcastle gave him a testimonial to present to the workmen of the South Metropolitan Gas Company, as they were anxious that he should be introduced by them, and he could not afford to hurt their feelings by not presenting their testimonial. He said he did so in no spirit of undue pride, though he had been proud of his relations with them. His hope was rather that their words might help him to get quickly into the same relations with themselves.

REGISTER OF PATENTS.

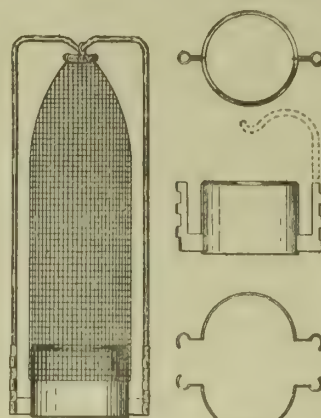
Suspending Device for Incandescent Mantles.

MARTINI, A., of Berlin.

No. 21,667; Oct. 13, 1908. Date claimed under International Convention, Oct. 16, 1907.

This suspending device has a sleeve-ring of sufficient compressibility and extensibility to render it capable of being used upon different sized burner-heads without injuring the incandescence body.

As shown, the ring is in two parts, fitting upon the upper end of the burner-head and carrying a suspending device for the incandescence bodies. The parts of the sleeve ring which are adapted to engage and hold one another are outside the ring; and they also serve to carry the suspending wire—the latter being for the protection of the incandescence body during packing and unpacking, conveyance, placing on the burner, and (in part) during the use of the body on the burner.



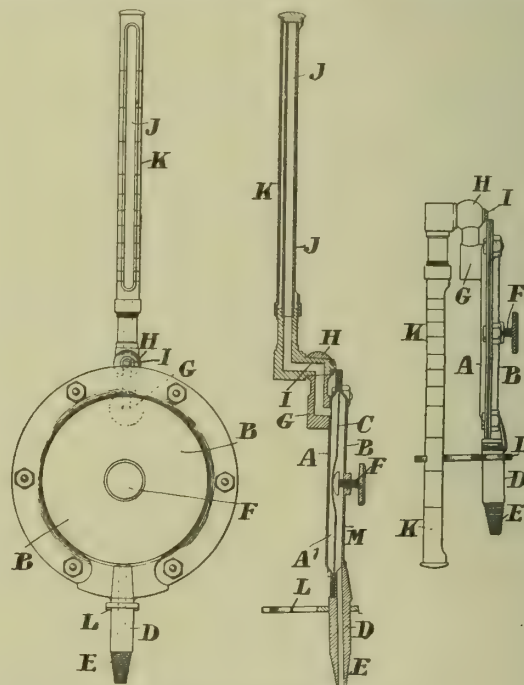
Martini's Mantle Suspender.

Pressure-Gauges.

GLOVER, R. B. G., of Queen Victoria Street, E.C., and Edmonton.

No. 24,625; Nov. 16, 1908.

This invention relates to pressure-gauges having two hollow discs with a flexible diaphragm between them, and a screw to alter the capacity of the mercury compartment for positioning the mercury at zero; a compartment being on either side of the diaphragm—one compartment having a pipe connected with the gas supply, and the other containing the mercury and having a pipe connecting with the gauge-glass. The object of the invention is to so construct the gauge that it can be affixed to any existing gas-pipe; the gauge-glass be folded on to the casing so that the apparatus can be carried in the pocket; and the mercury be positioned at zero for each testing by a movement of the diaphragm for compensating for varying degrees of temperature.

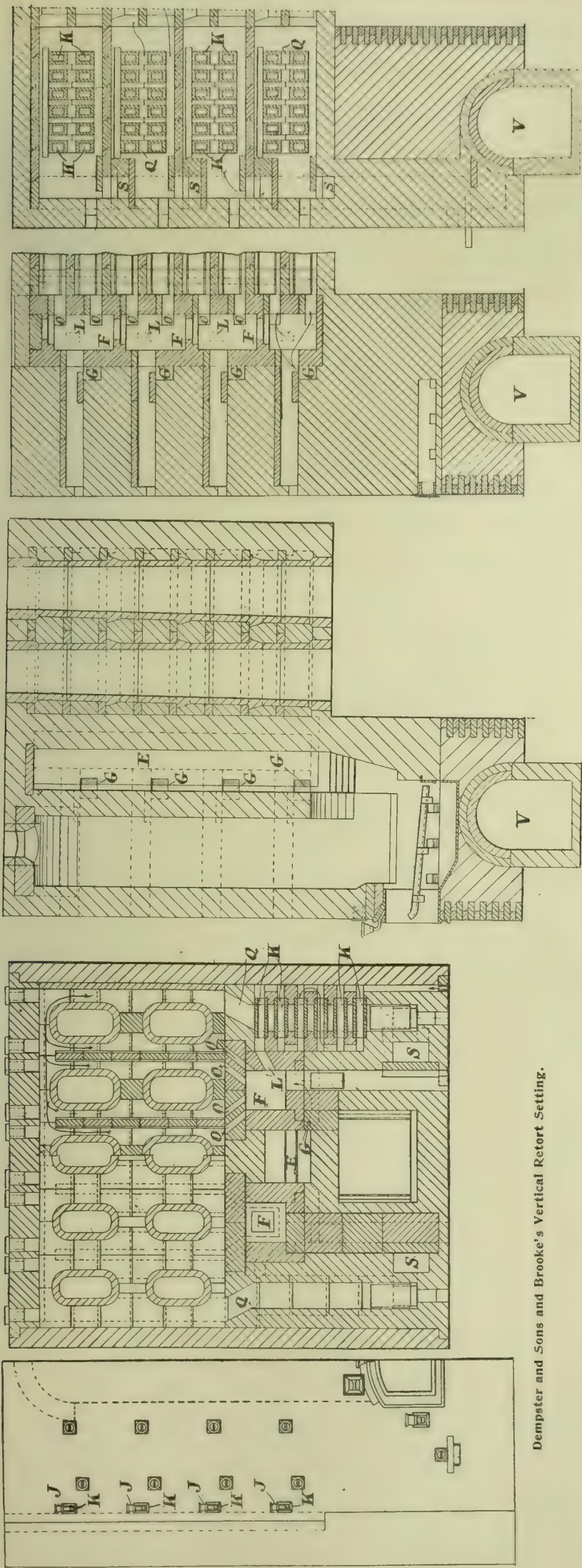


Glover's Pressure Gauges.

The illustration shows the apparatus in condition for applying to a gas-pipe; also as doubled up for carrying in the pocket.

The two hollow discs A B have between them a metal diaphragm C, so as to form two chambers. To the disc B is connected a short tube D, preferably screw-threaded at E on the end, in the manner of a gas-burner, so that the apparatus can be screwed to a gas-pipe. This disc B is also provided with a screw F for action on the diaphragm. The other disc A carries an arm or pipe G having a valve casing H; and to this arm is connected, by a plug I, the gauge-glass J, protected by a graduated casing K. The plug is revolvable for the purpose of closing the chamber or compartment A¹ containing the mercury from the gauge-glass J, and so as to position the gauge-glass and casing K next to the disc A and be held thereto by a catch L, so that the article can be carried in the pocket.

Now when it is desired to use the apparatus, the gauge-glass J is released from its catch L and placed in the vertical position—thus opening the valve formed by the plug I and casing H between the mercury compartment A¹ and the gauge-glass J. The screw F is now operated to act upon the diaphragm C, which displaces the mercury in the compartment or chamber A¹ until it indicates zero on the gauge-glass J. The apparatus is now screwed to a gas-pipe and the gas turned on,



Dempster and Sons and Brooke's Vertical Retort Setting.

when the gas enters the chamber M and acts upon the diaphragm, forcing the mercury up the gauge-glass J until the pressure of the gas is indicated on the scale.

Vertical Gas-Retorts.

ROBERT DEMPSTER AND SONS, LIMITED, and BROOKE, R. M., of Elland. No. 1037 : Jan. 27, 1909.

The principal object of this invention (which relates to vertical, or substantially vertical, gas-retorts of the type to which the inventors' previous patent, No. 16,405 of 1908 refers) is to attain practical uniformity in the heating of the several retorts in one setting, and, if desired, of different parts of each of such retorts. A subsidiary object is, in settings heated from one or more combustion chambers supplied by a single producer, to facilitate the working of a portion of the retorts—say, for example, one-half or two-thirds of the total number—while the remainder are not in use.

The illustration shows, by way of example, the application of the invention to a bed of ten retorts.

The producer-gas chamber E communicates with the combustion-chamber F, through openings G controlled by dampers. The setting is divided vertically into two portions by a wall into which the two central retorts are built; each portion having a separate vertical combustion chamber, so that, if desired, only four or six retorts might be worked while the remainder were not in use. The secondary air is admitted at each side of the furnace; the amount required for various

parts of the combustion-chamber being separately controlled by adjustable slides J. The air enters the regenerator passages K, and passes through openings into the combustion chamber, which is provided with baffles. The ports L and G are so arranged that the gases are ignited at the back part of the combustion-chamber; the object being that each port O shall better receive its share of the products of combustion.

The hot gases from the combustion-chambers pass through the ports or openings O into the setting, travelling horizontally in single streams between the retorts. Then the combined streams, having given up part of their heat, pass between the outer retorts and the pier walls to the waste-gas passages Q of the regenerators; thence, through openings controlled by dampers, to the vertical flues S. In the lower portion of these flues are dampers, which regulate the flow of waste gases from each half of the setting to the main flue V.

The setting is shown as divided by horizontal partitions into four compartments at each side; each compartment having a separate regenerator. Each compartment may be further subdivided by one or number of partitions, which act as supports to the retort but do not extend to the regenerator.

Each compartment is heated by four streams of hot gases direct from the combustion-chamber; and each stream is kept separate until each has passed over an equal amount of the exposed surface of the retorts—that is, each stream is at first confined to heating the exposed surface portion of two retorts, so that each side of each retort (except the outer ones in that division of the compartment) has a separate

supply of heat. The streams then, having each given up an approximately equal portion of its heat, unite, and the combined stream, in consequence of its increased volume, suffices to heat to the required temperature the remainder of the exposed portions of the retorts, on its way to the outlet Q. Consequently, the greatest uniformity of heating is said to be obtained in each compartment. This uniformity of heating, the patentees remark, combined with the short travel of the heating gases in practice, assists greatly in economizing fuel and in increasing the efficiency of the setting.

Owing to the slight difference in length of travel of the streams of gas to the outlet Q, from each of the inlet ports O of any one compartment, it is desirable that the port O, which is furthest away from Q, should be slightly larger than the next, and so on; the one nearest to the outlet being the smallest. However, the difference has been found to be so small that the patentees prefer, in the first instance, to make all the ports of the same size, and then, after the bench is heated, to apply some fire-clay material to the ports so as to adjust their areas. For this purpose, sight boxes are arranged exactly opposite the ports, and divisions are made on the same level, so that the fire-clay may be easily placed into position by a rod introduced at any time during working.

The inventors conclude their specification by saying: In the process of gas manufacture in vertical retorts having these improvements applied thereto, the heat applied to each part of the retort can be regulated as desired, so that the carbonization may proceed simultaneously throughout the length of the retort, and, owing to the short

travel of the streams of heated gases coming from the combustion-chamber into the setting, such streams need only have an ordinary carbonizing heat—that is, a lower initial temperature than in the present known forms of settings for vertical retorts. In the case of combustion-chambers built at the top or bottom of the setting only, with consequent long travel of the heating gases, when a retort is newly charged with a large volume of cold coal the initial temperature of the streams of heating gases must of necessity be exceedingly high, in order to be able to impart carbonizing heats to retorts throughout their length of travel, and then leave the setting at the required carbonizing heat. Moreover, in practice with long travels of heating gases, the temperature of such a stream of gases, when first coming in contact with a newly-charged retort, would probably drop below the carbonizing heat; and, in consequence, the carbonization of the coal, instead of proceeding simultaneously throughout the length of the retort, would begin at one end and gradually extend over the length of the retort, with consequent waste of time and inefficient results.

Turning Down and Extinguishing Gas-Jets on Vehicles.

D'IVERNOIS, G. H., of Paris.

No. 25,650; Nov. 27, 1908.

This apparatus, to enable all or a number of gas-burners of a railway or other vehicle to be lighted, turned low, and extinguished by operating a handle inside or outside the vehicle, comprises: (1) A high-tension magneto coil for supplying the igniting current and driven by clockwork mechanism wound up automatically by (for example) a wind-wheel mounted on top of the vehicle and driven by the resistance of the air in the travel of the vehicle; with the aid of a friction roller driven by the axle of the vehicle; by a reciprocating or rotary motor driven by the compressed air of the brake system; or by the compressed lighting gas. (2) Central controlling mechanism adapted to put the clockwork in operation to drive the magneto for supplying the igniting current to the burner. This central control mechanism, in its preferred form, consists of a box fitted at a suitable point inside or outside the vehicle and comprising a handle or device adapted to be moved over suitable indications. The movement of the handle serves through the medium of a striker and suitable stops to turn on or shut off partially or entirely a cock fitted in the gas-pipe passing through the control-box, and also to release the clockwork so as to start the magneto coil and ignite the burners.

Treatment of Coke.

ELY, B., and ROLLASON, A., of Pye Bridge.

No. 26,121; Dec. 3, 1908.

The patentees claim as their invention: "In the treatment of coke, made in retorts or ovens, excluding air and moisture from the heated mass during the process of slowly cooling, by covering the coke, when withdrawn from the retorts or ovens and while in an incandescent state, with a layer of coke breeze."

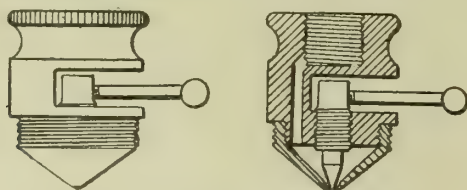
In their specification, they say that coke made in retorts or ovens has been found unsuitable for use as fuel in open fires, owing to the difficulty of maintaining the fire in an incandescent state without air-blast. To remedy this defect, they propose that the coke as withdrawn from the retorts or ovens, and while in an incandescent state, is covered with a layer of coke breeze of sufficient thickness to exclude air and moisture while it is slowly cooling down. The resulting coke, it is said, becomes softened, and when employed as fuel in an open grate or a furnace will ignite and burn with a steady flame. "Such coke," it is pointed out, "can be ground and used in the manufacture of electric carbons or blacking for foundry purposes or any other use for which soft carbon can be employed."

Regulators or Injectors for Incandescent Gas-Burners.

ZECHNALL, L., of Bunhill Row, E.C.

No. 2199; Jan. 29, 1909.

This invention relates to regulator injectors or valves for incandescent gas-burners wherein a screwed plug is employed as a needle-valve for regulating the aperture of the nozzle which forms the injector for the gas and air mixing-chamber of the bunsen burner.



Zechnall's Incandescent Burner Regulator

The body part is formed with a gap or cut-away part. It is also formed at one end with the usual screwed recess for connecting to the gas supply; while the other end is provided with a conical cap with a nozzle forming a gas-chamber in communication with the gas supply by the passage D. Within the body part, on that side of the gap adjacent to the nozzle, is a screwed plug formed at one end with a needle valve adapted to fit more or less tightly within the nozzle by being screwed backwards or forwards by the handle which projects into the gap. By turning the handle in one direction, the needle valve entirely shuts off the passage of gas through the nozzle; while by turning it in the opposite direction, a "very fine regulation" of the quantity of gas forming the jet can be obtained without decreasing the pressure.

Burner-Tubes for Incandescent Lamps.

EHRLICH and GRAETZ, of Berlin.

No. 9139; April 17, 1909. Date claimed under International Convention, March 6, 1909.

This invention relates to means for controlling the air supply to the mixing tube or chamber of a bunsen burner as used in incandescent gas-lamps.

It is usual, the patentees remark, to provide a control ring for adjusting the air openings in the bunsen. It has already been proposed to effect the operation of this control ring by means of suitable gearing; and such a device is illustrated in patent No. 22,821 of 1907 granted to Max Graetz.

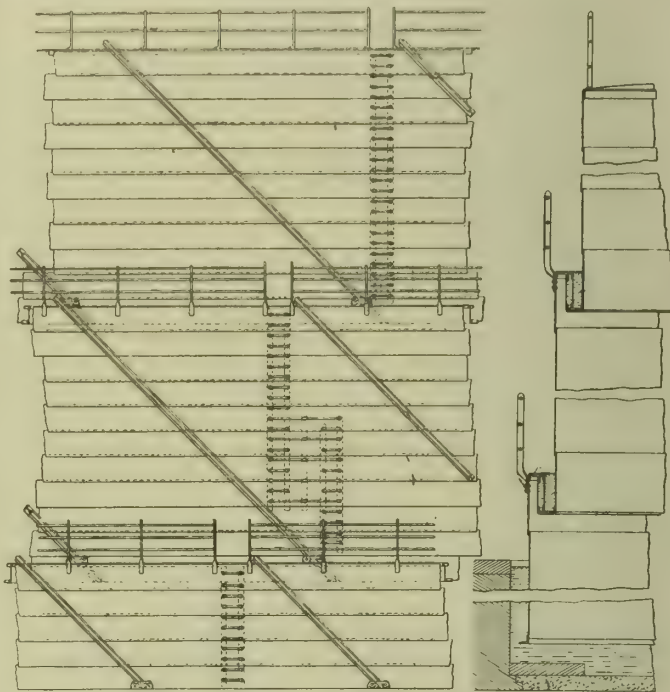
The object of the present invention is to provide an improved device for effecting the adjustment of the control ring, consisting of a threaded rod carrying a transporter pin which engages with the air-control sleeve on the outside of the burner-tube, while the threaded spindle is adapted to engage in a fixed threaded member, so that, on rotating the spindle, it moves bodily. This bodily movement of the threaded spindle, it is said, enables the operator to form an estimate of the amount of air opening provided on the mixing-tube.

Ladders for Spirally-Guided Gasholders.

DOWNES, J. H., of Dipton, and WRIGHT, H. F., of Donnington, near Newport, Salop.

No. 9482; April 21, 1909.

The object of this invention is to provide ladders for use with the lifts of spirally-guided gasholders, where ladders cannot be used in one vertical run on the lift, by which men can, with ease and safety, ascend and descend the several lifts of the gasholder.



Downes and Wright's Ladders for Spiral Gasholders.

The holder illustrated is one with three spirally-guided lifts requiring the ladders for the middle lift to be arranged in lengths which are not in line with each other. The curb or top of each lift is made of sufficient width for a man to walk upon round the holder, and to the upper edge of the lift standards are fixed to stand out some distance. Where the ladders meet the hand-rails, the railings are discontinued, for men to gain access to the pathways. When the ladders come in such situations as to avoid the spiral guides (as on the first and third lifts), the ladders can be made in one length, as usual; but when they are in such situation that the spiral guide-rails will not allow of the ladders being in one length (as shown on the second lift), they are, according to this invention, made in lengths set in vertical planes some distance apart, and treads and hand-rails are arranged so as to allow men to pass from one length of ladder to the other. These treads and hand-rails are shown as continuations of some of the treads of the lengths of ladder; but they may be short lengths of ladder arranged to be folded with the main lengths of ladder.

Interrupted Gas Supply at Sunderland.—Some excitement was caused a few days ago in a portion of the district of the Sunderland Gas Company, by an interruption in the supply which took place at about 6 o'clock in the evening, and which was caused by one of the Water Company's men unaccountably turning off at the main the gas supply instead of the water, as had been his intention. The interruption (which is naturally made a good deal of in electrical quarters), lasted only three or four minutes; and, of course, it was in no way due to the Gas Company or to defects in their plant. Immediately the Company were apprised of the occurrence, the lamplighters were again started on their rounds; but the difficulty in connection with lights that might have been left burning in houses while the tenants were out, was greater. However, where such a state of affairs was thought to exist, friendly neighbours entered the premises and turned the gas off, or else sent messages to the residents to return; and the chance of serious consequences was thus minimized.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

German v. English Gas-Retorts.

SIR,—The correspondence on the above subject, arising out of the letter which appeared in your issue of the 19th ult., needs little comment from me; but I should like, in a few words, to make a little clearer the position taken by this Company in the matter.

For years past, we have been endeavouring to encourage British manufacturers to produce goods nearer in quality to those obtainable abroad.

I have before me a schedule of the prices we have paid for retorts during the past five years; and the same figures would be true over a much longer period. I find we have paid some British makers *more than double the price per foot* that others were asking us (and were paid) for retorts which they claimed to be the best of their kind. Price has been only one of the considerations governing the settlement of a contract; and we have never wittingly sacrificed quality to it.

If our practice had been to accept only the lowest tender, we should have only ourselves to blame if we were supplied with fire-clay drain pipes in which to carbonize our coal. But we have not forgotten that a large proportion of our dividend is still made in the retort-house; and we have spared neither pains nor expense to get the best article obtainable.

What Mr. Settle's letter means, I am at a loss to discover. I have hitherto managed to keep politics out of gas making; and I have no present intention of departing from that policy. But I am free to express my belief that neither Free Trade nor Protection will recover for our manufacturers their lost position, unless they, in the words of the Prince of Wales, "Wake up!" and take Science as the handmaid to their Industry.

South Metropolitan Gas Company,
Nov. 6, 1909.

CHARLES CARPENTER.

Horse-Power Rating of Gas-Engines.

SIR,—Referring to the letter on the above subject which appeared in your issue of Oct. 19, we have long felt that many makers list the powers of their engines too highly, and moreover base their calculations on gas of a thermal value almost impossible to obtain—namely, 700 B.Th.U. On the other hand, one cannot shut one's eyes to the fact that in this strenuous age, and with the excessive competition that exists for every order in the market, each maker not unnaturally tries to make his engine appear better than that of his rival. But judging from the way in which buyers are now insisting on guaranteed figures being proved after the engine is erected, they are pretty well alive to the possibility of an eager salesman rather overstepping the mark. While human nature exists as it is, it seems difficult to devise an effective cure.

On the other hand, we have always tried to safeguard the purchaser by only listing our engines at powers which can be obtained with gas ranging from 550 to 700 B.Th.U.; and, moreover, we advocate that for regular working a margin of power below our printed figures should be allowed. Similarly, the powers given off by producer gas are calculated with gas of 140 B.Th.U. The variation between gas of 550 and 700 B.Th.U. would not affect the power of an engine more than 3 per cent.

Speaking for ourselves, we think that we can safely claim that we have drawn up our lists quite as much for the buyer's benefit as our own.

For CROSSLEY BROS., LIMITED,
D. H. IRWIN, Managing-Director.

Manchester, Nov. 1, 1909.

LEGAL INTELLIGENCE.

THE WELSBACH COMPANY'S TRADE MARK.

Clerkenwell Police Court.—Saturday, Nov. 6.

(Before Mr. BROS.)

The hearing of the summonses taken out against the Welsbach Incandescent Gaslight Company, Limited, by the Wolfram (Tungsten) Metal Filament Lamps, Limited, for selling and exposing for sale goods to which, as was alleged, a false trade description was applied, was continued to-day (see *ante*, pp. 265, 332).

Mr. RUFUS ISAACS, K.C., M.P., Mr. H. A. COLEFAX, and Mr. ERNEST LUNGE appeared in support of the summonses; Mr. WALTER, K.C., and Mr. A. H. BODKIN represented the defendants.

Mr. J. Y. Fletcher, the Manager of the electric light department of the General Electric Company, Limited, examined by Mr. RUFUS ISAACS, said his firm were the agents in this country for the Auer Company of Berlin, from whom they received metal filament electric lamps for sale. At first they were called Osmium lamps, because the metal filament was made of osmium; but in 1906 the Osram lamp was introduced. These lamps were made in Germany; but since the passing of the new Patents Act, a factory had been erected in this country for their manufacture. They bore the name of the Auer Company. When they were first introduced into England, so far as he knew, no other metal filament lamp except the Osmium had been invented by Baron von Welsbach. A copy of the "Daily Telegraph" containing the advertisement of the defendant Company's lamps was handed to witness, and he was asked what effect it would have on his mind. He replied that he should consider the lamps offered were the invention of Baron von Welsbach or the output of the Auer Company. The effect of stamping these lamps with

the words "Aur" and "Welsbach" would lead people to believe that they were the product of the Auer Company, or the German Welsbach Company, as it was sometimes known in this country. So far as he knew, neither Baron von Welsbach nor the Auer Company had anything whatever to do with these lamps.

Cross-examined by Mr. WALTER, witness said he knew there were three Welsbach Companies in Europe—the German, the Austrian, and the English. He was not aware that 98 per cent. of the shares of the Austrian Company were the property of the English Company. He did not know that the policy of the Welsbach Companies had been not to use the words "Auer" or "Welsbach" on the territories of the others. He believed the German Company undertook not to use the word "Auer" for a certain period in connection with incandescent gas mantles; but he thought the period had now expired. The registered trade mark of the German Company for incandescent gas-lamps was "Degea."

Mr. WALTER: Is it not a fact that the word "Auergesellschaft" formed no part of the name of that Company until two years ago?

Witness: It has been part of the name as long as I have known it, which is 2½ years.

During the last 2½ years, has a single advertisement been issued by your Company in which the word appears?—Not by our Company.

With the exception of one circular, have your Company ever advertised the word "Auer" in connection with the lamps?—No.

In further cross-examination, witness said that, as far as he knew, Baron Welsbach had nothing to do with the Osram lamp, either as manufacturer or inventor; nor was he aware that since Jan. 17, 1899, the Welsbach Company had had the trade mark "Aur" registered for goods in Class 13. He now saw, however, by a certified copy of the Patent Register produced, that it was so. He was not aware that the trade mark "Aur" had been used upon all merchandise sold by the Welsbach Company for many years. He was not prepared to deny that the word "Aur" upon goods in this country commonly meant that they were the goods of the Welsbach Company. Asked if he was prepared to deny that the word "Welsbach" upon goods in this country commonly meant the merchandise of the Welsbach Company, he replied that he should deny it with respect to electric goods. It was not within his knowledge that until the word "Welsbach" appeared on an electric filament lamp, not a single electric lamp had been so marked. In advertisements, the word "Welsbach" had only been used in connection with Osram lamps in reprints from the daily newspapers. In these it was stated that Dr. Auer von Welsbach, who invented the first incandescent gas-mantle, also invented the first metal filament electric lamp. The word "Auer" had not appeared in any advertisements of Osram lamps.

In re-examination by Mr. RUFUS ISAACS, witness said that on the wrapper in which the Osmium lamps were sold, which was printed in German, the word "Auergesellschaft" appeared.

The further hearing of the case was adjourned until the 20th inst.

BORROWING MONEY FROM A PREPAYMENT METER.

At the Old Street Police Court, last week, Lewis Granafsky, a Russian subject, of Church Street, Bethnal Green, was charged before Mr. Biron with stealing 2s. 7d., the moneys of the Commercial Gas Company, between the 19th ult. and the 2nd inst., from a gas-meter at the address given. Mr. Young, solicitor, who appeared for the Company, said the circumstances of the case were peculiar. The prisoner had been supplied by the Company with a penny-in-the-slot gas-meter, and on the 2nd inst. a collector, when he called to take the state of the meter and remove the money, was informed by the prisoner's wife that her husband had taken 2s. 6d. from the box; and she then offered the collector a half-crown to replace the money. The collector found from the index that the money was 2s. 7d. short, refused to take the half-crown offered, and communicated with the Company, who then brought the charge. A collector of the Company was called, who bore out Mr. Young's statement. He said that, in addition to having been offered the money by the wife, it was also offered to him by the prisoner when he returned home at dinner time. In reply to the Magistrate, witness said the woman offered him the money before he had examined the meter; but as he was not authorized to receive the money in this way, he reported the matter to the Company. Prisoner's wife had handed witness a key which she said her husband had used for opening the lock. A detective sergeant stated that, when arrested, the prisoner at once admitted that he had taken the money, as he had been slack, and was short of his rent. He said he did not see any harm in his action at the time, and was now sorry for it, but he had always been ready to pay the money back when the collector came for it. The collector, recalled, said he visited about once a month, so that the people knew pretty well when he would come.

His Worship said he thought the Company contended that the money in the meter was in the consumer's charge, and that he was responsible for it until it was collected by the Company. Mr. Young: Not at all. The insertion of a penny in the slot constitutes a "purchase" from the Company, and the consumer who takes money from the meter is in the same position as a man who, having purchased and paid for something in a shop, takes the coins he has paid out of the till again. Mr. Biron: I do not think any Jury would convict on such evidence. Your own witness states that the money was offered to him before even he had inspected the meter and knew there was a shortage. In a charge of larceny, there must be felonious intent; and the prisoner had offered to replace the money directly your representative called. He had no right to take the money; but the charge must be dismissed. The Company were, however, perfectly justified in bringing it.

In re East Sussex Gas and Water Company.

Last Saturday, Mr. Justice Swinfen Eady had before him a motion for judgment in a debenture holder's action, which came on as a short cause in default of defence. Mr. Ward Coldridge appeared for the plaintiff (one Bowman); and the usual order was made.

WATER SUPPLY TO TENEMENT HOUSES.

An interesting case in regard to the water-rate payable in respect of houses let out in tenements was heard by Mr. Hopkins, at the Lambeth Police Court, on Monday last week, when Mr. W. Arlidge was summoned by the Metropolitan Water Board for 7s. alleged to be due for the supply of water to a house at 11, Stockwell Green. Mr. Desmond Collins, the Assistant-Solicitor to the Board, appeared in support of the summons; Mr. George Kebble represented the defendant.

The house, which is rated at £28 a year, is let to four separate tenants, and it was argued for the defence that these tenements should be treated as flats in separate occupation, and that deductions should be made from the rate for periods during which they were unoccupied. The defendant stated that the tenants paid 6s. a week; the rent including rates and taxes. If the rent was not paid and he distrained, he would do so for the full amount. If he failed to pay the water-rate, and the tenant had to pay it, the tenant would sue him for it, but could not deduct it from the rent.

Mr. Kebble raised a question as to the legality of a resolution passed by the Board, to the effect that they intended looking to owners for payment in cases where the rent included the water-rate. Defendant, in reply to Mr. Kebble, said the four flats were let to separate tenants; and for the first two weeks in the quarter all of them were empty. The resolution of the Board as to cases in which the rent included the water-rate was not communicated to him, and, so far as he knew, it was never made public. He had forwarded to the Board a cheque for 3s. 6d., which he considered was the proportion of the rate due. In answer to further questions, he said he was being sued by the Board in the Westminster County Court in respect of thirty or forty houses; and there would not have been any difficulty in including this house.

His Worship compared the house in question to a boarding-house, in which, he said, the water supply would vary considerably in quantity according to whether there were few or many lodgers; but the suppliers of the water would charge the same in any case. Mr. Kebble submitted that the cases were not analogous, as here the tenements were separately occupied, though they did not happen to be separately rated for the relief of the poor. His Worship pointed out that the house might at any time be letting at £28 a year, as soon as Mr. Arlidge could find a good paying tenant. Mr. Kebble said he understood his Worship to hold that the house was to pay because it was not separately rated for the relief of the poor. On the Magistrate replying in the affirmative, Mr. Kebble remarked that the large majority of houses of this kind were not so rated. His Worship said Mr. Arlidge might have only one tenant, or he might have four. Four would use more water than one; but the Water Board could not get more than their 5 per cent. on £28. Why, he asked, did the defendant's way of letting his house give him some rights against the Board which he had not otherwise? Mr. Kebble said the defendant only claimed his statutory rights. He asked the Magistrate if he would state a case if requested to do so. His Worship replied that he certainly would not, on a question of 3s. 6d.

An order was made for the amount claimed, less 1s. 1d. for the fortnight the whole house was empty, and 3s. 6d., the amount of the cheque paid. His Worship allowed the Board £2 2s. costs.

Claim for Damage through a Tar-Painted Road.

At the Ashford County Court, on Monday last week, his Honour Judge Shortt had before him the case of *Ellen v. Kent County Council*. It was a claim by Messrs. G. Ellen and Sons, farmers, of Charing, for £26 16s. 6d. damages sustained by the death of a cow alleged to have been poisoned as the result of the negligence of defendants' servants. Mr. Stuart Bevan (instructed by Messrs. Kingsford, Drake, and Coke, of Ashford) appeared for the plaintiffs; Mr. H. J. Bracher, solicitor, represented the Council. The case for the plaintiffs was that the main road, which runs through their land, was tar-painted on the 19th and 20th of May last, and on the 29th a thunderstorm occurred, and the heavy rain washed the tar from the road through small cross channels into a stream from which plaintiffs' cows drank. The rain occurred in the early morning, and later in the day the cow was found to be ill. A veterinary surgeon (Mr. F. Gillard) was called in, and he diagnosed the case, and treated the cow for irritant poisoning of the coal-tar series. As the cow became worse it was destroyed, and a post-mortem examination disclosed, according to Mr. Gillard, that his diagnosis was a correct one. A portion of the viscera was sent to Dr. Landor, the well-known veterinary toxicologist; and he certified that the beast had taken a dose of tar fully sufficient to poison it. In cross-examination, Dr. Landor stated that creosols were contained in tar; and he admitted that he could not say whether the poison was taken in the form of creosote or tar—the suggestion being that there were both tar and creosote on plaintiffs' premises. The plaintiffs' case had not been concluded when the Judge was taken ill, and the further hearing was adjourned.

In re Robertsbridge Water and Gas Company.

Last Tuesday, the action of *Meadows v. Robertsbridge, Salehurst, and Hurst Green Water and Gas Company, Limited*, came before Mr. Justice Joyce in the Chancery Division of the High Court of Justice, on a motion for judgment in default of defence. Mr. Groser said the plaintiff was the owner of £2000 worth of debentures of the Company, and she sought to enforce her security, as the assets were very small. Correspondence had taken place between the solicitors, and it had been intimated there would be no defence. His Lordship asked whether the Company supplied any large town with gas and water. Mr. Groser said that was what they would like to do, but at present they only supplied a few small villages. His Lordship asked what was to become of the Company. Mr. Groser said the undertaking would have to be sold as a going concern. His Lordship made the usual order in a debenture holder's action, and suggested there should be an inquiry as to the best method to realize the property. Mr. Groser said this should be done.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Ordinary General Meeting of the Association was held last Tuesday, at the Cannon Street Hotel, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. R. W. Wilson) read the notice calling the meeting; and also the following report of the Directors:

The Directors have pleasure in reporting that the results of the Association's operations during the half year ended June 30 last have been satisfactory.

The profit of the half year, together with the sum of £28,648 brought forward from the account of the preceding half year, amounted to £271,044, as compared with £270,889 for the corresponding half year of 1908.

The Directors have to report that, on April 1 last, the Association's business at Frankfort was incorporated with the Frankfort Gas Company (the other Company supplying gas in that city). That Company has been re-constituted with a subscribed capital of £680,000, divided into 13,600 shares of £50 each. Of this capital, the Association has received, in exchange for its Frankfort establishment, 7000 shares of the nominal value of £350,000; the local Company 3600 shares of the nominal value of £180,000; and the Corporation of Frankfort has subscribed for the remaining 3000 shares of the nominal value of £150,000.

A contract has been concluded between the re-constituted Frankfort Gas Company and the Corporation of Frankfort fixing the conditions of the supply of gas until 1959. In consequence of this amalgamation, the returns of the workings for the half year under review contain the results of the Frankfort workings up to April 1, 1909, only; thus any comparisons of the workings of the past half year as a whole with those of the corresponding half year would be somewhat misleading.

Including Frankfort for the first quarter, the coal carbonized during the first half year of 1909 amounted to 494,595 tons, at an average gross cost of 19s. 4½d. per ton.

The number of consumers at the Association's stations at the end of the half year, excluding Frankfort, was 391,860, which represents approximately an increase at the rate of 9 per cent. during the past twelve months.

Some 48 miles of new mains were laid during the half year under review; and the total length of mains laid up to June 30 last, exclusive of those in Frankfort, was 2169 miles.

The plant and mains at the stations have been maintained in their usual efficient condition.

Progress was made with the erection, at Aix-la-Chapelle, of the new retort-house with four settings of vertical retorts.

At Antwerp, on the new Hoboken works, the coal-handling plant, and naphthalene, ammonia, and tar washers were completed; and the erection of the condensers, exhausters, coke-conveying plant and pumps, together with the construction of roads and drains, was proceeded with.

A contract for the exclusive supply of gas for 26 years (until 1935) was concluded with the Commune of Brasschaet, a suburb lying to the north-east of Antwerp; and a monopoly of the supply of gas until 1935 and of electricity until 1920 in the Commune of Cappellen, to the north of the city, was also acquired.

At Berlin, progress was made with the construction of the new steel tank for the large gasholder on the Schöneberg works, as also with a new retort-house at the Holzmarktstrasse works; and the new purifier-house at Mariendorf was finished. The third retort-house for verticals at Mariendorf, referred to in the report for the second half year of 1908, was also completed. At the Weissensee works, supplying the north-eastern suburbs, a complete installation of new plant was erected on the land, adjacent to the works, the purchase of which was mentioned in the report for the second half year of 1907.

A supplementary contract was concluded with the commune of Steglitz—one of the large southern suburbs of Berlin—by which the Association secured a prolongation of the gas monopoly for twenty years, until 1946, and the perpetual right to supply gas, without monopoly, after the expiration of the contract.

At Brussels, progress was made with the erection of the new retort-house for the verticals at Forest, and with the necessary coal and coke conveying plant. Advantage was taken of a favourable opportunity to acquire the property No. 48, Rue de l'Arbre Bénit, adjoining the Association's offices, and workshops at Brussels.

The contract for the exclusive supply of gas to the commune of Ixelles—a suburb situated to the south-east of Brussels—was prolonged for fifteen years; and a monopoly of the supply of electricity in the commune of Forest, situated to the south of the city, was secured. In addition to these, the Association was successful in concluding contracts for the monopoly of the supply of gas and electric current to the Communes of Grand Bigard, a north-western suburb, and Alsemberg, situated to the south-west of Brussels.

At Flushing, good progress was made with the erection of a new retort-house to contain twelve regenerator settings of horizontal retorts; and a coal-conveying plant, referred to in the last report, was completed, and put in action. A site has been acquired in a suitable position in this town for a building to contain a show-room and offices.

At Essonnes—one of the towns supplied by the Compagnie Continentale du Gaz—a prolongation of the monopoly of the supply of gas was obtained for ten years, until 1951, and a 25 years' prolongation—i.e., until 1938—of the contract with the town of Meaux, another station of the same Company, was also secured.

In conclusion, the Directors desire to draw the attention of the proprietors to the accounts for the half year ended June 30 last, and to the balance-sheet. These have been duly audited; and from them the Directors have, in accordance with the provisions of the Companies' Clauses Consolidation Act, prepared a scheme showing the profit of the Association for the half year, and the portion thereof applicable to the purposes of dividend, which they recommend now to be declared—viz., a dividend of 4 per cent. for the half year ended June 30, 1909, payable free of income-tax on and after Tuesday, the 9th inst.

THE GAS SUPPLY AT FRANKFORT.

The CHAIRMAN, in moving the adoption of the report, said that six months ago, when he had the pleasure of addressing the proprietors, he mentioned that there were various important negotiations proceeding at several towns which the Association were lighting, and that day the proprietors had learned from the report that one of these important negotiations had resulted in the conclusion of a new contract with the town of Frankfort-on-Main. But as this was a wholly new departure

Scheme for the Division of the Profits of the Half Year ended June 30, 1909.

Balance brought forward from last half year . . .	£28,648	1	0
Profit resulting from the workings at the stations and dividends on investments, less interest on debenture stock, and the charges on accounts of depreciation and income-tax	242,396	11	9
	£271,044	12	9
Dividend of 4 per cent. for the half year	£197,600	0	0
Credit to pension reserve	40,000	0	0
Balance carried forward to next half year	33,444	12	9
	£271,044	12	9

with regard to their works in Germany, he thought it would be of great interest to the proprietors to learn from him the exact history of this particular transaction. In 1900, at the November meeting, the Chairman (the late Mr. Goodwin Newton) spoke as follows:

Since the close of the half year, an event had occurred to which he would like to call attention, as it would be of importance to the Association in the future. This was the conclusion of a working agreement and pooling of profits at Frankfort-on-Main with the Frankfort Gas Company. The Board had long been negotiating to terminate the sharp competition between the Gas Companies there, which the agreement just completed effected. The proprietors should know that at Frankfort the Association supplied common gas; the Frankfort Gas Company, until 1911, supplied candel gas of high illuminating power; and the town supplied electric light, in competition with both of the Companies. He considered all parties would benefit under this pooling arrangement, which contained stipulations for the ultimate amalgamation of both gas undertakings.

So spoke Mr. Newton nine years ago; and exactly what he predicted had taken place. Two years since, the Directors entered into negotiations with the town for a prolongation of the public lighting contract. He said "public lighting" because their rights in Frankfort extended to 1959 for private lighting only. But they were hedged about with so many old clauses in connection with ancient contracts, that it might have been a matter of difficulty to continue the business there if they had the serious opposition of the town, who indeed at one time contemplated putting up opposition gas-works for the supply of Frankfort. Two years ago, he said, they opened negotiations with the authorities for a renewal of the contract. The town wished to negotiate with each Company separately; but as one Company could take no steps without the consent of the other, owing to the amalgamation of their interests, it was decided that only one Company—the Frankfort—which was already constituted under German law, should carry through the negotiations with the municipal authorities. A contract was eventually entered into, after protracted and laborious negotiations. On June 17 last, the contract was concluded; and it replaced the old contract between the town and the two Gas Companies. The Frankfort Gas Company, as they must call it now, was granted, until 1959, the exclusive right of supplying gas in the districts already supplied by the two Companies, and also in another new district, called Niederrad, which was one of the suburbs of Frankfort. The town, in consideration for this concession, were to receive certain payments—an annual payment of £4500, and a contribution out of the gas sold to private gas consumers of 1½ pfennig for lighting and prepayment gas, and ¾ pfennig for cooking and industrial gas. The town was bound to take over at a valuation at the end of the contract, all the then existing plant, mains, and other property of the Company which was intended for the permanent purposes of the undertaking. The town had also the right to purchase the whole undertaking, at intervals of five years, from Oct. 1, 1929. But if this right was exercised, the town had to pay in addition—if, for instance, the concern was taken over on Oct. 1, 1929—twelve-and-a-half times the average net profit of the last five working years preceding the date of purchase. This was in addition to the purchase money. A definite price had also been fixed, of £200,000, for the land the Company already owned; and any land acquired by them during the contract period was to be taken over at the price of the purchase, so that no unearned increment would accrue to the Company. [Laughter.] The present Managers of the Company were Mr. William Drory, hitherto Manager of the Frankfort station, and Messrs. Kohn and Schiele, who were the Managers of the local Company at the time of the amalgamation. The Board of Directors consisted of nine members, five of whom, including the Chairman, Herr L. Delbrück, were nominees of the Association; the remaining four being original Directors of the local Frankfort Company. It would, therefore, be seen, if the figures read out from the Directors' report had been followed, that the Association were the predominant partners in this large undertaking at Frankfort; and not only that, but the town itself had an interest in the well-being of the Company. He was perfectly certain that they would be able to carry on the business very much better in the future than it had gone on in the past. In this transaction, which had resulted in the erasing of Frankfort from the list of stations directly controlled from London, the Directors were of opinion that, in their holding of shares in the Frankfort Company, and in the payment by that Company of a considerable amount of cash (which was not received yet, but which was entered in the accounts under investments and loans abroad), they had obtained the full capital value of the Frankfort establishment, and no adverse effect had been made on the Association's assets. Before concluding his remarks about Frankfort, he should like to pay a tribute to Mr. L. Delbrück, their principal representative in Germany. He had borne the brunt of these negotiations. He had carried them through with astonishing skill, knowing so well the feelings of Germans, both in Berlin and in Frankfort, where he had large business connections; and he (the Chairman) thought it was in great measure owing to him that this business had been brought to such a successful conclusion. He really could not speak too highly of the diplomatic way in which Mr. Delbrück had managed this very difficult business.

THE VIENNA SUBURBS CONTRACT.

Having told the proprietors some good news, he had now to tell them something that was bad. He also mentioned six months ago, the

negotiations that were going on at Vienna for the prolongation of the contract which the Association held in the suburbs. Some of the old proprietors would remember that, as far back as 1899, the Association lost the contract for what was called Inner Vienna—that was, the old town of Vienna—but that they were able to continue the lighting of certain of the suburbs, through a fresh contract, up to 1911. The Directors had used every effort to prolong the contract by offering very favourable terms. But the Municipality were determined to extend the operations of their own municipal gas-works; and so they had finally refused what the Association offered. The position remained exactly as described to the proprietors by previous Chairmen; and the most important condition of the contract was that on Dec. 31, 1911, the Municipality were to purchase the mains, service-pipes, candelabra, and gas-meters in the territory covered by the contract, in so far as such mains and lighting plant were the property of the Association. The purchase of the mains, &c., was to be by the payment of a sum to be determined by a legal valuation, which sum was to be due after the operation had been completed. These were the terms in the contract; and the result was that the position of the Association remained as before, subject to the conditions of the contract of April, 1899. The provision made by the Directors for adequately meeting the position on the termination of the contract had in no way been affected. It was true they had a few suburbs still remaining to them on the other side of the Danube which they would be in the position to light for some few years longer.

DEPRESSION IN TRADE.

To speak briefly on the subject of the half-year's proceedings in regard to the gas made and sold and so on, they had had satisfactory results at most of the stations. But there was depression of trade in Germany; and one or two of the stations had felt the prevailing condition more than others. He might instance Aix-la-Chapelle, which, as the proprietors were aware, was almost on the Belgium frontier, and was a large manufacturing town, and so easily influenced by depression in trade. At this station, they had had an actual decrease in the sale of gas; but at the other stations, except the minor one of Graslitz, a moderate but fair increase was shown. The same remarks applied to the meters placed, the mains laid, and to the general business at the stations.

THE BALANCE-SHEET.

With reference to the balance-sheet, on the debtor side of the account, the only item that called for remark was the debenture stock and interest thereon. He spoke on this subject at some length at the May meeting. If any of the proprietors had compared their balance-sheets with the one a year ago, they would have noticed an increase in the debenture stock of £761,400; and the interest thereon had increased by £11,104. Of course, this amount of interest had to go against the revenue of the half year. Then sundry creditors stood at £106,000 less than in the balance-sheet to June, 1908; and this decrease was owing, among other things, to the receipt of the debenture stock money, which enabled the Directors to reduce the outstanding obligations and liabilities. Then, alluding to the creditor side of the account, the items of works and mains, less amortization, and land, taken together, notwithstanding a considerable outlay on extensions, apparatus, and land, showed a decrease of £162,000. But, of course, the difference was accounted for by the fact that the Frankfort establishment (which a year ago stood in the items of works, mains, land, and so on) had now been transferred, owing to its having been taken as shares, into investments and loans abroad, which had been increased by the sum of £537,828. This not only included the Frankfort investment, but also increased loans for capital purposes to companies in which the Association held a controlling interest. He might say these loans were all well secured; and the interest was regularly paid. Coming to the profit and loss. The half year, compared with the corresponding period of 1908, exhibited an increase of only £2318. This was partly accounted for by the fact that they only got a quarter's profit out of Frankfort—that was, up to April 30, on which date the new Company took the business over; and they had not yet received the profits from Frankfort for the second quarter. That would amount to £8000. Then a year ago, they had—it being leap year—an extra day's business, which represented about £2500 profit. So that the profit and loss account, though only exhibiting an increase of £2318, really, under ordinary circumstances, would have shown an increase of about £12,000 to £14,000.

CONTROLLING INVESTMENTS.

He had mentioned that they made loans to foreign gas companies in which the Association had a controlling interest; and it would interest the proprietors to hear something as to one of these Companies. In the year 1900, a Company was formed under the title of the Central Gas and Electricity Company, with a capital of £250,000, to work concessions for the supply of gas and electricity in various towns in Hungary. To this Company the Association made over the gas-works at Esseg and Raab for 3500 shares. Subsequently the Association increased their holding in the Company until they had a preponderating interest. The Central Company also from time to time purchased further concessions, and took over the business of other gas and electricity companies in Hungary; but they allowed the undertakings to be administered by the original Boards of Directors. Although the Central Company in this manner was able to earn a fair return on the capital invested, the Directors of the Association came to the conclusion last year that the business would be much better administered from the Association's head office. Accordingly, from the beginning of 1909, the Board of the Central Company had been replaced by that of the Association, with the addition of Dr. von Teltcher (the Association's Agent in Vienna) and Dr. von Wagner (residing at Budapest), a Hungarian gentleman, who had been a Director of the Central Company. It was a satisfaction to be able to inform the proprietors that, so far, this alteration had worked to the benefit of the Central Company and of the Association, and that the Board had every hope that, under their direct management, the business would continue to improve. The capital account of the Central Gas and Electricity Company now stood at £315,000, of which the Association held 67 per cent. The towns supplied with gas or electricity by the Company were Arad, Esseg,

Kaschau, Miskolcz, Neubäusl, Neutra, Raab, and Szegedin. It would be remembered that the Association formed their French business into a separate Company in accordance with French law; and he was glad to be able to report that they had been able to secure considerable extensions of contracts at the most important towns of that Company. They had been as follows: Armentières, from 1917 to 1950, Corbeil, from 1910 to 1941, Essonnes, from 1941 to 1951, Evreux, from 1920 to 1945, and Meaux, from 1913 to 1938. In addition, contracts had been secured in two other suburban communes. He could assure the proprietors that the affairs of this Company were now consolidated on a firm footing; and though they had to make very large reductions in the price of gas, the Company's prospects were thoroughly satisfactory.

TAX ON GAS-MANTLES.

He was also glad to be able to report that the new taxes which were pending in Germany at the time of the last meeting had been dropped; but unfortunately the gas industry had not entirely escaped. A somewhat heavy tax had been imposed on gas-mantles. This would tend to increase the Association's working expenses, especially in public lighting, because, in many instances, they had to provide mantles at their own cost.

IMPRESSIONS ABROAD.

There were before the proprietors nine Directors, and he thought that nearly all of the nine, as well as the tenth (who was lying ill at Wiesbaden), had been occupied during the year on the Company's business abroad. He did not wish to dwell upon it; but there was no doubt the work of a Director of the Association when he went abroad was much greater—there was much more responsibility—than when he (the Chairman) joined the Board thirty years ago. However, they had found everything in splendid working order. All the new buildings that had been erected during the summer were admirably finished; and the whole of the stations were well stocked to meet the requirements of the winter. He was also glad to report that there were signs of considerable revival of trade throughout the whole of Germany.

INCOME-TAX ON DIRECTORS' AND AUDITORS' FEES.

There had been a notice before the proprietors of a resolution upon which he thought he ought to say a few words. The proprietors had always received their dividends free of income-tax; and it had always been the habit of the Company to pay the salaries of the staff free of income-tax. To do this was within the province of the Directors. But there had also crept in, quite unwittingly, the fact that the Auditors and members of the Board had had their fees free of income-tax. He was told by legal authorities they had acted wrongly; and so he had only to place himself and his colleagues in the hands of the proprietors, and leave the matter for them to decide—as to whether the Board should be whitewashed for what they had done in the past, and receive authorization for what should be done in the future.

The DEPUTY-CHAIRMAN (Mr. Arthur Lucas) seconded the motion, which was unanimously adopted.

Moved by the CHAIRMAN, and seconded by Mr. J. H. BIRCHENOUGH, C.M.G., the dividend mentioned in the report was declared.

Sir JOHN RUNTZ remarked that, as the Chairman had pointed out, income-tax had been paid on the Directors' and Auditors' fees a little irregularly; but he had a resolution to propose which would simply regularize the custom of the Association in this matter. It was as follows:

That all payments of income-tax assessable on the Directors' and Auditors' remuneration, heretofore made or authorized by the Board out of the funds of the Association, be, and the same are hereby, approved and confirmed; and that the Board be, and they are hereby, authorized to continue to pay out of the funds of the Association all income-tax assessable on any remuneration henceforth payable to any Director or Auditor for the time being of the Association.

Passing from this subject, he said the Chairman had asked if any of the proprietors had compared the figures in the present accounts with those for the corresponding half of last year. He should like to call attention to two or three of the items. Loans upon bills and other negotiable securities had increased by £67,000; investments in English, Colonial, and Indian securities, by £130,000; and investments and loans abroad, £537,000. This meant they had more in securities now by something over £700,000 than they had at this period last year. At any rate, they had this large amount of floating capital in case it was required. The position of the Association was excellent. Each half year there was progress; and he could not help saying that, from the present outlook, the Association would prosper more in the future than it had done—good as it had been—in the past.

Mr. H. H. S. CROFT seconded the motion; and it was unanimously agreed to.

The CHAIRMAN, having expressed his acknowledgments, said he was glad Sir John Runtz had called attention to the items in the balance-sheet. There was another item, cash and bills at stations, which showed an increase of £195,000. This was money retained abroad, because they could get better interest on it over there than in London, and in order to meet outstanding liabilities for new works in various parts of the country. With regard to loans and investments, they had carried out the advice Sir John Runtz gave them last year, and had invested in Colonial securities; but these would have to be sold very shortly, and be invested in the business.

Moved by the CHAIRMAN, and seconded by Colonel H. LE ROY-LEWIS, D.S.O., a hearty vote of thanks was passed to the Secretary, the Engineers, and Managers, and the staffs in London and abroad; and subsequently, on the motion of Mr. J. GURNEY FOX, seconded by Mr. E. H. WILKINSON, the Chairman and Directors were also cordially thanked.

At the recent Business Exhibition (Olympia), the Richmond gas-flasher, for illuminated signs, attracted considerable attention. Its simplicity in action and the easy manner in which it can be fixed to an ordinary incandescent burner caused general remark. A large number of orders were, it is said, booked for it.

TORONTO GAS CONSUMERS' COMPANY.

Resignation of the General Manager and Secretary.

The Sixty-First Annual Meeting of this Company was held on the 26th ult.—Mr. JOHN L. BLAIKIE (the President) in the chair.

The Directors presented their report for the year ended the 30th of September, in the course of which they stated as follows:—

The output of gas for the year amounted to 2,226,163,000 cubic feet; being an increase of 219,359,000 cubic feet, or 10·93 per cent., over that of the previous year. During the year, upwards of 32½ miles of new mains were laid, making the total mileage 394; and 5784 new services were put in. The mileage of mains is the largest laid; and the number of services introduced greatly exceeds those put in during any year of the Company's history. The demand for gas is rapidly increasing, and applications for the extension of the Company's mains have been coming in almost daily.

Gas making was commenced at the new works on the 13th of August last. No drawbacks were experienced; and the works have since been in successful operation, the results obtained being entirely satisfactory. In view of the continued rapid increase in the gas consumption, the Directors have decided upon the erection of another gasholder having a capacity of 5 million cubic feet, which will be by far the largest in Canada; and tenders for its construction and erection having been invited from the principal English and American firms, the lowest tender has been accepted, and the work will be forthwith proceeded with.

The Directors having considered it advisable to have an inspection made of the Company's whole plant, both old and new, secured the services of Mr. Thomas Newbigging, M.Inst.C.E., of Manchester, a well-known and eminent Gas Engineer. His inspection was made in July last, and the report is a most satisfactory one. Mr. Newbigging refers in the highest terms to the condition and efficiency of the works and their management.

The Directors much regret to announce that Mr. W. H. Pearson, the General Manager and Secretary, is resigning his position, after having been in the service of the Company for over 55 years. The Directors desire to record their high appreciation of the long, faithful, and efficient services rendered by him, and express the hope that he may enjoy a well-earned rest for many years to come, when relieved from the responsible and onerous duties which he has so ably performed for an almost unprecedented length of time.

The accounts accompanying the report showed that the gas-rental in the year amounted to \$1,536,999, compared with \$1,410,899 in the preceding twelve months; being an increase of \$126,100. The sale of residuals, consumers' supplies and maintenance, and office rents brought up the total revenue to \$1,737,765. The expenditure having been \$1,133,681, there was a balance of \$604,084. The addition of interest on debentures and the special surplus account made a grand total of \$3,684,209, which was disposed of as follows: Dividends, \$342,167; interest, \$11,563; renewal fund for plant and buildings, \$308,548; carried to special surplus account, \$21,931.

The PRESIDENT said it was very gratifying to the Directors to be able to present so satisfactory a report and statement of accounts for the shareholders' approval and adoption. The past year had been the most important in the history of the Company. It was made so by several great facts, such as the completion of the new works, and the acceptance of a tender for the erection of a new gasholder; by an inspection of the entire plant of the Company by Mr. Thomas Newbigging, of Manchester, and his report thereon; by the decision of the Directors to seek authority to increase the capital stock of the Company by \$2,500,000; and by the resignation of Mr. W. H. Pearson as General Manager and Secretary, after having been 55 years connected with the Company. It would be seen from the statement of accounts that, after payment of the operating expenses and dividends, and making due provision for the statutory demands of the plant and buildings renewal fund, there stood at the credit of the special surplus account the sum of \$21,931. This condition was gratifying when they considered that interest charges had been paid upon a necessarily large outlay of capital in connection with the works on Eastern Avenue, where operations had recently commenced. They might, therefore, reasonably expect to make even a better showing during the current year, though the price at which gas was now being supplied in Toronto was about the lowest charged by any gas company on the Continent. This spoke volumes for efficient and economical management, especially when it was borne in mind that coal and oil had to be brought hundreds of miles to the gas-works. The output of gas for the year amounted to no less than 2226 million cubic feet, or nearly 11 per cent. more than that of the preceding year. The consumption of gas was rapidly increasing. The Company began operations in the year 1848. After 54 years—say, in 1902—the output of gas had reached 900 million cubic feet per annum. In 1909—seven years later—the output of gas amounted to 2226 millions; being an increase of 1300 million cubic feet—the increase alone being nearly 50 per cent. more than the whole volume of gas was in 1902. The President proceeded to cite a few other figures to show the extent of the Company's operations, and illustrate the extraordinary growth which had taken place in the business, especially in recent years. He said the Company's requirements of coal during the past year amounted to more than 130,000 tons in the delivery of which some 3000 railway cars had been employed. About 4,000,000 gallons of gas oil were consumed, and the coke sales and deliveries amounted to upwards of 36,000 tons. Passing on to refer to the inspection of the works and plant by Mr. Newbigging in July last, he said the report which had been presented to the Directors was most satisfactory. It was as follows:—

During the past week I have made the circuit of your gas undertakings, inspecting the different stations, and making myself acquainted with the clerical work in the office of the Company.

It gives me pleasure to bear my testimony to the good condition of the apparatus, plant, and machinery throughout, and generally to the up-to-date character of these.

The only marked deficiency which I find is the storage capacity for the gas. The capacity of the existing holders is considerably short of the maximum day's production, instead of being in excess, as is desirable and necessary on the score of safety and economy. This, however, will be remedied when the proposed new gasholder is completed and at work.

Judging by all that I have observed, the management of the works is of the best. I am well acquainted with the principal gas-works in England and many of those in other countries, and I speak from personal knowledge

when I say that the Toronto Gas-Works will not suffer by comparison with the best of these.

The various labour-saving appliances introduced are of the first order; and to the general application and use of these is to be attributed, in a large measure, the excellent working results obtained and the general economy in cost.

The order and cleanliness of the works, and the freedom from anything likely to create a nuisance, are remarkable, and such as reflects credit on all concerned.

In the Toronto gas undertaking the shareholders may be congratulated on possessing a property the value of which can hardly be exaggerated.

This, said the President, coming from so eminent an authority as Mr. Newbigging, could not but be most gratifying to the shareholders, as it had been to the Directors. Reverting to their report, and to the statements that upwards of 32½ miles of new mains had been laid during the past year, and that the total length now was 394 miles, he said that never before had there been so many miles laid and so many services (5784) introduced in one year in the Company's history. With regard to the new gasholder advised by Mr. Newbigging, the work would be at once proceeded with. The large outlay in prospect necessitated an increase in the capital; and therefore the shareholders' approval was asked to the issue of \$2,500,000 of stock, which would raise the capital to \$6,000,000. The last issue, early in the year, had been easily placed at an average premium of 103.91 per cent.; and no doubt when the time came for portions of the new stock to be offered for sale there would again be many eager purchasers. The dividend of 10 per cent. never varied, and was paid every three months with unflinching regularity. He might repeat what he said a year ago, that the city of Toronto and the shareholders might well be congratulated on having one of the most complete and up-to-date plants on the Continent, on which there was no mortgage and no bond or debenture debt—which, in short, was wholly unencumbered. Hence the position of the Company was altogether unique, and the envy of gas companies both in Canada and the United States. The President concluded his speech by referring to the resignation of their "old and esteemed friend" Mr. Pearson, as General Manager and Secretary of the Company. This portion of his remarks will be found in the article dealing with this matter which appears earlier in the present number of the "JOURNAL."

COLONIAL GAS ASSOCIATION, LIMITED.

Return of Tide of Prosperity in Australia.

The Annual Meeting of the Association was held last Tuesday, at the London Offices, No. 138, Suffolk House, Laurence Pountney Hill, E.C.—Mr. SAMUEL SPENCER in the chair.

The SECRETARY (Mr. ALFRED J. KINGDON) read the notice convening the meeting and the Auditors' report; and the report and accounts were taken as read.

The CHAIRMAN said before commencing the ordinary proceedings of the meeting, he should like to say it was with great regret that the Board had to announce the death of their late Melbourne colleague—Sir Thomas Bent. Early in September the Board received the sad news. It came to them as a great surprise. They communicated with the Managing-Director (Mr. Swinburne) asking him to offer their condolence and sympathy with his family. He (the Chairman) was confident the shareholders would approve this action. Sir Thomas had been a Director from the start of the Company—now twenty-one years ago; and his loss to the Company and to the City of Melbourne was a great one. Perhaps most of the shareholders had read that the Victorian Parliament adjourned for a day out of respect to Sir Thomas's memory and his services to the State. Moving that the balance-sheet and report be adopted, the Chairman proceeded to remark that it was with much satisfaction that the Directors met the shareholders this year, with the best return the Company had had for very many years. As this was the coming of age of the Company—it being their twenty-first anniversary—their enterprise was, the Directors trusted, now entering upon a career of thoroughly well-established prosperity. Everything, as far as they could see, pointed in that direction, as the Colony was exceedingly prosperous. From the most recent remarks of the Premier, bankers, and others, the country was making great progress; and their own Managing-Director was sanguine that the Company were participating in the same good fortune. The figures in the present balance-sheet justified the Directors in confirming what Mr. Swinburne had said. The two very full half-yearly reports from him dealing with each of the twelve works showed that his opinion was that the Company were entering upon a better position than they had been in up to the present, and that he had the best possible belief that their prosperity would continue. Mr. Swinburne reported that the works, plant, and machinery were in a satisfactory condition. It was with great pleasure that the Directors were able to increase the dividend to 5½ per cent.; and the Board felt confident the shareholders would heartily agree with what was proposed, especially as, so far as the Directors could foresee, it could be maintained, and from time to time be gradually increased. Some years ago they got up to 7 per cent.; and he (the Chairman) was sanguine that they would reach this rate again, with even hope of a higher dividend. The present satisfactory position had also enabled the Board to increase the payment of the salaries of the Managing-Director and the Secretary (who had been with them thirteen years); and this action of the Board, he felt confident, would meet with the approval of the shareholders. It would be gathered from what he had already said that the Company's prospects for the coming year were of the most cheering character, as the coal contracts were somewhat about the same price as for the past year. The increased sale of gas would, it was anticipated, equal, if not exceed, the 14 per cent. recorded during last year. The leakage was down to 8 per cent., which, it was gratifying to note, was 3 per cent. lower than in the previous year; and there was every prospect of this reduction being increased. During the past year, they had secured 364 new consumers, which gave a very satisfactory increase on the previous year. In the report, it was stated that the Council at Geraldton had given notice to acquire

the works there. The concession the Company had was for 21 years. If the Council should follow up their proposal, the arrangement of terms would be by arbitration; and the shareholders might be quite satisfied that the Board would look after the best interests of the Association in any settlement that was arrived at. The £25,000 of debentures fell due for repayment on Jan. 1 next; and the Directors were arranging for their renewal at the same rate—5 per cent., and for 21 years, with power reserved to the Company to redeem at par the whole, or part, any time after Jan. 1, 1915, by giving six months' notice. It was exceedingly gratifying to the Board to have had responses to the extent of about £23,000 from the present holders; the balance being available to any shareholder requiring to take a proportion. In turning to the accounts, it would be noticed that the capital account had only been increased by about £4000 during the last seven years, although extensions had been made in mains and services and other requirements annually to the extent of something like £2000 a year—the difference having been carried out from revenue, which brought down considerably the cost per million cubic feet of gas made. It would be of interest to mention that, during the past seven years, nearly £6000 had been written off for depreciation; and almost the same amount had been credited to the reserve fund. The increase in the capital account by £4000 had enabled the Company to meet the additional sale of gas to the extent of at least 50 per cent. during the period; and, in addition, the residuals had nearly doubled. The increase of £1004 for coal, wages, and renewals, was due, of course, to the very satisfactory increase of gas made and sold. Bad and doubtful debts, it would be noticed, appeared as *nil* in the accounts, against about only £20 last year. This, he should think, was a record for any Company, and highly creditable to their collectors, and to the consumers. The stocks were some £300 more; and this was chiefly on account of coal, which, it was thought advisable to have in case of any falling off in the deliveries. In conclusion, he said it was a pleasure to the Board to be able to present such a balance-sheet to the shareholders, as it was the most satisfactory for many years. It was also most gratifying to the Directors that nothing appeared in it as due in the way of loan from the Bank. As already mentioned, the prospects for the current year were most encouraging, and there was every hope that the progress of the Association would continue, and that the Directors would be able to meet the shareholders again next year with even a better result than the one they now placed before them.

Mr. W. C. PARKINSON seconded the adoption of the report with much pleasure, seeing that it was exceedingly favourable. It was not a great while since that their late colleague, Sir Thomas Bent, was in this country; and they had the pleasure of a long interview with him. They found he thoroughly understood the position of the Company; and he gave them some most valuable hints. He (Mr. Parkinson) hoped and believed the prophecy of their Chairman would be fulfilled, The Company were in a prosperous condition; and he trusted they would remain so.

Mr. DYER heartily congratulated the Board upon the excellence of the balance-sheet, and upon the progress of the Company. He was glad to see the unaccounted-for gas down by 3 per cent.; but when it was considered that they had twelve works, and some of them small ones, there was nothing to complain about in this respect. He was pleased to observe that the Directors continued to write off for depreciation, as he was a strong believer in a low capital account. He noticed that the reserve fund was now £5968, but the reserve fund investment was only £2160. He supposed the difference was invested in the works themselves. This undoubtedly paid the best, though it was the usual thing to have the reserve fund invested in Consols.

Mr. JOHN COATES said the Directors had presented the shareholders with a splendid balance-sheet this year. Very few people knew the amount of labour entailed by a Company of this sort. He thought the Board was the most moderately paid one in the City of London. He had something to do with the drawing up of the Articles of Association, which controlled the Directors' fees; but he should not draw up such articles in the same way again. In concluding his remarks, he paid a handsome tribute to the memory of the late Sir Thomas Bent.

The CHAIRMAN remarked, in regard to the reserve fund, that a part was being utilized to greater advantage in the business of the Company, than if they invested it in outside securities. As to the Directors' fees, they could not, under the Articles of Association, alter them until the shareholders got 6 per cent., nor could the shareholders vote the Directors a bonus.

The motion was unanimously carried.

The CHAIRMAN proposed the declaration of a final dividend at the rate of 7 per cent. per annum, free of income-tax, making 5½ per cent. for the year, against 5 per cent. last year, and the placing to the reserve fund of £600.

Mr. CHARLES HUNT, in seconding, said their ability to pay a larger dividend this time seemed to him to be an ample justification of the policy the Directors had pursued during the last few years, of reducing the price of gas as far as practicable. It had limited their income temporarily; but it had induced a much larger consumption, and naturally broadened the basis of their business.

The proposition was unanimously carried.

Moved by the CHAIRMAN, and seconded by Mr. A. GODWIN-HAMMACK, Mr. Parkinson was re-elected to the Board; and proposed by Mr. PARKINSON, and seconded by Mr. F. R. SMITH, the Chairman was also re-elected.

On the proposition of Mr. DYER, seconded by Mr. C. A. MORGAN, the Auditors (Messrs. Wood, Drew, and Co.) were reappointed.

A resolution thanking the local Directors and staff and the Secretary was passed, on the motion of the CHAIRMAN, seconded by Mr. SAMUEL CUTLER; and a like compliment was paid the Directors, on the motion of Mr. CUTLER, seconded by Mr. DYER.

The Brodsworth and District Gas Company, Limited, are putting down plant on the property of the Bullcroft Colliery Company, Doncaster. Their first customers will be the model village at the Brodsworth Main Colliery; but the future possibilities of the Company are understood to be considerable, as the Bentley Colliery is only some 1½ miles away, and the district is pretty sure to develop with the three large collieries in full working order.

SOUTHAMPTON GAS COMPANY.

The Half-Yearly General Meeting of the Company was held last Wednesday—Captain A. J. CORSE SCOTT, J.P., presiding.

The CHAIRMAN, in moving the adoption of the report and accounts, remarked that the past half year had been a satisfactory one. The amount available for dividend, after payment of debenture interest, was £15,102. The maximum dividends amounted to £13,590, leaving a balance to be carried forward of £1512. There had been an increase in the sale of gas, and also in the number of consumers; and he had every reason to believe that this state of things would continue. During the past half year, upwards of 400 public gas-lamps had been disconnected, and electric light fitted. This was a policy the reverse of which was taking place in other towns in the United Kingdom. This year in Marylebone the London County Council refused to sanction a loan of £8000 for the purpose of electrifying the gas-lamps. The Local Government Board refused a loan to Hastings for the same purpose. At Finchley, the Council, after applying for a loan, were asked by the Local Government Board if they had carefully considered the relative cost of electricity and gas. At Great Yarmouth, when the Local Government Board were applied to for a loan of £2000 to substitute electric light for gas, the Local Government Board replied "that it was not the practice of the Board to sanction loans for undefined expenditure on public lighting, and that the Board saw no reason to make an exception in the present case." The Board further added "that at present they were not satisfied that the substitution of electricity for gas would result in any economy or improved lighting." The Corporation of the City of London had been for some time engaged in an elaborate inquiry on the various methods of street lighting; and a deputation of the Corporation visited the Continent in the spring. They reported that the authorities at Berlin, as a result of experiments, had decided to spend upwards of 7,000,000 marks in taking out the present gas and electric lamps and installing the latest pattern of inverted incandescent gas-burners in their place. As a result of their investigation, the deputation reported "that high-pressure incandescent gas-lamps with inverted burners should be adopted as the illuminant; but where gas is impracticable, electricity, with open arc and flame arc lamps, should be installed." Lighting by high-pressure inverted incandescent gas-lamps was being extensively used in the City of London. Other London districts where gas was being used in preference to electric light were West Ham, Islington, Lewisham, Deptford, and Camberwell; and this notwithstanding the fact that some of the Councils had their own electric light works. The Directors were certain that if the Corporation would give to the Company the opportunity to instal the latest form of incandescent gas lighting, it would be amply proved that this was not only more economical than, but greatly superior to, electric light for the purpose of illuminating the public streets. At present, they were suffering from severe competition, as the people did not know the cost of the electric light, but they did of gas. They were in the dark with regard to the electric light; and if the ratepayers only knew the cost, he thought they would not submit to the action the Corporation were taking. The Directors had now decided to let on hire a large range of gas-fires at very low rentals. Patterns might be seen in the offices. An official of the Company would be sent to any consumer who wished for advice as to the most suitable type of fire for his requirements. The best results were often not obtained from incandescent burners; and in order to assist the consumers, the Directors were now willing, whenever desired, to clean and adjust consumers' burners periodically, free of charge, and provide mantles, chimneys, and globes at the very lowest prices. Consumers who availed themselves of this offer would not only be relieved of all trouble, but would also know that their burners were maintained in an efficient manner. In consequence of the resignation of Mr. Eady, the Directors advertised for a Secretary. Over sixty applications were received; and Mr. J. R. H. Jacobs, Assistant Secretary and Accountant of the Reading Gas Company, was appointed to the position, at a salary of £400 per annum.

The report and accounts were adopted, as was also a proposition for the payment of the maximum dividends. Thereafter the shareholders confirmed the appointment of Mr. J. R. H. Jacobs as Secretary, at a salary of £400 a year; and it was agreed that the Directors' fees and the superannuation of Mr. C. Crowther Smith, a former Secretary, and Mr. E. W. H. Eady, the late Secretary, be paid free of income-tax.

The Chairman and Directors were thanked for their services, as also were the Secretary, the Resident Engineer and Manager (Mr. S. W. Durkin), and the staff.

Proposed Extension of the Plymouth Gas Supply Area.

By their last Act of Parliament, the Plymouth and Stonehouse Gas Company obtained power to extend their mains to several parishes and villages lying outside the borough of Plymouth and Stonehouse urban district. Some of these outlying places have for several years enjoyed the advantages conferred by these powers of expansion; and the Company now contemplate a further advance by extending the mains to the villages on the south side of the Cattewater. This will necessitate the laying of long lengths of pipe; for though the area includes a fairly large population, it is rather widely distributed, and is separated from Plymouth by a broad estuary. At present a canvass of the district is being carried out by the Company; and at a meeting of the Plymouth Parish Council last week, a letter was read from the Secretary of the Company (Mr. H. B. Heath) asking if the Council would light the village by gas. It was pointed out by Mr. Heath that, as the capital outlay would be considerable, much would depend upon the willingness displayed by the inhabitants to take the supply. The Chairman of the Council (Mr. W. H. Coleman) said that in order to light a district they must get the consent of a two-thirds majority of the residents. Mr. G. O. Coleman thought the Council, as a body, were in sympathy with the object of the Company; but they could not decide the question. It was resolved to point this out to the Company, and to say that no definite reply could be made to the suggestion respecting public lighting until a poll had been taken.

THE PROPOSED GAS-WORKS EXTENSIONS AT BELFAST.

In moving the minutes of the Gas Committee which were adopted at the quarterly meeting last week of the Council of the County Borough of Belfast, the Chairman of the Committee, Mr. J. A. Doran, J.P., referred to the exhibition held recently in the Ulster Hall, which he said had been a great success.

As to the resolution passed by the Corporation at a special meeting in favour of the appointment of four experts to advise them in regard to the proposed extension of the gas-works, the Committee had selected Mr. Walter R. Herring, of Edinburgh, Mr. Charles Hunt, of London, Mr. W. H. M'Laughlin, J.P. (of Messrs. M'Laughlin and Harvey, Contractors, Belfast), and Mr. W. J. Stewart (of Messrs. J. & W. Stewart, Contractors, Belfast). The questions to be addressed to the Consulting Engineers were as follows: "Is any extension of the present gas-works necessary; if so, what provision should be made for the future, having regard to the capacity of the existing works, the present rate of increase of consumption, and the possibility of the future development of other undertakings for the supply of light, heat, and power? What is the smallest area of land that should be acquired for the new works per million cubic feet daily capacity, having regard to local circumstances and economical working? So that comparisons can be made as to the relative values of the different sites, prepare estimates of the following: (1) The cost of constructing foundations to works level on each site; (2) the cost of coal-handling plant to each site; (3) the cost of coal conveyance to each site; (4) how the income from sales of coke and other residuals will be affected at each site; (5) how the cost of production of gas will be affected by any other consideration peculiar to some of the sites and not common to the whole." Mr. Mercier asked if the whole of the city would be open to the experts for their opinion so far as the sites were concerned. He was aware that Ormeau Park was voted-out a month ago; but he did not know if the position would now be altered. He thought Ormeau Park was the place for the extension. It was, however, pointed out that the Council had passed a resolution eliminating Ormeau Park from the list of proposed sites. Alderman Tougher said it was certainly in his recollection, notwithstanding this resolution, that all the sites which had been under consideration, including Ormeau Park, would be submitted to the experts. Mr. Doran: As far as I am concerned, Ormeau Park will be one of the sites.

ELECTRIC LIGHTING AT HASTINGS.

An Unnecessary and Expensive Luxury.

It may be remembered that the Hastings Town Council lately decided to allocate a sum of £500 out of the rates for the purpose of adapting gas-lamps to electric lighting, notwithstanding that the Local Government Board had peremptorily refused to sanction a loan for the purpose. A correspondent of the "Hastings and St. Leonards Observer"—Mr. Angelo Lewis—in a letter which appeared in the issue for the 30th ult., inquires very pertinently what the ratepayers stand to gain by this expenditure.

Dealing first with the quality of the light, Mr. Lewis says: "No one ventures to suggest that the new light is better than the old one; indeed, anyone with eyes in his head can see for himself that it is far poorer. As a matter of fact, the estimated candle power of the electric street-lamps is 45 candles, as against the 50-candle power of the gas-lamps; but this understates the actual inferiority of the former—the gas-light, even when nominally equal, having a far greater power of self-diffusion. Anyone who desires to test the question in a practical way has only to take his stand, when the moon is not shining, at the end of Cornwallis Gardens and look down each side. The western side, which has the electric lamps, slumbers in feeble reddish light. The eastern side, which still enjoys the clear white light of the incandescent gas-burners, looks positively brilliant by comparison."

Passing next to the cost of the new light, Mr. Lewis takes for example one road, the conditions in which he presumes are the same elsewhere, and says: "I find that the gas-lamps (the property of the ratepayers, in good working condition, but now cast upon the scrap heap) were supplied with gas at £3 2s. 2d. each per annum. The Municipality, in order to compete (or make believe to compete) with the Gas Company, undertake to supply electricity at the same rate, which works out at about 2d. per unit. Now, in the year ending March 31, 1908, the cost per unit of the current sold was over 6d.; and for the last year, even when made to appear smaller by the ingenious expedient of ignoring capital charges (which are separately debited to the unfortunate ratepayer) it was over 3d. On the actual supply, therefore, there is at the lowest estimate a loss of more than 1d. per unit. Our councillors would seem to have attended the same school as the old woman who lost a penny on every egg she sold, but declared that the quantity paid her. The loss on last year's working of the electric light undertaking is stated to be £380r 11s. 4d., which sum has been, or will be, charged to the general district rate. The ratepayers are now to pay an extra £500 for the privilege of losing more money annually over an inferior light."

Another correspondent characterizes the change of lights as a "retrograde step," for he says the roads, which were adequately lighted before, now leave much to be desired. He adds: "Authority for the conversion was obtained under absolutely false pretences. It was distinctly stated in the Council Chamber, no doubt on the authority of a responsible official, that the light would be as good as before. But the result is a lamentable failure; the lighting is distinctly worse."

The Directors of the Continental Union Gas Company, Limited, have decided to recommend to the proprietors, at the forthcoming general meeting to be held on Dec. 7, dividends of 2½ per cent. for the half year on the ordinary stock, free of income-tax, and 3½ per cent. for the half year on the preference stock, less income-tax—making for the year 5 per cent. on the former, and 7 per cent. on the latter.

THE DANGERS OF TARRED ROADS.

In our "Legal Intelligence" will be found a short report of the opening proceedings in an action brought against the Kent County Council by some farmers for damages for the loss of a cow alleged to have been poisoned by water contaminated by washings from a tar-painted road under their supervision. We learn from the "Morning Post" that some trouble has arisen from this cause in the Isle of Wight in connection with fish life. It is stated that fishermen at Carisbrooke report that they have discovered that 75 per cent. of the rainbow trout in a neighbouring stream have been destroyed in consequence of the surface water from a tar-sprayed road in the village being allowed to drain into the stream. Above the point where the tar-washings enter the water the fish have not been affected. Inquiry by a representative of our contemporary at the Board of Agriculture and Fisheries failed to elicit any information in support of the view that the evil was in any sense widespread. At the offices of the National Sea Fisheries Protection Association, it was stated that the trouble was one of which anglers had been aware ever since the introduction of motor-cars created the dust problem, and in turn led to the treatment of certain roads with tar and other preparations. "There is no doubt," said Mr. J. Wrench Towse, "of the connection between tarred roads and destroyed fish; but the question is largely one of degree. You must take into consideration where the tar comes from. It might be comparatively innocent if obtained from some gas-works, and have little or no effect on the fish; while the tar from other gas-works would be most prejudicial in its results. The fish get the tar on their scales, and are choked. All fresh-water fish are affected; and trout seem specially sensitive in this respect. Another point is that while the tar itself may be harmless, it is often mixed with other substances, and the resultant composition is a source of danger whenever it gets into the streams. I cannot particularize; but you must know that the nature of the tar compound placed on the roads in various districts differs according to local needs and requirements. Then, again, time is a considerable factor in the question. If a thunderstorm occur while a tarred road is being made, the washings will be plentiful, and will kill almost anything in the streams, especially in the summer, when the water is low. But two months after the road has been finished the thunderstorm might occur, and the danger to the fish from tar and tar products would not be there."

METROPOLITAN WATER BOARD.

Rating of the Undertaking—South Suburban Gas Company's Case.

At the Meeting of the Metropolitan Water Board last Friday, the Appeal and Assessment Committee, having considered a suggestion made by the London County Council, and supported by certain of the Metropolitan Borough Councils, as to keeping the accounts of the Board's undertaking in such a way as to render the net earnings in each parish easily ascertainable, reported that there were serious practical difficulties which rendered the suggestion impossible of adoption. The London County Council's object in seeking this revision of procedure was to secure, if possible, a larger proportion of the rateable value for London as compared with the outside area. It by no means followed, however, the Committee contended, that this would be the case. The Board's undertaking was one concern, managed from one centre, and financed from a common fund. The accounts of the Board, moreover, were kept as for one undertaking; no regard being had to the distribution of the expenditure as between the several parishes through which it extends. It was, in fact, impossible to directly charge each parish with the correct proportion of the expenses incurred in supplying it with water. By means of the system of inter-communication which the Board had established, and which had proved to be of great value and importance, all the works, wherever situated, were available for supplying water to any part of the Board's area. The water consumed in any parish therefore might be, and frequently was, derived from various sources; and the method of supply might, and did, vary from day to day. It was clear, therefore, that it was absolutely impossible to earmark any particular portion of the supply and say that it cost a specific sum. The Committee recommended that, as the Board found serious practical difficulties which rendered the suggestion of the London County Council impossible of adoption, the Council and the Finsbury and Southwark Borough Councils be informed accordingly and furnished with a copy of the Committee's report. Consideration of the subject was adjourned.

The same Committee presented a report on the action of the South Suburban Gas Company against the Board (see *ante*, p. 191). After stating the facts, the Committee said: "We have always regarded the charge for any domestic supply as being regulated by sections 8 and 9 of the Charges Act, prescribing a rate of 5 per cent. on the rateable value with a rebate in certain circumstances. The learned Judge has confirmed our view of the operation of the Act. The case may be regarded somewhat in the light of a test action, as, if the point of the plaintiffs had been conceded, the decision would have applied to all factory and business premises, and would have materially affected the Board's revenue. So far as the South Suburban Gas Company are concerned, the decision does not materially affect them, as the Board's supply was discontinued, at their request, at Michaelmas, 1908. We are dealing with the question of charge so far as it affects the water used from April 1, 1908, to the date the supply was cut off; and we do not anticipate that there will be any difficulty in arriving at a satisfactory settlement. The decision is a particularly valuable one, so far as the Board are concerned, and has definitely established the principle that it is the character of the user and not the nature of the premises which regulates the question of water charges."

The Finance Committee reported that the Local Government Board, while of the opinion that the disallowance was lawful, had remitted the surcharge of £59 16s. 4d. made by the District Auditor in the Board's accounts for 1907-8. It may be remembered that the amount was expended in refreshments, &c., in connection with the ceremonial opening of some of the Board's works.

EXTENSION OF THE CAMBORNE WATER-WORKS.

A New Reservoir.

Owing to the increase in the population and the growth of industrial enterprise within their district, the Camborne Water Company have experienced considerable difficulty in maintaining an adequate supply of water during recent dry seasons. In the parliamentary session of last year, a Bill was promoted, as noticed in our columns at the time, for the raising of additional capital and the construction of works to enable the Company to cope with the growing demand. The main feature of the new works is an additional storage reservoir with a capacity of 4 million gallons, which is now approaching completion. It has a depth of more than 20 feet; and its construction presents some features of interest. The whole district is intersected by ancient mine workings, and the site of the reservoir has been the scene of activity of this kind in the past. Its configuration, moreover, rendered it necessary to build a dam enclosing the water on three sides. In its construction, reinforced concrete has been employed; sheets of expanded steel being used as reinforcement. The Engineers describe the dam as an oblique plane in a series of bays, in which the principle of girder and double cantilever under gradually increasing loads has been predominant. Beyond this, and at 10 feet intervals, counterforts of heavy profile have been built on continuous foundations, forming a complete structure, with a stability of more than three times the overturning force. It is pointed out that the adoption of steel reinforcement not only effects an enormous saving in the quantity of concrete employed, but adds to the tensional strength of the structure. The reinforced dam rises to a height of 18 ft. 6 in. above the ground-level, at which it has a thickness of 1 ft. 6 in. It narrows gradually as it rises, and at 15 feet below the top-water level is 1 ft. 4 $\frac{1}{2}$ in. thick; at 10 feet below, it is 1 ft. 1 $\frac{1}{4}$ in. thick; at 5 feet below, 10 $\frac{1}{2}$ inches thick; and at the top-water level, only 7 inches thick. The slope at the foot is 45°, and above this is 1 in 3.

In the feeding of the reservoir, the main stream is diverted into a receiving-tank, and after flowing through a measuring-chamber passes to a battery of Candy pressure filters below the reservoir. From the conduit supplying the filters is an overflow into the reservoir, so adjusted that any water in excess of the immediate demand is automatically fed into the reservoir. A balancing reservoir is being constructed to equalize the pressure, and the major length of the pipe aqueduct is being duplicated. A water-tower, charged by means of electrically-driven pumps from the balancing reservoir, will serve one isolated high-level district; and the rest of the area will be supplied by gravitation. The whole scheme will be completed by the reorganization of the distributing plant, and the provision of a system of waste detection by means of Deacon meters.

Mr. F. W. S. Stanton, Assoc.M.Inst.C.E., of Chatham and Bristol, is the Engineer of the scheme, which was taken in hand upon the advice of Mr. S. C. Chapman, Assoc.M.Inst.C.E., the Engineer of the Torquay Water-Works, who, on being consulted by the Company, reported in favour of a large extension of the undertaking.

INCREASED WATER STORAGE FOR BURY.

Completion of the Scout Moor Reservoir.

The Bury and District Joint Water Board obtained powers six years ago for the construction of three reservoirs in the Scout Valley; and shortly afterwards they gave instructions for obtaining tenders for a high-level reservoir on Scout Moor, for which drawings had been prepared by their Engineer (Mr. J. Cartwright, M.Inst.C.E.). The tender of Messrs. James Byrom, Limited, of Bury, was accepted; and on Aug. 3, 1905, the first turf was cut by Mr. J. Cunliffe, and the first stone in the tunnel invert laid by Mr. J. Garnett. The reservoir was completed on the 27th ult., and, in the presence of the members of the constituent authorities of the Board, it was formally opened by Alderman R. D. Duxbury, the Chairman of the Works Committee, and the water was turned on by Alderman Cartin. The following are some particulars of the work, which was carried out under the personal supervision of Mr. Cartwright.

The reservoir is situated on the moorland heights about six miles north-east of Bury and 3 $\frac{1}{2}$ miles south-east of Haslingden, at an elevation of 1183 feet above sea-level. It has a storage capacity of some 50 million gallons, and a top-water area of more than 6 acres. The area of the gathering-ground is 250 acres. The reservoir is capable of maintaining a delivery of 250,000 gallons per day during a dry year, in addition to the statutory 136,500 gallons of compensation water to the stream. The main embankment covers an area of 17,600 square yards, is 530 feet long, 550 feet wide at the base, and 20 feet wide at the top. Its height above the level of the stream course is 115 feet. It contains 164,000 cubic yards of material. The inner slope has an inclination of 3 horizontal to 1 vertical; the upper portion being pitched with heavy masonry, the lower shingled. The outer slope has an inclination of 2 $\frac{1}{2}$ horizontal to 1 vertical, and is benched and grass-sown.

The bye channel skirts the northerly side of the reservoir. It is a paved channel with masonry walls 500 yards long and 6 feet wide, and is designed to carry away the flood waters in the heaviest storms. The waste weir is constructed in curved ashlar, and is 25 feet wide on the crest; the ends being built into semicircular bulk-heads. The by-wash is formed of a series of masonry steps terminating in a pool which is designed to break the force of the water. The walls are constructed of block in coarse masonry, backed with concrete.

The puddle trench is 600 feet long and 12 feet wide; its maximum depth is 65 feet; and it contains 1300 cubic yards of concrete and 10,300 cubic yards of clay puddle. The puddle wall varies in width from 23 feet at its base to 7 feet at the top, and contains 9200 cubic yards of clay puddle. The outlet tunnel, which carries the supply-pipe (15 inches in diameter) through the embankment, is 570 feet long and 5 feet diameter, and is built in concrete and brickwork.

The valve tower is constructed of concrete masonry and brick. It is 10 ft. 6 in. square at the bottom and 8 ft. 6 in. diameter at the top bank

level. Its height is 110 feet, and it contains two 24-inch and six 15-inch sluice-valves for regulating the supply and enabling the water to be drawn off at varying levels. It is connected with the embankment by a bow-string wrought steel bridge, 65 ft. 6 in. long and 4 feet wide.

The Whittle Brook intake receives the waters of the Whittle stream, which are conveyed to the reservoir by a covered conduit. The intake is built in masonry, provided with sluices designed to shut off the water in times of heavy floods. The regulating well is a brick structure containing an automatic valve, which ensures a regular head of water on the supply-mains. From this well issue two pipes, one 8 inches diameter for supplying Haslingden, the other 6 inches diameter held in reserve for other districts. The meter-house is a brick structure, and contains an 8-inch and a 6-inch Venturi meter. The regulating well and the meters have been fixed in a position and at a level which will allow of filters being hereafter constructed without interference with the works already completed. Junctions have been provided on the supply-main, to permit of connections to convey the water to the filters and thence to the regulating well. The length of the conduit from the well to Haslingden is 8600 yards. The storm-wall top of the inner slope of the main embankment is 500 feet long. The boundary wall enclosing the site is 3780 feet long and 6 feet high.

COKE PRODUCTION IN PENNSYLVANIA LAST YEAR.

According to the advance sheets of the Government report respecting the coke production of the United States for the past year, the quantity produced in Pennsylvania was 15,511,634 net tons, out of a total for the United States of 26,033,518 net tons. In 1907, Pennsylvania produced 26,513,214 tons out of a total of 40,779,564 tons. The production in 1908 showed a decrease of 11,001,580 tons, or 41.5 per cent., from that of 1907, or of 7,548,877 tons, or 32.7 per cent., from that of 1906. The years 1906 and 1907, however, were years of plenty in the coal-mining and coke-producing industries, and can hardly be considered representative of the normal output. If, however, the production of Pennsylvania in 1908 is compared with the average of the eight preceding years, it is noted that the production still shows a decrease of 2,597,188 tons, or 14.3 per cent. The production in 1908 was the smallest since the year 1904.

The conditions in 1908 were almost a direct contrast to those which prevailed during the preceding year. During 1907, until the effects of the financial troubles began to be felt, there was scarcely a time when the production was in excess of the demand; whereas in 1908 the occasions were just as scarce when the supply was not in excess of the market requirements. The result of these conditions is exhibited in the proportionately larger decrease in the value of the coke as compared with the decrease in production. The total value of the coke produced in Pennsylvania in 1908 was \$32,569,621, against \$67,638,024 in 1907; showing a decrease of 51.8 per cent. The drop in tonnage was 41.5 per cent. The decrease in the value of the production in 1908 was greater than the value of the entire coke output of Pennsylvania in 1904.

The average price per ton obtained for coke in Pennsylvania in 1908 was \$2.10 at the oven, as compared with \$2.55 in 1907, \$2.35 in 1906, and \$2.05 in 1905. The only reason to be assigned for the excess in the 1908 price over that of 1905 is the fact that operators were able, through contracts, to maintain prices, and thus prevent entire demoralization, and also the fact that a large proportion of the coke produced in Pennsylvania is not placed on the market, but is used by the producers themselves or by allied interests, and the value put upon it is purely arbitrary.

The quantity of coal consumed in the manufacture of coke in Pennsylvania in 1908 was 23,215,964 net tons, valued at \$23,250,885. This represents 19.81 per cent. of the total production of bituminous coal in Pennsylvania during the year. In 1907, the consumption of coal in the manufacture of coke was 39,733,177 net tons, valued at \$42,732,546, representing 26.4 per cent. of the State's total bituminous coal production. The much smaller percentage in the quantity of coal used for coke making in 1908 as compared with the preceding year indicates that the decrease in the demand for coke by the iron furnaces was in greater proportion than that in the demand for coal from other consumers of fuel. The difference between the value of the coke and the value of the coal from which it was made in 1908 was \$9,318,736, or 40.1 per cent.; in 1907, the difference was \$24,905,478, or 58.3 per cent. The number of coke-making establishments in 1908 was 252, or one less than in 1907, though the total number of ovens in the State increased from 51,364 to 52,606. Of these establishments, 44 were idle; and of the 52,606 ovens, 3616 were out of blast throughout the year.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The meeting of the Western District of the Scottish Junior Gas Association in Glasgow to-night was a very satisfactory one so far as attendance was concerned. The discussion was a failure, the reason for which is doubtless to be found in two of the attending circumstances—first, in that the subject, "Carbonization Fifty Years Ago," was one upon which juniors could have nothing to say arising out of experience; and, second, in that, by a strange happening, over which no one could have control, not a single representative from the elderly ranks of the membership was present. The subject was an interesting one, and was well handled by Mr. Orr; but it was a matter for instruction rather than criticism. It is perhaps well that it was not discussed, for any discussion upon it would have taken the form of a re-fighting of the battles of the olden times. This might have been amusing, but could scarcely have been profitable.

Notice is given to-day by the Corporation of Kirkcaldy of an application for a Provisional Order authorizing the extension of the burgh and other matters. Among the other matters specified is the acquisition of the undertaking of the Kirkcaldy Gaslight Company, Limited. The notice states that the Town Council, on May 10 last, resolved to adopt the Burghs Gas Supply (Scotland) Act, 1876, and appointed the

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 382.

Issue	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue.	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Oct. 74	10	Alliance & Dublin 10 p.c.	17-18	..	5 11 1	195,242	Stk.	Aug. 26	10	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
298,955	10	"	7	Do. 7 p.c.	12-13	..	5 7 8	561,000	Stk.	"	5	Liverpool United A.	223-225	..	4 8 11
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	91-100	..	4 0 0	718,100	"	"	7	Do. B.	166-168	..	4 3 4
200,000	5	Oct. 28	6 1/2	Bombay, Ltd.	52-64	..	5 8 4	306 083	"	June 25	4	Do. Deb. Stk.	104-106	..	3 15 0
40,000	5	"	6 1/2	Do. New, £4 paid.	43-43 1/2	..	5 9 1	75,000	"	June 11	5	Malta & Mediterranean.	48-51	..	5 17 1
50,000	10	Aug. 26	15	Bourne- 10 p.c.	28-28 1/2	..	5 5 3	560,000	100	Oct. 1	5	Met. of 15 p.c. Deb.	59-102	..	4 18 0
311,810	10	"	7	mouth Gas B 7 p.c.	16 1/2-17	..	4 3 7	250,000	100	"	4 1/2	Melbourne 1/2 p.c. Deb.	100-102	..	4 8 3
75,000	10	"	6	and Water Pref. 6 p.c.	15 1/2-15 3/4	..	3 16 2	541,920	20	May 27	3 1/2	Monte Video, Ltd.	123-134	..	5 5 8
380,000	Stk.	Aug. 12	12 1/2	Brentford Consolidated	254-257	..	4 17 3	1,775,892	Stk.	July 29	4 1/2	Newc'te & G'tesh'd Con.	100-108	..	4 3 4
300,000	"	"	5 1/2	Do. New	190-192	..	4 19 0	518,795	Stk.	June 25	3 1/2	Do. 3 1/2 p.c. Deb.	93-94	..	3 14 6
50,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13-13 1/2	..	5 3 8
206,250	"	June 11	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	300,030	Stk.	Apr. 29	8	Oriental, Ltd.	139-141	..	5 13 6
220,000	Stk.	Sep. 10	11	Brighton & Hove Orig.	218-213	..	5 3 3	60,000	5	Sep. 10	13	Ottoman, Ltd.	68-68 1/2	..	6 5 6
246,320	"	"	11	Do. A Ord. Stk.	150-152	..	5 5 3	31,800	53	Aug. 26	13	Portsea Island A.	137-159	..	4 19 0
460,000	2 1/2	Oct. 14	10	British	42-43	..	4 13 0	60,000	50	"	13	Do. B.	129-131	..	4 19 3
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c.	118-120	..	5 0 0	100,000	50	"	12	Do. C.	120-123	..	4 17 7
165,700	"	"	4 1/2	Do. B 3 1/2 p.c.	83-90	..	5 0 0	114,800	50	"	10	Do. D and E.	101-103	..	4 17 1
82,278	"	"	5 1/2	Do. C 5 p.c.	106-108	..	5 1 10	398,490	5	Oct. 28	7	Primitiva Ord.	68-71 1/2	..	4 18 4
5,500	"	June 25	3 1/2	Do. 3 1/2 p.c. Deb.	88-90	..	3 17 9	796,85	5	July 29	5	Do. 5 p.c. Pref.	52-54	..	4 10 11
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	13 1/2-14	..	5 0 0	488,903	100	June 1	4	Do. 4 p.c. Deb.	95-97	..	4 2 6
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	96-98	..	4 1 8	1,000,000	10	Oct. 14	8	River Plate Ord.	163-164 1/2	..	4 15 7
100,000	10	"	—	Cape Town & Dis., Ltd.	4-5	..	—	32,650	Stk.	June 25	4	Do. 4 p.c. Deb.	96-98	..	4 1 8
100,000	10	"	—	Do. 4 1/2 p.c. Pref.	52-53 1/2	..	—	250,000	10	Sep. 29	8	San Paulo, Ltd.	44-144 1/2	..	5 8 6
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	47 1/2-48 1/2	..	6 3 9	62,500	10	"	6	Do. 6 p.c. Pref.	113-124	..	4 18 0
100,000	Stk.	June 25	4 1/2	Do. 4 1/2 p.c. Deb. Stk.	82-84	..	5 7 2	125,000	50	July 1	5	Do. 5 p.c. Deb.	51-52	..	4 16 2
157 150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	108-110	+ 1 1/2	4 10 11	135,000	Stk.	Sep. 10	10	Sheffield A.	230-232	..	4 6 2
1,493,280	Stk.	Aug. 26	5 1/2	Commercial 4 p.c. Stk.	109-111	..	4 13 8	29,984	"	"	10	Do. B.	230-232	..	4 6 2
560,000	"	"	5	Do. 3 1/2 p.c. do.	104-105	..	4 14 4	523,500	"	"	10	Do. C.	230-232	..	4 6 2
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	70,000	10	Oct. 14	10	South African.	122-124 1/2	..	7 16 11
800 000	Stk.	"	5	Continental Union, Ltd.	97-99	..	5 1 0	6,429,895	Stk.	Aug. 12	5 1/2	South Met., 4 p.c. Ord.	120-122	..	4 7 4
200,000	"	"	7	Do. 7 p.c. Pref.	138-140	..	5 0 0	1,895,445	Stk.	July 14	3	Do. 3 p.c. Deb.	83-85	- 2	3 10 7
493,270	Stk.	"	5	Derby Con. Stk.	121-123	..	4 1 4	209,820	Stk.	Aug. 26	8	South Shields Con. Stk.	154-156	..	5 2 7
55,000	"	Oct. 2	4	Do. Deb. Stk.	103-105	..	3 16 2	605,000	Stk.	Aug. 12	5 1/2	S'th Suburb'n Ord. 5 p.c.	119-121	..	4 10 11
148,995	"	"	5	East Hull 5 p.c. Ord.	97-99	..	5 1 0	60,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
486,090	10	July 14	12	European, Ltd.	243-25	..	4 16 0	117,018	"	July 14	5	Do. 5 p.c. Deb. Stk.	122-124	..	4 0 8
351,060	10	"	12	Do. £7 10s. paid.	184-19	..	4 14 0	502,310	Stk.	May 13	5	Southampton Ord.	111-113	..	4 8 6
15,141,545	Stk.	Aug. 12	4 1/2	Gas 4 p.c. Ord.	102-104	- 1 1/2	4 9 8	120,000	Stk.	Aug. 12	6 1/2	Tottenham A 5 p.c.	133-135	..	5 1 9
2,600,000	"	"	3 1/2	light 3 1/2 p.c. max.	88-90	..	3 17 9	453,940	"	"	5 1/2	and B 3 1/2 p.c.	111-113	..	4 15 3
3,792,735	"	"	4	and 4 p.c. Con. Pref.	104-105	..	3 16 2	149,470	"	June 25	4	Edmonton 4 p.c. Deb.	100-102	..	3 18 5
4,193,975	"	June 11	3	Coke 3 p.c. Con. Deb.	83-85	- 2	3 10 7	182,380	10	June 11	8	Tuscan, Ltd.	9-9 1/2	..	8 8 6
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3 1/2 p.c.	92-94	..	5 6 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
62,500	"	"	6 1/2	Do. do. 5 p.c.	117-119	..	5 9 3	236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	109-111	..	4 10 1
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	174-174 1/2	..	6 4 0	255,600	Stk.	Aug. 26	6 1/2	Wands- 1 B 3 1/2 p.c.	139-141	..	4 14 0
131,010	Stk.	Sep. 10	6 1/2	Ilford A and C	138-140	..	4 12 10	79,416	"	June 25	3	worth 1 3 p.c. Deb. Stk.	73-75	..	4 0 0
65,781	"	"	5	Do. B	105-107	..	4 13 6	895,872	"	Aug. 12	5 1/2	West Ham 5 p.c. Ord.	123-125	- 1	4 6 0
65,500	"	June 25	4	Do. 4 p.c. Deb.	102-104	..	3 16 11	210,000	"	"	5	Do. 5 p.c. Pref.	127-129	..	3 17 6
4,940,000	Stk.	May 13	8	Imperial Continental	110-112	..	4 7 11	253,300	"	June 25	4	Do. 4 p.c. Deb. Stk.	112-114	..	3 10 2
1,235,000	Stk.	Aug. 12	3 1/2	Do. 3 1/2 p.c. Deb. Red.	95-97	..	3 12 2								

Prices marked * are "Ex div."

second meeting for consideration of the resolution to be held on Nov. 15. The Provisional Order will make the following provisions applicable to the gas undertaking after it has been acquired by the Corporation: Empower the Corporation to acquire the lands belonging to the Gas Company, and a plot of land adjoining, and to erect gas-works thereon; to amend or repeal the provisions of the Acts relating to the gas undertaking with respect to the illuminating power of the gas and the testing of it, and to make other provisions with respect to the illuminating power, purity, and testing of the gas and the apparatus to be used therefor; to alter and vary the provisions of the Acts relating to borrowing for the gas undertaking with reference to the sinking fund and repayment of borrowed money; to provide that, if there be any surplus remaining on account of the revenue of the gas undertaking, the Corporation may carry that surplus, or part of it, to the burgh general assessments; that the Corporation may make regulations as to the size, material, and other particulars of pipes and fittings to be laid by consumers; to provide that the Corporation may sell, let for hire, fix, repair, and remove engines, stoves, ranges, pipes, and other fittings, and to make provision for such engines, fittings, &c., not being subject to distress or landlords' hypothec; and to make provision in respect to the recovery of all gas rents and charges and meter-rents, and as to the discount to be allowed on public lighting.

The municipal elections which took place on Tuesday have been remarkable for the absence of any question of importance relating to gas supply. There were a few grumblers at electoral meetings in Edinburgh at the practice of the Gas Commissioners in requiring deposits from consumers, and at the high price charged for gas through prepayment meters; but none of the candidates took the subject up. Lord Provost Gibson, the head of the Gas Commission, retired from office, and has been succeeded by Mr. W. S. Brown, who, though he has been in the Town Council continuously since 1892, and had previously served a term of three years, has never been a member of the Gas Commission, and, indeed, has sometimes been not over friendly to that body. Lord Provost Gibson, it may be noted, was the recipient, a day or two before he retired, of the honour of Baronetcy. In Glasgow, Mr. M. W. Montgomery has been re-elected Convener of the Gas Committee, and Bailie Paxton has been re-elected Vice-Convener. In Kirkcaldy, where a gas transfer is in progress, the candidates addressed themselves to the subject of gas supply; the remarks being mostly favourable to the transfer. In the Kilmarnock Town Council, Mr. Robert Muir, who has been Convener of the Gas Committee for the past five years, was yesterday appointed a Bailie of the burgh. He was also, by a majority, and after a heated discussion, re-elected to the convenership.

There is a correspondence at present in progress in the pages of the "Glasgow Herald" upon the smoke problem, in which one of the writers stated the other day that it was becoming evident that far more of their citizens were acutely interested in the state of their atmosphere than ever cared for the smell of the Clyde. How many, he asked, of the residents in Glasgow suffered more or less from nasal, bronchial, or lung disease during winter? Perhaps 50 per cent. would not be too

large an average. The Lord Provost thought, he went on to state, that Glasgow could not move in the matter without the co-operation of the surrounding communities; but he could not follow his reasoning. Why should Glasgow not give separate meters for gas-stoves, and a reduced charge for gas thus consumed, as was done in many Scottish burghs? In this matter at least Glasgow could apply her methods to Govan and Partick. The great difficulty, of course, was the kitchen fire and the supply of hot water. He saw it stated in a recent number of the "Westminster Gazette" that this problem had been solved; but the writer would like to know how costs compared. In the same article, it was shown how thoroughly exploded was the notion that there was anything unhealthy about a gas heating stove set in an ordinary fire-place. Many people, he believed, would instal gas-heaters for their kitchen boilers, even if the cost were double that of coal, owing to the saving in labour, to say nothing of cleanliness.

At a meeting on Tuesday of the Cowal District Committee of the Argyll County Council, a requisition from electors was submitted, asking that Sandbank be formed into a special lighting district. A report on the subject was furnished by Mr. W. Roger, the Burgh Surveyor of Dunoon, in which he dealt with the two forms of lighting—gas and electricity—and suggested that ordinary gas be used, as being preferable to electricity. He estimated the charge at 2½d. in the pound on the rates, divided between owner and occupier. It was agreed to create a lighting district.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Nov. 6.

Sulphate of Ammonia.

Although new business direct from consumers has continued scarce, the week's requirements for covering orders previously taken by dealers have been sufficient to absorb current production, and no further decline in values has taken place. The closing quotations are still £11 2s. 6d. per ton f.o.b. Hull, £11 3s. 9d. per ton f.o.b. Liverpool, and £11 5s. per ton f.o.b. Leith. There is no new feature to comment upon in the forward position. Home manufacturers persist in demanding a premium; while second-hand sellers, as well as the German and Belgian Syndicates, are reported to be booking orders for delivery over the first six months of next year at current prices.

Nitrate of Soda.

The depression in the market for this article is unrelieved, and values on spot are barely maintained at 9s. 3d. per cwt. for ordinary and 9s. 6d. for refined quality.

Tar Products.

LONDON, Nov. 8.

Business in tar products has been rather quiet during the past week. Pitch remains unaltered in price; but orders are scarce, and rather lower prices are being accepted on the Continent. Creosote is

THE LIGHT THAT NEVER FAILS. BLAND LIGHT ALWAYS SUCCESSFUL.

THE FOLLOWING LETTER SPEAKS:—

55, Acacia Road, Regent's Park, N.W., Oct. 29, '09.

I have much pleasure in informing you that the Bland burners supplied to me have been very successful indeed. Owing to the strong draught in my entrance hall, I had found it practically impossible to get a burner that was satisfactory, and during three years I tried several well-known makes, all of which gave me a lot of trouble. The Bland burner has entirely withstood the strong air currents, and in every way has proved itself most satisfactory. The present mantle has been on for 18 months, whereas previously I could not get one to stand longer than a few days. I have much pleasure in telling you this experience, as the Bland burners have not only saved me considerable expense, but I have got rid of a trouble which gave me much annoyance.

(Signed) F. S. BENNETT.

THE BLAND LIGHT SYNDICATE, LTD.,

63, Queen Victoria Street, City, E.C.
20, Fennel Street, Manchester.

quiet, and there is not much business doing. Benzol is somewhat uneasy, owing to the fear that a duty may be imposed on this article in France next year.

The average values during the week were: Tar, 13s. to 20s., *ex* works. Pitch, London, 26s. to 26s. 3d.; east coast, 25s. 6d. to 26s.; west coast, 24s. 6d. to 25s. 6d. Benzol, 90 per cent., casks included, London, 6½d. to 6¾d.; North, 5¾d. to 6d.; 50-90 per cent., casks included, London, 7½d.; North, 6¾d. to 7d. Toluol, casks included, London, 9d. to 9½d.; North, 9d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3¾d. to 3½d.; solvent naphtha, casks included, London, 1s. to 1s. 0½d.; North, 11¼d. to 11½d.; heavy naphtha, casks included, London, 10½d. to 11½d.; North, 11¼d. to 11½d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. Carbolic acid, 60 per cent., casks included, east coast, 10½d. to 10¾d.; west coast, 10½d. to 11d. Refined naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article has been decidedly quiet throughout the week, and makers have been a little more reasonable in their ideas. To-day, Beckton is £11 5s. per ton, and for forward delivery £11 8s. 9d. Ordinary makes on Beckton terms are £10 18s. 9d.; and Hull, £10 18s. 9d. to £11. In Liverpool, £11 to £11 1s. 3d. are the figures; and in Leith, £11 5s. to £11 7s. 6d. For forward delivery, £11 10s. is quoted.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade has shown quietness in steam qualities; but there is a growing consumption for gas coals. In steams, best Northumbrians may now be quoted down to about 10s. per ton f.o.b., with a fair, though scarcely full, demand. Second-class steams are about 9s.; and steam smalls are from 5s. to 6s. The closing of the Baltic season has reduced the demand for steams, and hence the weakness in prices; while there is also a little ease in the quotations for next year's delivery. In the gas coal trade, the demand is increasing, and the deliveries on the long contracts will soon be at their heaviest. The prices do not show much change. The usual kinds of gas coals are from about 10s. to 11s. per ton f.o.b., according to quality; "Wear specials" being about 11s. 6d. There are fewer forward sales of gas coals at the present time—some of the buyers appearing to expect concessions, and producers wishing to have more certainty as to the prospects before selling a larger proportion of the output. There are rather more hopes of a settlement of the difficulty which arises in the Northern coalfield at the end of the year; but the time is now somewhat short, so that both buyers and sellers are a little uncertain. Coke is steady, and gas coke has been freely shipped of late, so that the stocks are not very heavy.

Good gas coke is from 12s. 6d. to 13s. 3d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

Trade has been fairly active during the past week. There is a better request for shipment; and the cold weather improved the home demand. The prices are: Ell 9s. to 10s. 6d. per ton f.o.b. Glasgow, splint 10s. 3d. to 10s. 6d., and steam 9s. to 9s. 3d. The shipments for the week amounted to 296,261 tons—a decrease of 48,039 tons upon the previous week, and of 20,028 tons upon the corresponding week of last year. For the year to date, the total shipments have been 12,788,912 tons—an increase of 594,715 tons upon the corresponding period.

Penrith New Water Supply.

New water-works, erected at a cost of about £50,000, were inaugurated at Penrith last week, when Mrs. Wainwright, the wife of the Clerk to the Urban District Council, turned on the water from the lake main to the reservoir; and as a souvenir, she was presented with a handsome bracelet, bearing the town arms in pearls. Mr. Henry Winter, the Chairman of the Council, turned the valve delivering the water from the reservoir into the town, and received from the Engineer a silver loving cup as a souvenir of the occasion. Mr. Winter pointed out that for many years a new source of water supply had been greatly desired by the inhabitants of Penrith; but financial, geographical, and engineering difficulties had stood in the way. Having spent £47,000 in providing water by gravitation from the mountains, and £35,500 on a sewerage scheme, Penrith could lay claim to be equal to any health resort in the country. The source of the supply is Hayeswater, a large tarn among the mountains, five miles from Patterdale. It is 1383 feet above sea-level; so that, though Penrith itself stands high, there is every facility for gravitation. The pipe-line is 18 miles long; several miles of it being over the fells. Analysts have described the water as "ideally pure;" while there is no habitation, mine, or works of any description within the drainage area. For 55 years the town's supply has been obtained by pumping from the River Eamont; but owing to the possibility of pollution, the Local Government Board urged the Council to undertake a gravitation scheme. This was designed by Mr. Baldwin Latham.

The Leek Gas Committee, having had an interview with the representative of the Gas Workers and General Labourers' Union, with regard to the application by the stokers for an advance of wages, recommended that the hours of work be re-arranged, so that the men be employed on eight-hour shifts whenever possible, instead of twelve hours as at present. This the Committee considered would be in the interest of all concerned. They also recommended that the men be paid time-and-a-quarter for Sunday work. The recommendation was adopted by the Urban District Council.

The "Official" FLUE Radiator.



A RADIATOR WITH A FLUE in order to be generally adaptable, must have its flue in such a position that it will go under the canopy of any ordinary grate, otherwise its usefulness is restricted to a small number of places.

THE "OFFICIAL" FLUE RADIATOR is expressly designed with its flue in the right place for going under grate canopies.

JOHN WRIGHT & CO.,
The Radiator Experts,
Essex Works, BIRMINGHAM.

Fatal Gas Leakage Caused by Road Roller.

An inquest was held at Plymouth last Thursday on the body of Mary Ann Hocking, a widow, living in Sutton Road. Deceased occupied with other people a room in a house. As she did not appear on Thursday morning, the door of the room was forced, and she was found lying dead in bed. There was a strong odour of gas; but the gas at the bracket in the room was alight. A post-mortem examination showed that death was due to gas poisoning. Dr. Clarke, who made the examination, said cases had been known where death had resulted from gas poisoning from a leakage of gas where at the same time a naked light was burning in the room. Mr. J. A. Richmond, the Manager of the distribution department of the Plymouth and Stonehouse Gas Company, said he had that morning examined the house and the vicinity for a leakage of gas. He found that a socket joining two lengths of 1-inch service-pipe, which conveyed the gas to the house, had been fractured. The main ran along the middle of the road, and was 3 ft. 2 in. below the surface; but the service-pipe was raised to enter the house, and the socket that was broken was only 12½ inches from the surface. As the fracture was quite new, it was practically certain that it had been made on the previous afternoon, when a steam-roller passed over the granite setts. The road was not one on which there was much traffic; and it was a rare occurrence for a roller to pass over the setts at the side of a road. Mrs. Sutcliffe, a lodger in the same house as the deceased, said there was a smell of gas after the steam-roller had been at work on Wednesday. They did not think it serious, and did not give notice to the Gas Company; and as Mrs. Hocking had lost her sense of smell, they considered it safe for her to sleep in the room. A verdict of "Accidental death" was returned.

Rhyl "Hard Hit" by Electricity.—In the course of a Local Government Board Inquiry held by Mr. H. R. Hooper at Rhyl, into an application by the Urban District Council to borrow £5000 for the purposes of the electric lighting works, the Electrical Engineer (Mr. Wright) said it was felt that the plant was not up-to-date, and was too big for the town's needs. The Inspector remarked that it was a novel application, as the Council wanted to substitute a smaller for a larger plant. Mr. Wright replied that they would save at least £350 per annum on the works cost by putting in the smaller plant. The Inspector said he realized that Rhyl had been hard hit by the undertaking; but he urged that the proper course to adopt was, not so much to reduce the works cost, but to develop and secure fresh consumers. An undertaking of this kind must not stand still. Out of every 3'6d., which was the cost per unit, 3d. went in capital charges. This being so, the works cost, when reduced, could not affect the matter much; but every fresh consumer helped to reduce the capital cost per unit. He suggested that the Council should borrow money for mains extension, and by careful developing of the demand bring the works to make a profit.

Proposed Public Lighting of Cobham by Oil.

Cobham has been aroused from its accustomed quiet by the decision of the Parish Council to light the streets by oil-lamps during the coming winter; for the importance of adequate provision in the way of public illumination, on account of the enormous extent of the through traffic on the roads, is realized in many quarters. Letters of protest to the papers have been followed by a public meeting convened by a number of parishioners who object to oil being adopted as the lighting medium. One speaker (Mr. C. A. Smith) suggested that the Parish Council should be instructed to adopt incandescent gas, in accordance with an offer made by the Gas Company. Mr. S. A. Child, a member of the Council, admitted that they would have very much preferred gas in the ordinary way; but, "as it appeared impossible to come to terms with the Gas Company," the Council had entered into a contract for lighting with oil. The contract was, however, only for the coming winter; and the standards could afterwards be used for gas or electric light. Mr. H. Lee said by the time all the oil-lamps were lighted, it would be necessary for the man to go back and put them out again. There was no need for them to make themselves a laughing stock. After the discussion had proceeded some time, a suggestion was made that a representative of the Gas Company who was present should be allowed to speak; but the Chairman (Mr. W. F. Finn), who is also Chairman of the Council, ruled that no one but a ratepayer could be heard. Canon Grane then expressed the opinion that no one in his senses would sign a contract for seven years—which was the condition laid down by the Gas Company on which certain proposals would be agreed to. Ultimately an amendment was carried, to the effect that the meeting should abide by the decision of the Council with regard to the lighting for the present season. As the Gas Company were, by the ruling of the Chairman, debarred from putting forward their side of the question during the proceedings, they announced that they had themselves hired the hall for another meeting, when the whole of the correspondence between the parties would be submitted. It has also been suggested that a Ratepayers' Association should be formed.

The annual smoking concert and prize distribution in connection with the Hastings Gas-Works Cricket Club (which is now the cricket section of the Sports Club) took place on the 27th ult., under the presidency of Mr. C. E. Botley, the Engineer and Manager of the Gas Company; Mr. C. F. Botley, the Assistant-Engineer, being in the vice-chair. Among those present were Mr. Harvey du Cros, J.P., a Vice-President of the club, and Mr. Arthur du Cros, J.P., the Member for Hastings, both of whom addressed the meeting. A varied programme of music was gone through. On the President's table stood the handsome trophy of the Hastings and District League, which the club won last season for the fourth time; and towards the close of the proceedings it was handed by the Secretary of the League (Mr. I. Kendall) to Mr. Botley, whose health he proposed. This was received with musical honours; and in responding Mr. Botley expressed the hope that the League would go on uninterruptedly.

The Outstanding Virtue

Of our Wide-Fire Principle is this—

The "SALON."

Fire width - 21 ins.



It affords a maximum width from which Radiation takes place.

No attempt to concentrate radiation within a narrow limit can replace this.

The Gas-Fires of the Future will all radiate from as wide an area as Coal-Fires.

THIS WIDE-FIRE SPACE PRINCIPLE
of **OURS** is what the Gas Industry was waiting for.

HAVE YOU SEEN THE "SALON"?

Its Fire-Space is 21-inches wide.

JOHN WRIGHT & CO.,
Essex Works,
BIRMINGHAM.

Sales of Stocks and Shares.

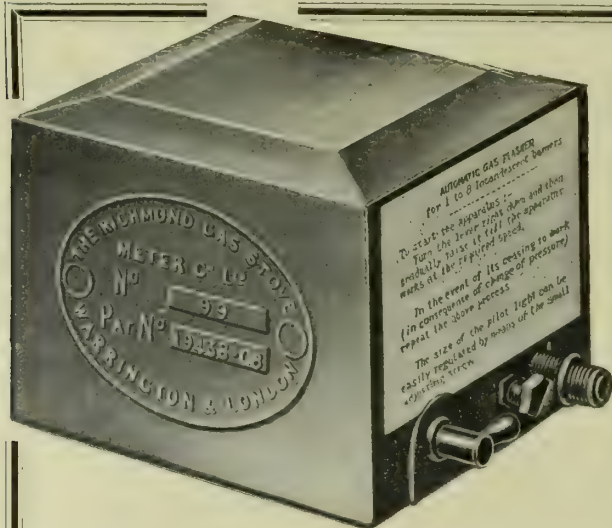
At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards offered, by order of Directors, two new issues of capital. The first lots consisted of 600 £10 preference shares in the Barking Gas Company, carrying dividend at the rate of 6 per cent. per annum from the 1st prox.; and they fetched from £13 to £13 2s. 6d. per share. The other issue was 500 £10 ordinary shares and £2200 of 4 per cent. mortgage debentures of the Herts and Essex Water-Works Company, Limited. The shares rank for a maximum dividend of 7 per cent. per annum; but similar shares received one at the rate of 2 per cent. for the year ended the 30th of June last. They were sold at from £9 to £9 12s. 6d. each; and the debentures were placed at par to 2s. 6d. per £100 premium. A small parcel of £10 original shares in the West Kent Gas Company, carrying 10 per cent. dividend, fetched £20 5s. apiece. At Grantham, on the previous evening, Messrs. Escritt and Barrell sold 550 shares of £1 each in the Grantham Gas Company, at 23s. and 23s. 3d. each; and two £10 shares in the Water Company at £27 apiece. On the same day, tenders were opened for the new issue of £3500 of ordinary "B" stock of the Redhill Gas Company recently advertised in the "JOURNAL." The Directors have allotted the full amount, which was applied for nearly twice over, at an average price of £102 0s. 11d. per £100 of stock. The larger portion was secured by local investors.

Additional Capital for the Southend Gas Company.—It will be seen, from an announcement which appears elsewhere, that Messrs. A. & W. Richards have received instructions from the Directors of the Southend Gas Company to offer for sale, at the Mart, Tokenhouse Yard, E.C., next Tuesday, new issues of capital to the nominal amount of £25,000—viz., £21,500 of new ordinary "B" stock, ranking for a standard dividend of 5 per cent., but entitled to £5 7s. 6d. per cent. (the dividend paid on this class of stock ever since it was first issued in 1904) as from the 1st prox., and £3500 of 4 per cent. perpetual debenture stock. Most Londoners, and many people in the Provinces, have watched the remarkable development of Southend and the adjoining places. In 1901, the population of the borough (including the parish of Prittlewell) was 28,793; whereas it is now estimated to be upwards of 61,000. Concurrently with this growth, increased travelling facilities have been afforded by the three Railway Companies serving the town which have converted it practically into a suburb of the Metropolis. Needless to say, the business of the Gas Company has increased commensurately, for while their sales of gas amounted to 112'36 million cubic feet in 1899, they were 320'77 millions last year—an increase at the rate of 185'47 per cent. For the six months ending June 30 last, the increase in the sales, compared with the corresponding period of 1908, was rather more than 12 million cubic feet, equal to 8'3 per cent. In view of the requirements of the permanent residential population and of the large influx of summer visitors every year, there is no reason why this progress should not continue; and consequently the necessity for additional capital by the Gas Company is not surprising.

Rawcliffe and District Gas and Coke Company.

In the City Article of "John Bull" for Oct. 30, the following remarks appeared with reference to the Eaton group of Companies: "Several inquiries and complaints have reached me of late concerning some of the water and gaslight companies of which Mr. Edmund Eaton is the moving spirit; and I notice that Mr. Justice Joyce has, on the application of the debenture holders, appointed Mr. C. Ryland Beeby, of No. 9, Bucklersbury, Receiver of one of these Companies—the Ticehurst and District Water and Gas-Works Company. The 'Financial News' gives the names of a round dozen of companies of the same group. One of these is the Rawcliffe (Yorks.) and District Gas and Coke Company, Limited, capital £10,000. An inhabitant of Rawcliffe informs me that their place does not belong to them, but they rent it only at £50 per annum; and that the chief thing they have done is to lay about 1½ miles of main-pipes and put in the meters. The shareholders have not received any dividends yet, although in the prospectus, which was issued in November, 1907, the statement is made that 'the gas-works and business is an old-established undertaking in good working order and revenue earning.' My informant states that the street-lamps, for which there is a contract with the Company, have not been lighted for seven nights this season; and that they had no gas for the houses either on the night of the 19th ult., and had to resort to candles, though they had gas in the houses before. 'I do not know how we are going to go on,' concludes my informant. I can sympathize with the unfortunate inhabitants of Rawcliffe; but I hope that they will bestir themselves and call upon the management to fulfil their contract, failing which the shareholders ought to be induced to put their house in order. Such management or mismanagement can only have one result—viz., that the Rawcliffe Company will share the fate of the Ticehurst Company, the future history of which I shall follow with much interest."

Suicide by Coal Gas.—At the Shoreditch Coroner's Court, last Tuesday, Dr. W. Wynn Westcott, the Coroner for North-East London, held an inquiry with reference to the death of Walter Thomas, aged 43, engineers' fitter, lately living at No. 32, Westmoreland Place, Shoreditch. The deceased was afraid he might become a cripple for life, so on the previous Saturday he fitted the india-rubber tube used for the gas-ring in the washhouse on to the ordinary burner in the kitchen, and placed the other end in his mouth. He was found dead a little later with the tube still in his mouth. Dr. J. H. Burrows deposed that death was due to gas poisoning. The Coroner remarked that of late years gas had come greatly into vogue as a medium for suicide, there having been a large number of cases. The explanation was quite simple; it was an easier and much more painless way than the knife. Witness said it was decidedly cleaner and more sure. After a few inhalations, one would become unconscious, and the thing was done. The Coroner said the illuminating gas of the present day was much more deadly than it was of old. The Jury returned a verdict of "Suicide during temporary insanity."



RICHMOND'S GAS FLASHER.

As Simple as a Gas Meter.

A NEW FIELD FOR GAS SUPPLY.

A simple apparatus actuated by the pressure of the gas consisting of a diaphragm similar to that used in a Gas Meter, with suitable chambers, passages, and tumbler balance weight, enclosed in a tin case with connections screwed for iron barrel. By adjusting the lever any required number of flashes may be obtained from, say, 8 to 20 per minute, depending on the pressure of the gas and the number of lights used.

Full particulars may be obtained from—

THE RICHMOND GAS STOVE & METER CO., LTD.



Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.

London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington.

The Distribution of Water Supplies.

In the course of his annual report, Dr. Meredith Young, the Cheshire County Medical Officer of Health, remarks that "there are many districts where the water supply for drinking and domestic purposes is of an exceedingly precarious character, both as regards quantity and quality. The time has, he says, come when an endeavour should be made to tackle these difficulties in more than a purely local manner. One is safe in asserting that there is a supply of water in the county available for much more than the domestic needs of the people and for the various trade and municipal purposes for which water is required. Some districts are over-supplied, while other districts have a supply not worth mentioning; and the latter are sometimes closely contiguous to the former. There are, for instance, more than a few cases where the main supplying water to a borough or large urban district runs through a rural district which is itself practically without a supply; and, in spite of the fact that such water-mains contain more than sufficient for the district supplied by them, the supply is looked upon as sacred to the district, and the poor rural district is left to shift for itself, though it may have thousands of gallons of water running through it which would constitute its salvation from water famine and the many risks to public health involved in this. The amount of selfishness displayed in this matter by well-to-do districts, and more particularly by water companies, is noteworthy. It ought to be recognized as a general principle that the laws of Nature should be observed, and that the water derived from any watershed area should be primarily the property of those resident in the watershed area in proportion to their needs. It will probably be a long time, however, before this humanitarian principle will be recognized in practice. Before any rationally-based steps for the adjustment of this condition could be taken, it would be necessary to obtain what one might call a water census for the county. Having got these facts together, the rational method of procedure would be to constitute a Water Supply Board for the whole county, and 'pool' the water supply available, connecting the supplies as far as possible, so that the one might be used to supplement the other when necessary. The scheme certainly involves a considerable expenditure, as existing supplies would have to be bought and interested persons compensated."

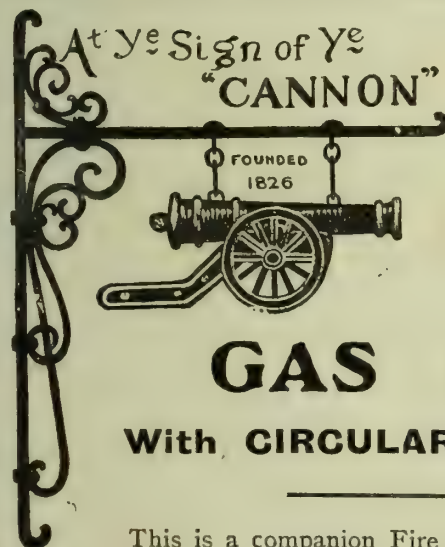
Additional Capital for the Brentford Gas Company.—In another part of the "JOURNAL" will be found an invitation by the Directors of the Brentford Gas Company for tenders for an issue of £30,000 of new stock, 1881, at a minimum price of £180 per £100 of stock, at which rate successful applicants will receive (providing the Company continue to pay the present dividend of 9½ per cent., which has been paid on similar stock for the past 4½ years) £5 5s. 7d. per cent. per annum. The capital now offered is required for the extension of the works and plant, to enable the Directors to meet the increased demand for gas. Tenders must be delivered at the offices of the Company not later than the 15th prox.

Receiver and Manager for the Painswick Gas Company.

Mr. Justice Swinfen Eady had before him on Friday a motion for the appointment of a receiver and manager of the Painswick (Glos.) Gaslight and Coke Company. In support of the motion, Counsel said the plaintiff was a lady holding a mortgage of £500 and one debenture of £500, which was, in fact, the only debenture issued by the Company. The interest had been in arrear for some time, and proceedings were being taken in the matter. They proposed as receiver and manager a gentleman residing at Stroud; and there was an affidavit of his fitness. The Company consented to judgment. His Lordship remarked that other persons had to be considered besides the shareholders; and therefore he refused to do anything more than appoint a receiver and manager.

Progress of the German Welsbach Company.—The Directors of the Deutsche Gasglühlicht Gesellschaft (Auer), which in 1893, 1894, and 1895 paid dividends of 100 per cent. or higher, report that, including the balance brought forward, the net profits realized in 1908-9 amounted to £201,900, compared with £159,700 in 1907-8. It is proposed to pay a dividend of 50 per cent. on the ordinary capital of £330,000, contrasted with 35 per cent. in the preceding year, 22 per cent. each in 1906-7 and 1905-6, and 20 per cent. in 1904-5. The preference shares are to receive 5 per cent. on the amount paid up, and also 6 per cent. on the nominal amount, in accordance with the resolution adopted at last year's general meeting. The prospects for this year are characterized as favourable; and it is intended to extend the thorium factory to permit of the manufacture of chemical products.

Charge for Water for a School.—Some time ago, the Breconshire Education Committee received a notice from the Cwmtyrch Joint Water-Works Committee that it was their intention to charge the Education Committee for water supplied to their school at the rate of 9d. per 1000 gallons, the meter to measure the water to be provided by the Committee. The Joint Committee did not, as a rule, levy any rate or charge for water in the district; but recently they had adopted the principle of charging the large consumers by meter. The Committee were advised by Counsel (Mr. W. M'Kenzie) that the County Council could demand a supply to the school and schoolmaster's house, and that in each case it should be charged for by a rate and not by meter, unless the Council were agreeable to the latter course. The Committee therefore informed the Joint Committee that they were not prepared to take water by meter; and the supply had consequently been cut off and the school closed. The suggestion was made that a water-rent should be agreed upon; but the Joint Committee were not willing to accept it. The Education Committee therefore recommended that steps should be taken by the County Council to compel the Joint Committee to supply the school with water, and charge for it by means of a rate. It would be necessary to take action in the High Court; and the Committee recommended that the Buildings Sub-Committee should be authorized to take such action as might be necessary.



SHOT No. 4.

THE "SOLAR"

GAS FIRE

With CIRCULAR FIREFRONT.

This is a companion Fire (but with Round Top) to our "Superb" Pattern.

The increased heating surface affords greater radiating power to the fire, and is a feature of distinct merit with these Fires.

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CANNON IRON FOUNDRIES, LD
DEEPFIELDS, Near Bilston, Staffs., Eng.

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Australasian Agents: JAMES HURLL & CO., Ltd., 20, Loftus Street, SYDNEY, and Box No. 4 (G.P.O.) Dunedin.



Re-Valuation of Properties in Penge.—In consequence of the Croydon Assessment Committee having declined to engage professional assistance for the purpose of re-valuing certain special properties in Penge, the Overseers have considered it necessary to employ valuers to assist them. Among the properties which have been and are being dealt with by the valuers are those of the South Suburban Gas Company and the Metropolitan Water Board. In the case of the Company, the assessment of £2400 gross and £1350 rateable has been increased to £3140 and £1902 respectively. With regard to the Board, an application is still pending on behalf of that body for a very considerable reduction, and the valuers are taking steps to oppose this.

Retford Gas and Water Supply.—The annual report in connection with the Retford gas undertaking shows that the gross profit for the year is £2287, as compared with £2331 for last year—a decrease of £44. This is more than accounted for by the low price obtained for residuals, and a reduction of 2d. per 1000 cubic feet in the price of gas, which has been in operation during the last half year, and which has reduced the revenue account by nearly £300. The net profit, after payment of the interest and instalments on loans, is £942, as compared with the previous year's profit of £960. The expenses in connection with the renewal and maintenance of mains, meters, services, and manufacturing plant have been more than usual. The report of the water-works points out that the undertaking has again, in common with other local authorities, been put to some considerable expense in opposing the Worksop Water Bill, but with a satisfactory result, inasmuch as the works will not be constructed on the site suggested by the Worksop Water Company, and the supply will have to be taken from a source which will not affect their wells. The costs of the opposition, amounting to £287, were not included in this year's accounts. The water-rates for the past year were £2936, as compared with £2906 for the previous twelve months, which is regarded as satisfactory.

New Joint-Stock Companies.—The Llandebie Water Company, Limited, has been registered, with a capital of £1000, in £1 shares, to take over the business of water-works proprietors carried on at Llandebie by Mr. R. Richards and others. The Blanchard Lamp Foreign Patents Company, Limited, has been registered with a capital of £30,000, in £1 shares (10,000 deferred), to acquire and turn to account certain patents for inventions relating to improvements in incandescent vapour burners.

Artesian Wells in the City of London.—The Special Committee of the Corporation of London appointed in May, 1908, to inquire and report as to the powers of the Corporation in regard to supplying water by means of artesian wells or otherwise, have reported that it is not expedient to take any action; and the Corporation have adopted their report. The Corporation more than twenty years ago sank an artesian well to supply their artisans' dwellings in Houndsditch; but they have no power to charge for the water from this well or from any other they may sink without an Act of Parliament.

Gas for Caretakers in London County Council Schools.—At the meeting of the London County Council last Tuesday, the Education Committee presented a report in which they stated that caretakers of the Council's secondary schools and training colleges living in quarters provided by the Council are allowed fuel, light, and water, free of charge, in addition to their wages. Up to the present no limit has been placed upon the consumption of gas in caretakers' quarters, though a limit of 40,000 cubic feet per annum has been imposed in the case of the keepers of elementary schools. The Committee thought that a similar limit should be fixed in the case of the caretakers, and they recommended that it should come into operation as from Jan. 1, 1910, and be in force until further order; and that the cost of any gas consumed in excess of this allowance should be borne by the caretaker concerned. The recommendation was adopted.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

SALES CLERK AND SHOW-ROOM ATTENDANT. Torquay Gas Company. Applications by Nov. 15.
CONFIDENTIAL CLERK. No. 5150.
WATER RENTAL AND ASSESSMENT CLERK. No. 5150.

Situations Wanted.

ENGINEER'S ASSISTANT. No. 5151.
SECRETARY, MANAGER, AND ACCOUNTANT. No. 5115.
SUPERINTENDENT OF INCANDESCENT STREET LIGHTING, &c. J. W. Coates, Bradford.

Plant, &c. (Second-Hand), for Sale.

LOW-PRESSURE LIFT. West Bromwich Gas-Works.

Stocks and Shares.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY. Nov. 23.
BOGNOR WATER COMPANY. Nov. 23.
BRENTFORD GAS COMPANY. Dec. 15.
LITTLEHAMPTON GAS COMPANY. Nov. 17.
MITCHAM AND WIMBLEDON GAS COMPANY. Dec. 6.
SOUTHERN GAS COMPANY. Nov. 16.
TENDRING HUNDRED WATER COMPANY. Nov. 16.
WORTHING GAS COMPANY. Nov. 23.

TENDERS FOR

Exhausting Plant, &c.

CLEATOR MOOR GAS DEPARTMENT. Tenders by Nov. 19.

Fire-Clay Goods.

CHORLEY GAS DEPARTMENT. Tenders by Nov. 16.
NELSON GAS DEPARTMENT. Tenders by Nov. 17.

A NEW ART STOVE WITH DISTINCTIVE FEATURES.

The "SAVOY."

REGISTERED DESIGN.

Artistically produced in Antique Copper in high class style, fitted with glass panels shown.

THE PARKINSON STOVE CO., LTD.

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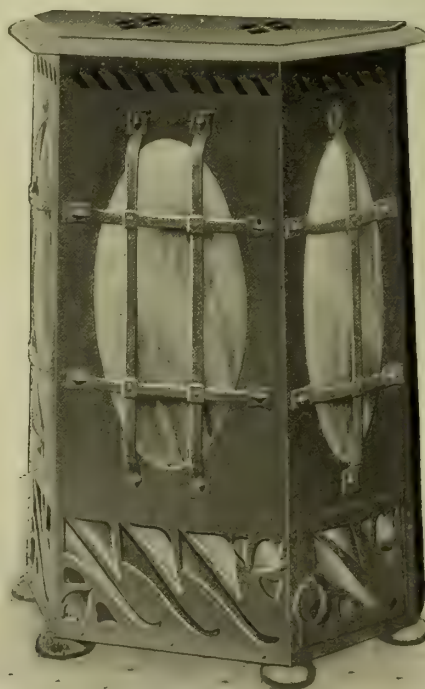
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Stour Street, Spring Hill.

LONDON:

129, High Holborn.

SPECIALLY DESIGNED FOR
THE HEATING OF HALLS,
CORRIDORS, CAFÉS, &c.



APPLICATIONS FOR LETTERS PATENT.

- 24,419.—STEWARTS AND LLOYDS, LTD., and STEWART, J. G., "Pipe-joints." Oct. 25.
 24,443.—MULLER, J. L., and BONNET, J., "Mantles." Oct. 25.
 24,447.—FRANCKLIN, H. J., "Coin-freed meters." Oct. 25.
 24,473.—KOEPE, A., "Laying underground pipes." Oct. 25.
 24,480.—GOODMAN, P., "Gas-main stoppers." Oct. 25.
 24,530.—DEIMEL, F., "Electric gas-igniter." Oct. 25.
 24,510.—POMEROY, F. H., "Lighters for gas." Oct. 25.
 24,557.—CLIMPSON, W. S., and PEARCE, A. W., "Governing and regulating the pressure of gas from mains." Oct. 26.
 24,559.—ORTEN-BÖVING, J., and JOHNSON, R. D., "Valves." Oct. 26.
 24,571.—MARCHANT, G. J., "Gas-stoves." Oct. 26.
 24,580.—BOWLEY, J. W., "Water-meter." Oct. 26.
 24,601.—DOUGLAS, N. H., "Ignition of gas." Oct. 26.
 24,610-II.—FONTAINE, T. de, "Gas-generators." Oct. 26.
 24,623.—WAKEFIELD, C. C., "Acetylene generators." Oct. 26.
 24,656.—HINKS AND SON, J., LTD., and LOUGH, E. O., "Taps." Oct. 27.
 24,725.—SHELDON, S. B., "Gas-producers." Oct. 27.

- 24,801.—PARKINSON STOVE COMPANY, LTD., and SPREADBURY, E. L., "Taps and cocks." Oct. 28.
 24,816.—CATLING, J. T., and CORNER, F., "Improvements in hydraulic mains in gas-works, and other apparatus where deposits are likely to occur from liquids under treatment." Oct. 28.
 24,847.—DICKSON, W. K. L., "Gas advertising signs." Oct. 28.
 24,866.—CAMPBELL, J., "Rotary gas-engine." Oct. 29.
 24,910.—SWAN, J. B. R., and IONIDES, A. C., jun., "Production of air gas." Oct. 29.
 24,944.—SPENCER, A., "Controlling supply of gas to railway carriages." Oct. 29.
 24,961.—CROSSLEY, K. I., and RIGBY, T., "Internal-combustion engines." Oct. 30.
 24,963.—GUY, W., "Acetylene generator." Oct. 30.
 25,036.—TILLEY, F. C., "Atmospheric burners." Oct. 30.
 25,018.—GRAF, A., and SMYTH, F. W., "Obtaining an improved gas for metallurgical and other purposes." Oct. 30.
 25,019.—RICHARDS, R. S., and PRINGLE, R. W., "Distilling or partially distilling coal, and the production of fuel." Oct. 30.
 25,036.—BAKER, C. A., "Making gas." Oct. 30.
 25,043.—BEIMANN, W., "Valves for closing ascension-pipes." Oct. 30.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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All Communications, Remittances, &c., to be addressed to
 WALTER KING, II, BOLT COURT, FLEET STREET, LONDON, E.C.
 Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

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 PALMERSTON HOUSE,
 OLD BROAD STREET, LONDON, E.C.

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"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEEDS.
 Correspondence invited.

LUX'S GAS PURIFYING MASS.

See Advertisement on p. 363.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

TAR WANTED.

National Telephone 7002. Telegrams: "UPRIGHT."
 Apply, THOMAS HORROCKS
 Albert Chemical Works, BRADFORD,
 MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Sulphate of Ammonia.

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WITH AND WITHOUT DIALS.

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MOVEMENTS FOR CLOCKS, PHOTOMETERS AND BAROGRAPHS, WHEELS, PINIONS, AND WORMS.
 WORKS, HANDSWORTH, BIRMINGHAM.

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PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE OF EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER OF PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
 WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.

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Telephones: 815 Oldham, and 2412 Hop, London.

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ANY QUANTITY. ANY PORT. ANY STATION.

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CHARLES E. FRY, LEAMINGTON,

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BROTHERTON AND CO., LTD., Ammonia Distillers.
 Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
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KRAMERS AND AARTS WATER-
 GAS PLANT.

K. & A. WATER-GAS COMPANY, LTD.

39, VICTORIA STREET, S.W.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

"GAZINE" (Registered in England and

Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.

It is also used for the enrichment of Gas. Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.

Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.

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(NATURAL.)

SPENT OXIDE PURCHASED.

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PAINT FOR GAS-WORKS.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.C.

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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.,

with which is amalgamated Wm. PEARCE & SONS, LTD.

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Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 941 AVENUE.

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BROTHERTON AND CO., LTD., Tar Distillers.
 Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
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Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

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CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
 Telegrams: "CHEMICALS."

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FINEST DUTCH BOG ORE.

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Best Percentages. For lowest Quotations to any Port, Station, or direct into Works, please apply to—
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Sheeting.
 HALLITE DOUGLAS, LIMITED, 106, Leadenhall Street, LONDON, E.C.

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MEADE-KING, ROBINSON, & CO.

Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

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Contractors for Complete CARBONIZING
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We guarantee promptness, with efficiency for Re-
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SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding
Oxide Lightly.
See Illustrated Advertisement, Nov. 2, p. 357.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND
CONTRACTORS,
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Telegrams: Telephone:
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J. W. & C. J. PHILLIPS, 28, COLLEGE HILL,
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Consumers in any form are invited to correspond
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turers, OLDBURY, WORCS.

APPLY TO THE
CHAIN BELT ENGINEERING CO.
DERBY, ENGLAND,
FOR REALLY RELIABLE
ELEVATORS AND CONVEYORS
ALSO
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JOHN RILEY & SONS, Chemical Manu-
facturers, Hapton, near Accrington, are MAKERS
of Special SULPHURIC ACID, for Sulphate of Am-
monia Making. Highest percentage of Sulphate of
Ammonia obtained from the use of this Vitriol, which
has now been used for upwards of 50 Years. References
given to Gas Companies.

"NUGEPE" GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
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For all Joints in connection with Oil-Gas Plant
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For all Gas Joints.
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For all Ammonia Joints.

"FORTO" Incandescent Gas Mantles
Combine Brilliancy and Strength. British
Made. Send for List.
ISAAC EALES AND CO., Howard Street, BIRMINGHAM.
Telephone: Central, 5623.

SULPHURIC ACID.
SPECIALLY prepared for Sulphate of
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Address Correspondence and Inquiries to OLDBURY,
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GAS PLANT for Sale—We can always
offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gas-holders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

SULPHURIC ACID for Sale, specially
suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers,
Works: BIRMINGHAM, LEEDS, WAKEFIELD, and SUNDER-
LAND.

APPLICATIONS for Appointments
arranged effectively. Greatly appreciated by
Recipients. Numerous unsolicited Testimonials. Write
Now for Particulars.
HERBERT GREATORREX, Upper Hackney, MATLOCK.

MR. W. B. MIMMACK, for many years
Secretary, Manager, and Accountant of the Crays
Gas Company (111 Millions), now in Amalgamation,
seeks APPOINTMENT in any or all of these Offices.
Address No. 5115, care of Mr. King, 11, Bolt Court,
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ENGINEER'S ASSISTANT.
YOUNG man just completed Indenture
at a large Provincial Gas-Works desires Position
as ASSISTANT. Good Draughtsman and Chemist.
Highest References.
Address No. 5151, care of Mr. King, 11, Bolt Court,
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YOUNG Gentleman (Age 37) wishes to
offer his Services to some large City as SUPER-
INTENDENT OF INCANDESCENT STREET
LIGHTING. Has thorough knowledge of giving the
best results possible for the Public, also for Corporations
Financially. No additional cost whatever. Really a
Re-arrangement in the Fitting. No flickering of the
Light or dying out. Weather no object. Advertiser
has also a few small Inventions, arrangements for
using which will be made with employers.
Address J. W. COATES, 28, Stephenson Street, Great
Horton, Bradford, YORKSHIRE.

WANTED, in a large Provincial Water
Department, a CONFIDENTIAL CLERK,
having a knowledge of Shorthand, Typewriting, Water-
Works Statistics, and Office Routine.
Also, Experienced WATER RENTAL and ASSESS-
MENT CLERK.
Apply, by letter, stating Age, Experience, and Salary
required, to No. 5150, care of Mr. King, 11, Bolt Court,
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TORQUAY GAS COMPANY.
SALES CLERK AND SHOW-ROOM ATTENDANT
REQUIRED FOR THE ABOVE COMPANY.
APPLICATIONS will only be considered
from persons who have had Practical Experience
and are at present occupying a Similar Position.
Salary, 30s. per Week.
Apply, by letter, to the undersigned on or before
Monday, Nov. 15, stating Age and Experience, together
with not more than Two copies of recent Testimonials,
R. P. KITSON,
Secretary.
59, Fleet Street, Torquay,

GASHOLDERS—Splendid, 45 feet dia-
meter, and New STEEL TANK fixed complete,
to Plan and Specification. Also 50 feet Single-Lift
and 50 feet Double-Lift. Cheap, with STEEL TANKS.
Can be seen temporarily erected.
FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

FOR SALE—Second Hand Low Pressure
LIFT, with Regulating Valve Complete. Stroke
20 feet. To lift load of 30 cwt.
Apply to HAROLD E. COPP, Engineer, Albion Gas-
Works, West Bromwich.

CLEATOR MOOR URBAN DISTRICT COUNCIL.
TENDERS are invited by the above
Council for the work of DUPLICATING the
EXHAUSTING PLANT at their Gas-Works on a new
site.
A copy of the Drawings and Specifications may be
obtained from the undersigned on payment of £1 1s.,
which will be returned on receipt of a bona-fide Tender.
Sealed Tenders, endorsed "Exhauster," and addressed
to the undersigned, to be delivered, at the Public
Offices, Cleator Moor, not later than Friday, the 19th
day of November, 1909.
The Council do not bind themselves to accept the
lowest or any Tender.

HENRY ROTHERY,
Clerk to the Council.
Public Offices, Cleator Moor,
Oct. 19, 1909.

BOROUGH OF CHORLEY.
(GAS DEPARTMENT.)
FIRE-CLAY GOODS.
THE Corporation are prepared to re-
ceive TENDERS for the Supply and Delivery at
their Gas-Works of FIRE-CLAY GOODS required
during the Year 1910.
Specification and Form of Tender may be obtained
from Mr. J. W. Allin, the Gas Engineer.
Tenders, endorsed "Fire-Clay Goods," to be addressed
to the undersigned, and delivered on or before Tuesday,
the 16th inst.
The Corporation do not bind themselves to accept
any Tender.

By order,
JNO. MILLS,
Town Clerk.
Town Hall, Chorley,
Nov. 5, 1909.

BOROUGH OF NELSON.

FIRE-CLAY GOODS.

THE Gas Committee invite Tenders
for the Supply of FIRE-CLAY GOODS for the
Season 1910.
Specification and Form of Tender may be obtained
on Application to Mr. A. J. Hope, Engineer and
Manager, Gas-Works, Nelson.
Tenders endorsed "Fire-Clay Goods," and addressed
to the undersigned, must be received not later than
Wednesday, the 17th of November, 1909.
The Committee do not bind themselves to accept the
lowest or any Tender.

J. H. BALDWIN,
Town Clerk.
Town Hall, Nelson,
Nov. 2, 1909.

SALES BY AUCTION OF GAS AND WATER
STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to
notify that their SALES BY AUCTION OF NEW
CAPITAL ISSUED UNDER PARLIAMENTARY
POWERS, and of STOCKS and SHARES belonging to
EXECUTORS and other PRIVATE OWNERS in LON-
DON, SUBURBAN, and PROVINCIAL GAS and
WATER COMPANIES, take place PERIODICALLY
at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing New Capital, and also for including
other Gas and Water Stocks and Shares in these Periodi-
cal Sales, will be forwarded on Application to Messrs.
A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND GAS COMPANY.

NEW ISSUE OF £21,500 NEW ORDINARY "B"
STOCK
AND
£3500 FOUR PER CENT. PERPETUAL
DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Nov. 16, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
TENDRING HUNDRED WATER-WORKS
COMPANY.
(Supplying Harwich, Parkeston, Dovercourt, Walton-
on-Naze, Frinton-on-Sea, and adjacent places.)

NEW ISSUE OF 400 £10 "B" SHARES.
MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Nov. 16, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
WORTHING GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £4085 CONSOLIDATED
ORDINARY STOCK.
MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Nov. 23, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
BOGNOR WATER COMPANY.
NEW ISSUE OF 250 £10 ORDINARY SHARES.
MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Nov. 23, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
ALLIANCE AND DUBLIN CONSUMERS' GAS
COMPANY.
NEW ISSUE OF £32,000 FOUR PER CENT.
PERPETUAL DEBENTURE STOCK.
MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Nov. 23, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

LITTLEHAMPTON GAS COMPANY.
SPARK AND SON are favoured with
Instructions to SELL BY AUCTION, at their
Sale Room, 25, High Street, Littlehampton, on Wednes-
day, the 17th day of November, 1909, at 3.30 p.m.,
precisely.

400 £5 "C" ORDINARY SHARES
in the Littlehampton Gas Company, in Lots of Four
Shares each.
Full Particulars and Conditions of Sale may be
obtained of Mr. WILLIAM BEDLAM, the Company's
Secretary, LITTLEHAMPTON, or at the Offices of the
AUCTIONEERS, at LITTLEHAMPTON or ARUNDEL.

BRENTFORD GAS COMPANY.

SALE BY TENDER OF £90,000 NEW STOCK, 1881.
IN pursuance of the Brentford Gas Order, 1881, Notice is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £90,000 of NEW STOCK, 1881, of the Company, to be paid up in full on or before the 15th day of January, 1910; such Stock being a portion of Additional Capital Authorized to be raised by Resolutions passed at an Ordinary Meeting of the Proprietors held on the 11th day of February, 1898, under the powers of the above-mentioned Order.

Particulars and Conditions of Tender may be obtained on Application at this Office; and Sealed Tenders must be sent in not later than Ten o'clock on the Morning of Wednesday, the 15th day of December next.

By order,
 WILLIAM MANN,
 Secretary.

Office: Brentford Gas Company,
 Brentford, Nov. 1, 1909.

Issued under the powers and subject to the provisions of "The Mitcham and Wimbledon Gas Act, 1907."

MITCHAM AND WIMBLEDON DISTRICT GASLIGHT COMPANY.

NOTICE OF SALE BY TENDER OF £12,000 CONSOLIDATED ORDINARY STOCK.

MINIMUM PRICE OF ISSUE £108 PER £100 OF STOCK.

THE Directors of the Mitcham and Wimbledon District Gaslight Company hereby Give Notice that they will be prepared to receive, not later than Five o'clock p.m. on Monday, the 6th day of December, 1909, Sealed Tenders for £12,000 CONSOLIDATED ORDINARY STOCK of the Company, in lots of the nominal amount of £50, or Multiples thereof.

No Tender for any less nominal amount than £50, or at a less price than £108 per £100 of Stock, will be entertained.

The Balance of the Purchase Money is to be paid on or before Monday, the 3rd day of January, 1910, from which date Dividend will accrue.

Tenders must be made on Forms provided by the Company, which, with Particulars and Conditions of Sale, can be obtained on Application to the undersigned.

BENJAMIN GREEN,
 Secretary.

Offices and Works, Western Road,
 Mitcham, Surrey.

TROTTER, HAINES, & CORBETT,
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SPENCER'S PATENT, No. 1576 of 1905.

NOTICE IS HEREBY GIVEN, that Proceedings for Infringement of this Patent will at once be taken against any person using in Gas-Purifiers Inclined Supports and Bars or Laths supported thereby so as to make the Laths break joint.

Dated this 2nd day of November, 1909.

JAMES CLARKSON,

Solicitor for Walter Spencer, of Elland, Yorkshire.
 the Patentee.

Town Hall Chambers, Halifax.

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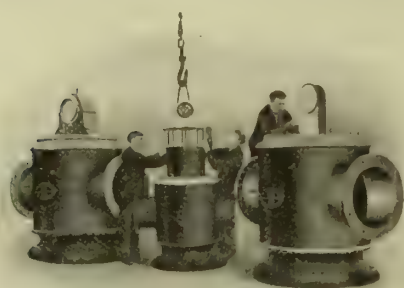
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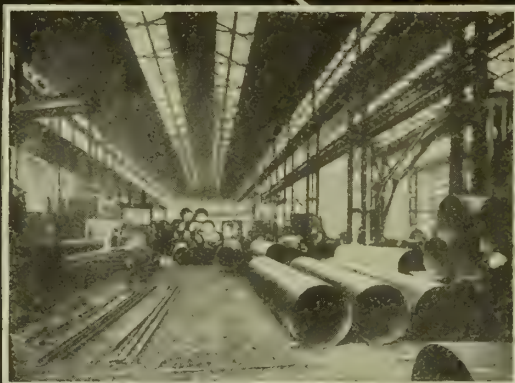
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LONDON: WALTER KING, 11, BOLT COURT, FLEET ST., E.C.



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[See Illustrated Advertisement, Oct. 19, p. 154.]

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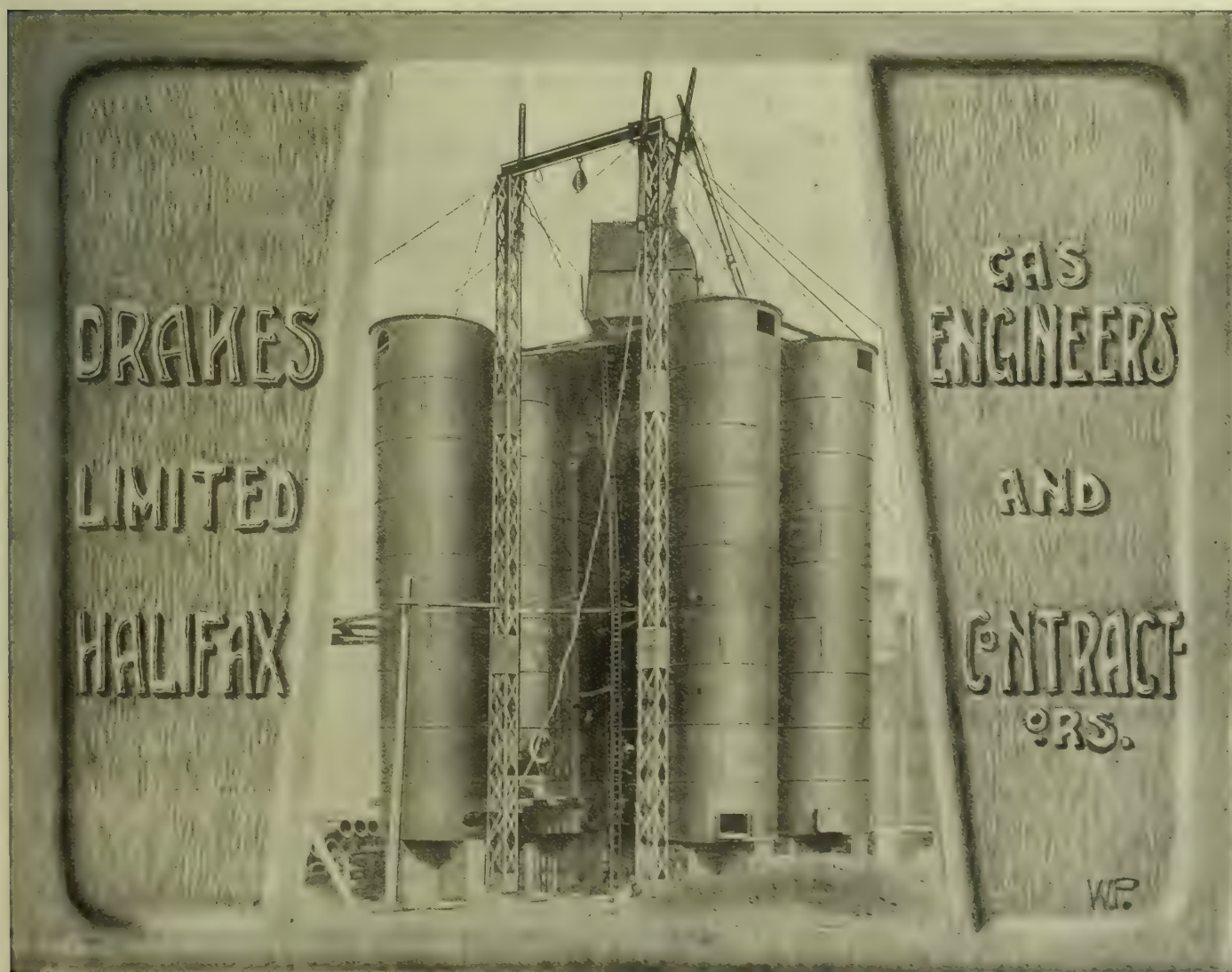
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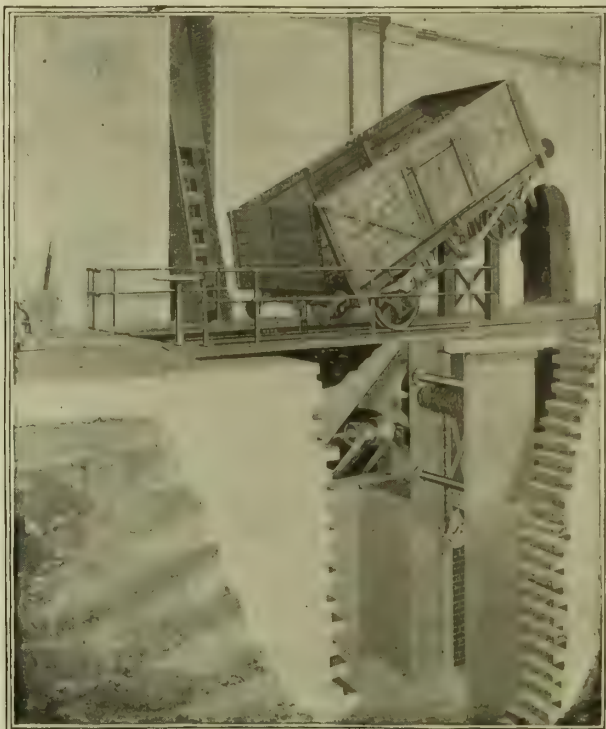
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MAIN LAYING.

Paper by PERCY GRIFFITH, M.Inst.C.E., and BRUCE MCGREGOR GRAY, Assoc.M.Inst.C.E., before the Association of Water Engineers.

A. The Authors used *Flanged Pipes* for the Rising Main up the Steep side of the Barff, and their experience proved that this was not an advantage, as the *rigidity of the Joints involved considerable difficulty* in regard to the depth of the Trench, and a good deal of Cutting to make the final Connections at each end of the Pipe-Line.

B. In the case of the Delivery Main, the Joints were *Ordinary Bucket Joints*, but made with Lead only. The only difficulty met with here was the necessity for pouring the Lead in at a suitable temperature to prevent it melting the Solid Lead Fillet, and running through into the Pipe.

C. In some of the Smaller Branch Connections, Lead Wool was used, and proved highly successful.

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Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

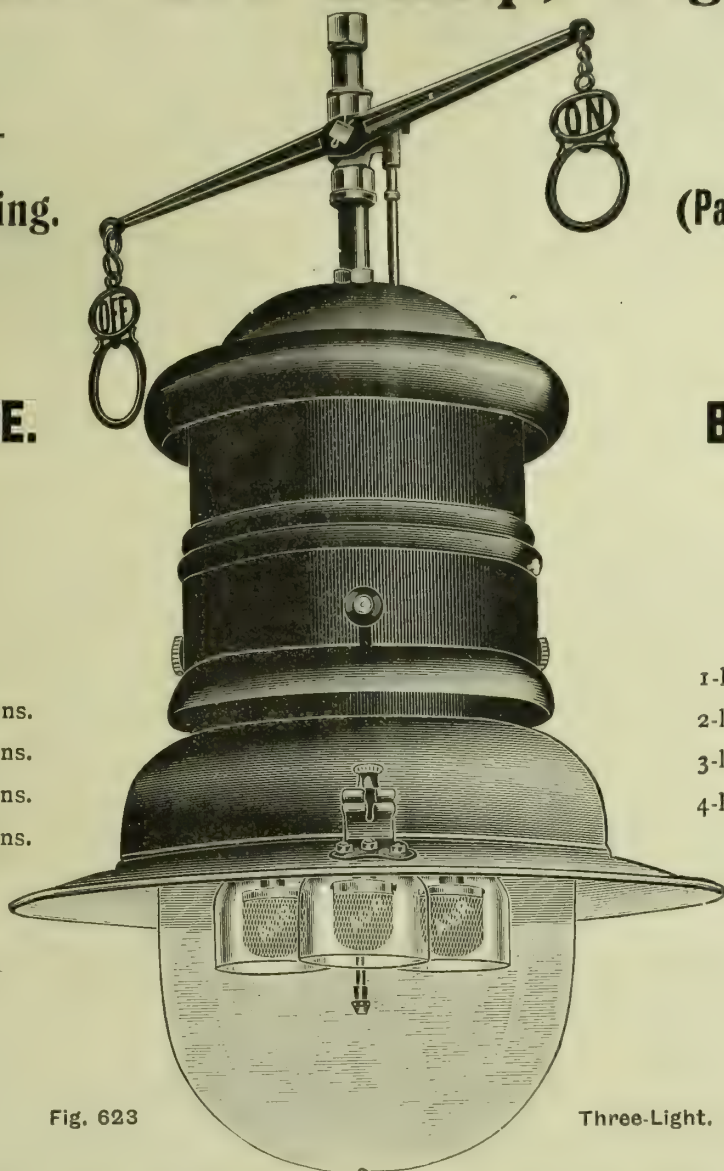


Fig. 623

Three-Light.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52 6	6/- extra.
2-light	8 feet	260	47 6	6/- extra.	4-light	16 feet	550	72 6	9/- extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3 6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2 3	5 9	5 9	9/-	Wired Globes, extra	each	2/-	2/-	2 9 3 6
" " " In Case lots per dozen.	19 6	57 9	57 9	93/-	Parabolic Reflector, extra	"	3 6	6/-	7 6 <small>Not made</small>
Case contains . . .	80	18	18	12	Welsbach Mantles, each	6d. subject as usual.			

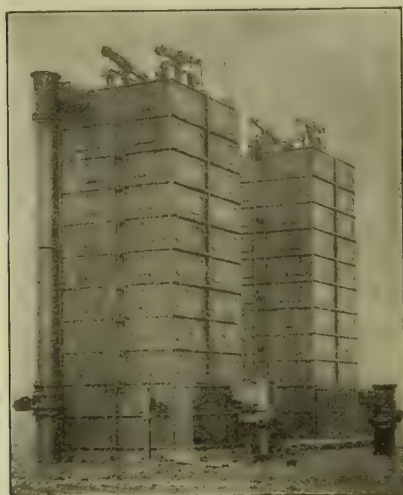
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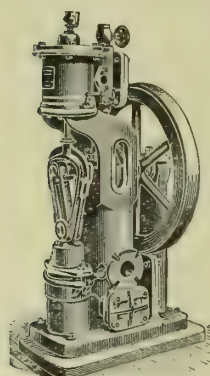


Fig. 705. "SINGLE RAM"
STEAM-PUMP.

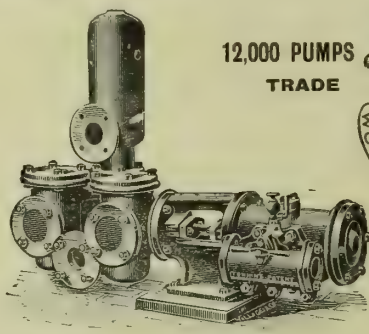


Fig. 598. "CORNISH" STEAM-PUMP FOR
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TRADE



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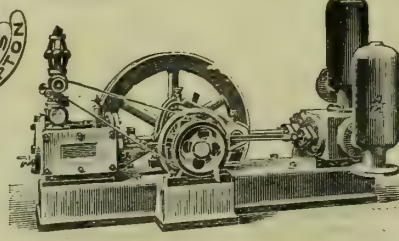


Fig. 685. "RELIABLE" STEAM PUMP FOR
TAR AND THICK FLUIDS.

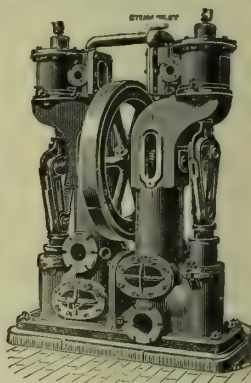


Fig. 712. "DOUBLE-RAM"
STEAM-PUMP.

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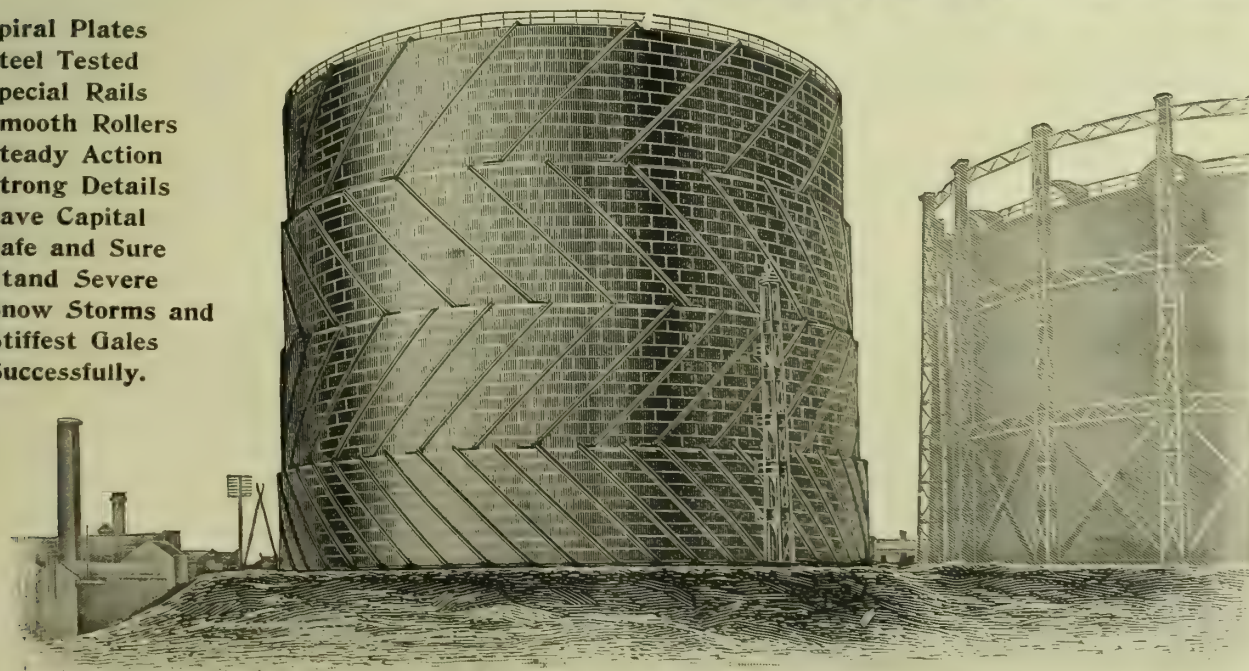
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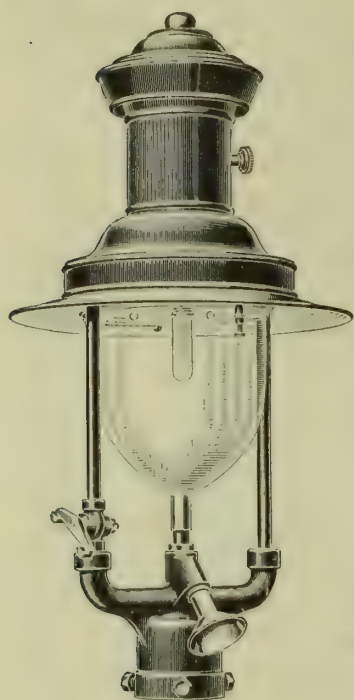


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MADE IN VARIOUS SIZES, AND ARRANGED FOR
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THE JOURNAL OF GAS LIGHTING

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LONDON, NOVEMBER 16, 1909.

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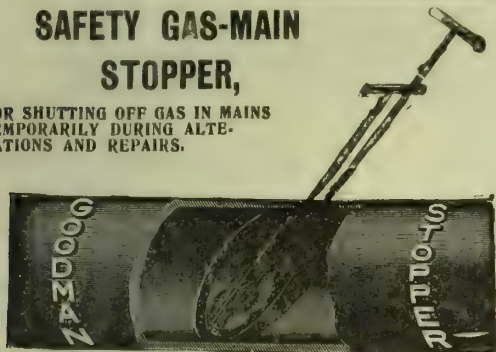
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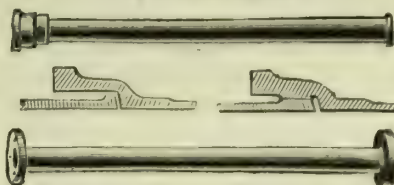
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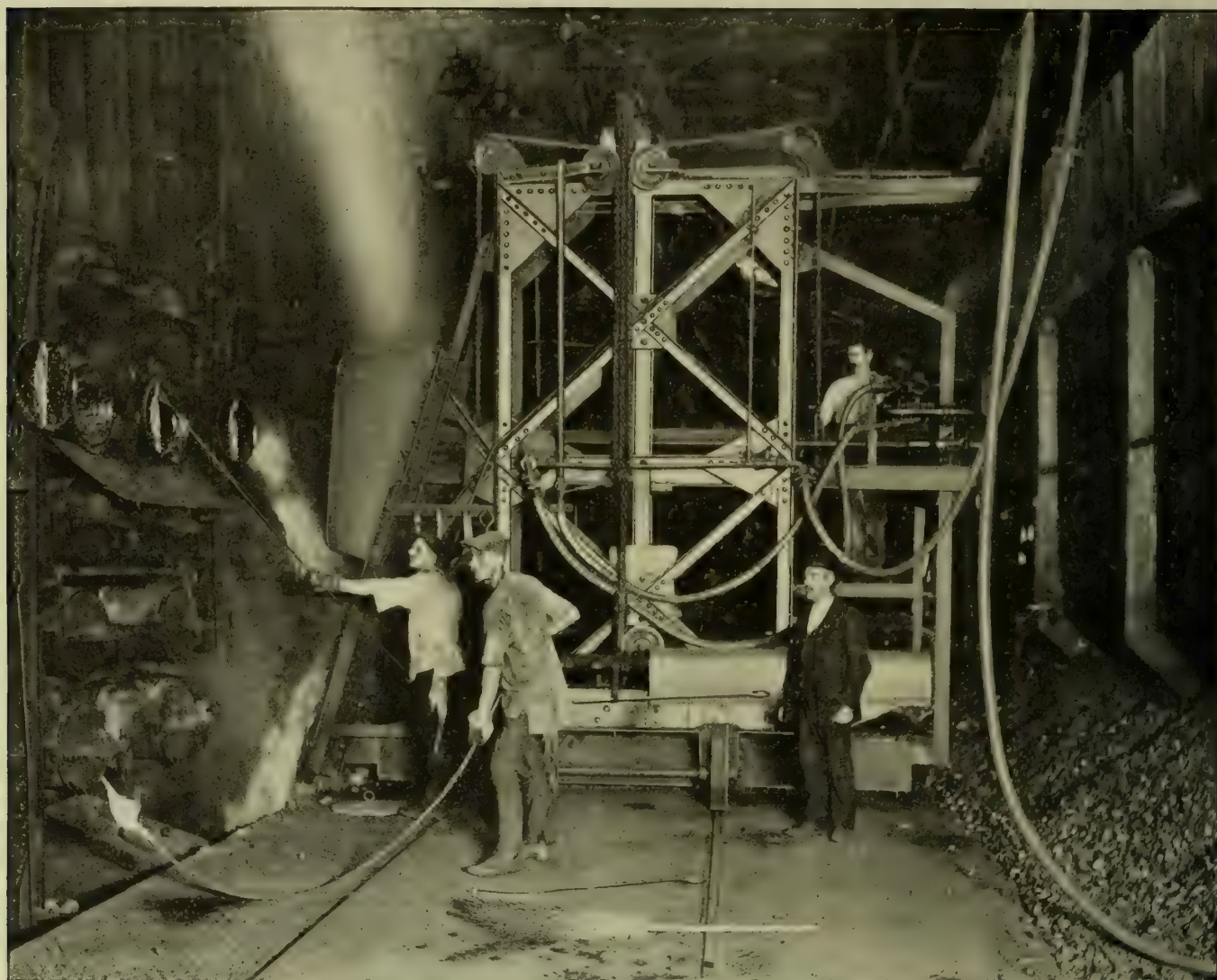
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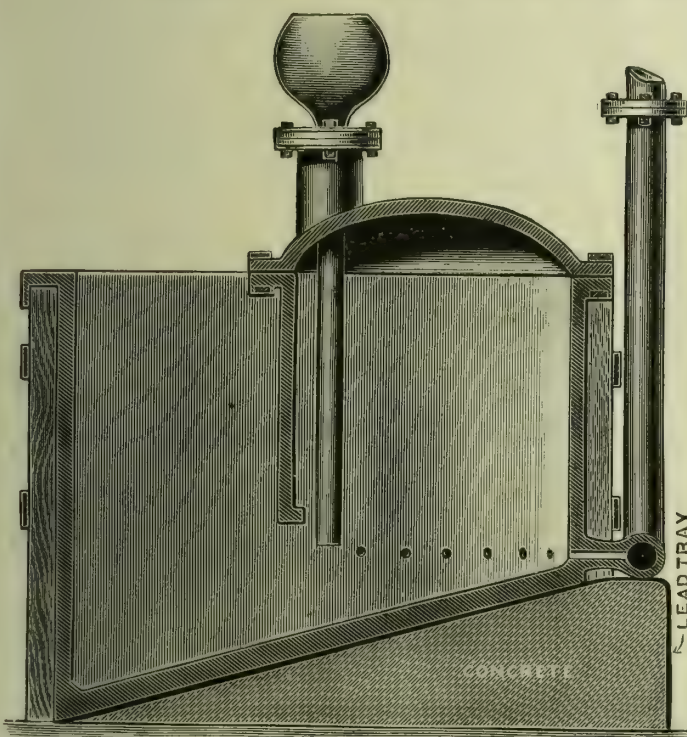
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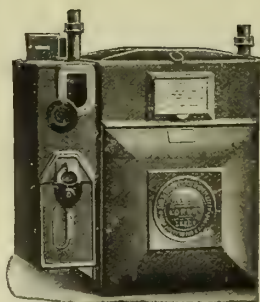
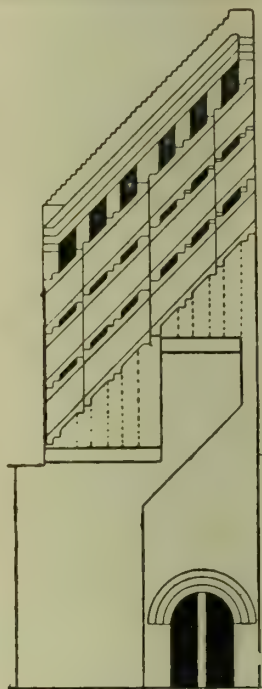
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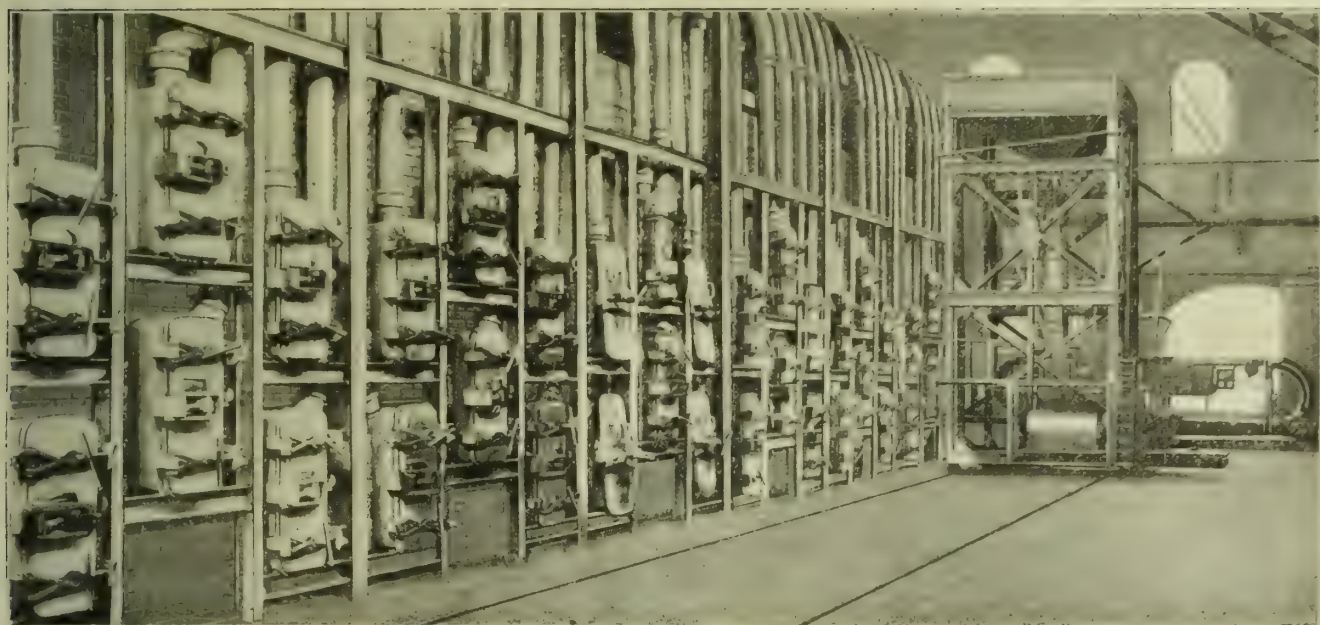


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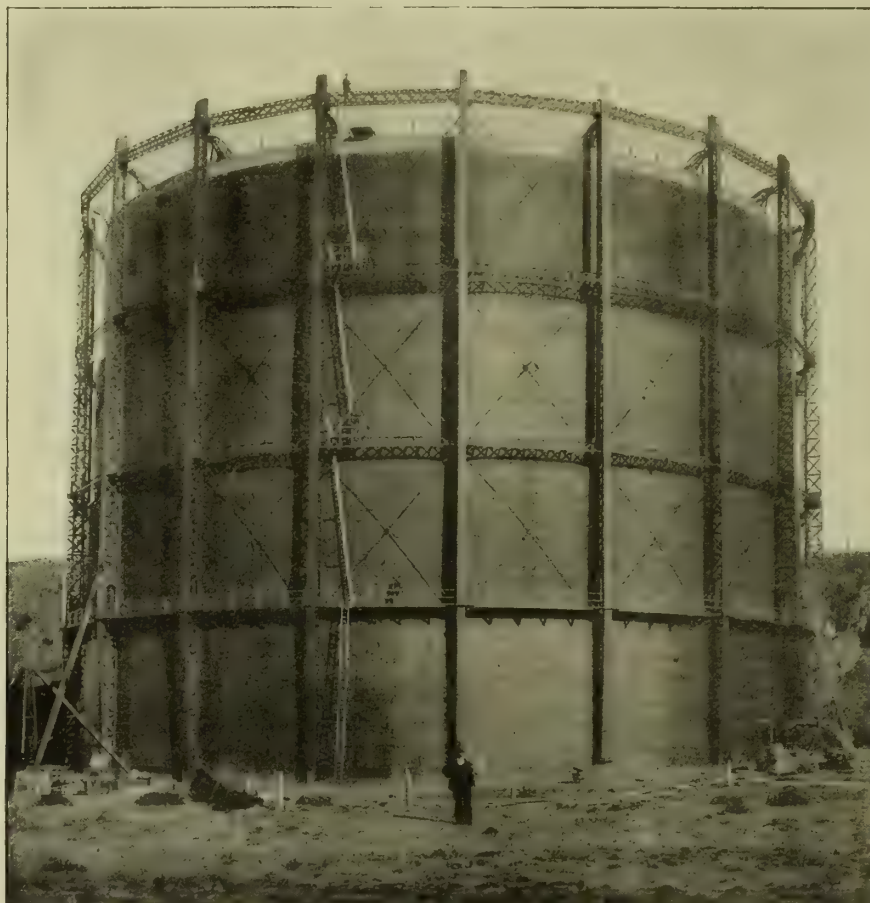
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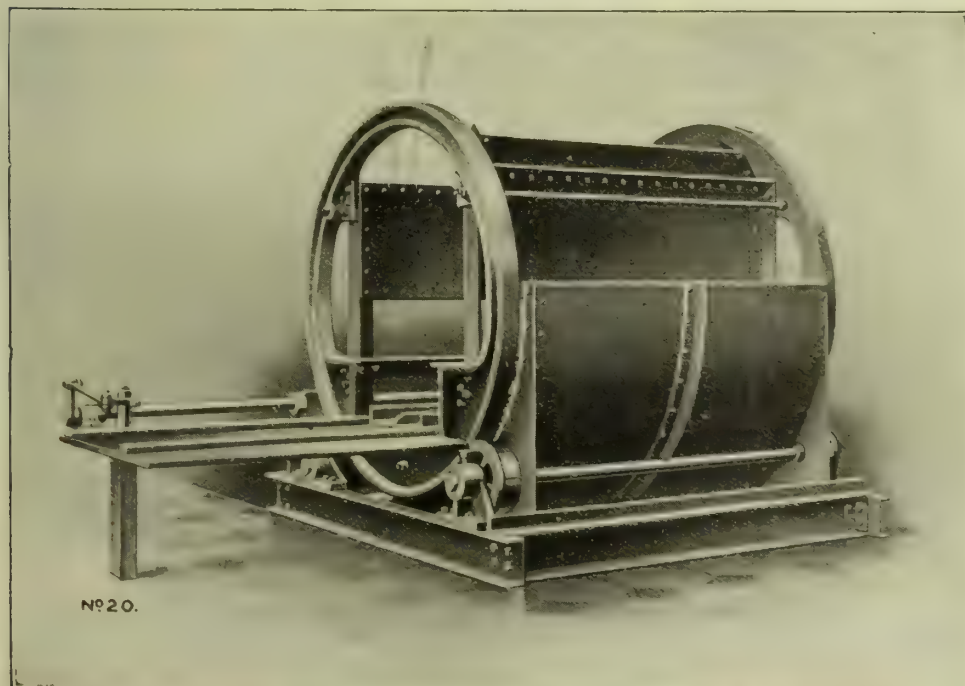
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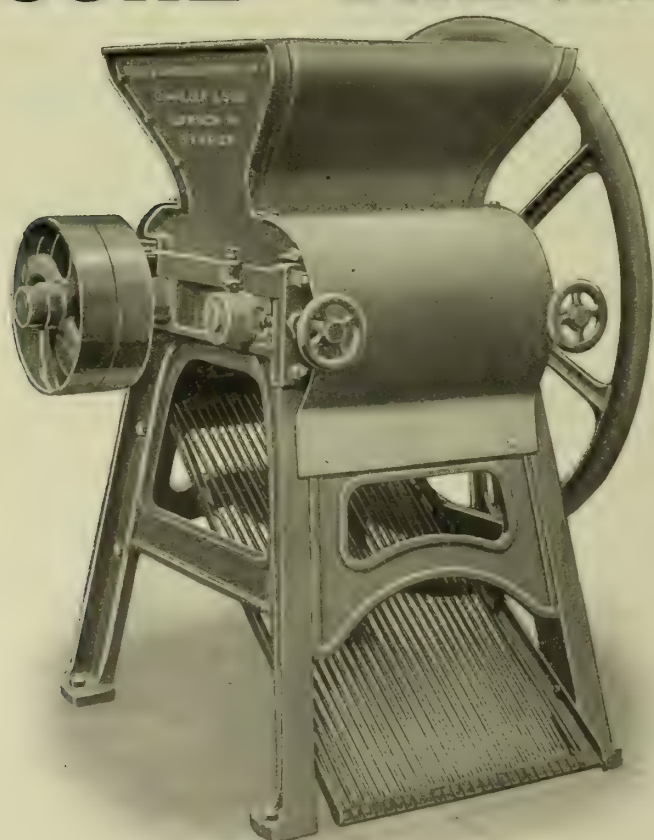
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VOL. CVIII., No. 2427.—TUESDAY, NOVEMBER 16, 1909.

EDITORIAL NOTES—GAS, &c.

The Uneconomic Object of Municipal Service.

As President of the Manchester Association of Students of the Institution of Civil Engineers, Mr. J. G. Newbigging, the Chief Engineer of the Manchester Corporation Gas Department, in his Inaugural Address last Wednesday, grasped an opportunity for impressing on those members whose work will be cast in other branches of engineering the dignified and important position occupied by the gas industry, and at the same time scattered among them the seeds of the correct policy in the administration of the affairs of municipal trading concerns. In every part of the structure of the address are seen that independent thought, that enthusiasm for profession and industry, and that broad-minded toleration for the views of others while defending individual opinion, that have been, and are, the recognized characteristics of the venerated personality that has taken such prominent part in the making of the industry's history. It is a great history, full of progressive work, and yet not without its darkened periods. The students who had placed before them the remarkable statistics of development, in the face of a strenuous opposition with at its back all the favour bestowed by the human love of novelty, will carry with them in their divers professional walks, through Mr. Newbigging's address, a greater esteem than possibly they would otherwise have possessed for the branch of the profession represented by gas engineering. Their eyes were opened to the vast field offered by the industry for the exercise of professional talent, to the immense financial responsibilities shouldered by the gas profession, and to the infinite service rendered by the professional work to the community in all its private, trading, and industrial circumstances. There has been much said in the past about keeping up the end of the gas industry in public recognition; and for taking and seeking for opportunities of doing so. An opportunity came to Mr. Newbigging; and he, as will be seen from his address, took it, and did his part well.

The opportunity was also taken by the President to make it quite clear that his sympathies are altogether hostile to the policy of appropriating the profits of municipal trading concerns in relief of the rates. It was a courageous stand on the part of a Chief Gas Engineer of a Corporation who have dipped so deeply and notoriously into the coffers of their gas undertaking to subsidize their administration of civic affairs the cost of which should be discharged in legitimate manner on terms of equality. But in this the President has with him that old campaigner on this question, his Chairman (Alderman Gibson), and the other members of the Corporation Gas Committee, as well as professional opinion, with a few exceptions, throughout the industry. The instinct and deliberate desire of the truly professional man placed in a sphere combining so many obligations and responsibilities as those of a gas engineer and manager, are to do the best possible for the concern and the capital with which he is entrusted, and for those whom the undertaking is destined to serve. This instinct and deliberate desire are strong within Mr. Newbigging; and therefore he is out of harmony with all municipal policy (such as profit appropriation) that imposes any restraint on him in serving the undertaking, and its patrons in degree great or small, to the highest advantage. The declaration is not incompatible with the President's position as a municipal officer. On the contrary, it indicates a strong fidelity to the interests that he is called upon to serve to the utmost of his ability; and that is just what Manchester looks for in, and expects from, their chief officers. With him the doctrine inculcated and believed, as underlying true municipal enterprise, is economic service. The sole motive of municipal trading of whatever description should be service at the cheapest possible rate; and that alone can justify such trading. All other considerations only supply amplifying borderings to the controversial question.

It is not, for instance, sufficient to say in regard to gas supply that relatively to the majority of towns the consumers are only charged what may be regarded as a fair figure for the service rendered, when, without profit appropriation, partly applied to benefit those who have not contributed to the making of the profits, the service might have been given at a much lower price.

The most economic gas service has not been the policy at Manchester. Good and economic administration has obtained within the Gas Department; beyond it a superior power has annihilated much of what has been done within to give to the citizens the gas service at the lowest possible price to which they are entitled, and which it is to the interests of the whole city they should have. The total quantity of gas consumed in Manchester between 1844 and 1909 could have been sold at prices producing £2,918,585 less, had the Corporation not taken this sum from the gas consumers to be devoted to purposes the liabilities in connection with which should have been discharged through the ordinary powers of direct rating. The sum named as having been appropriated is more—mark this!—by £136,950 than the total expenditure on manufacturing and distributing plant. Though the total expenditure on plant has been £2,781,635, the total liabilities to-day only amount to £1,515,275. The difference has been provided by the gas consumers, the works and plant have been maintained by them, the whole cost of administration has been borne by them, the ordinary rates and taxes to which the undertaking is subject have been paid by them, and upon all this £2,918,585 has been taken from their pockets for purposes foreign to the administration obligations and service of the gas undertaking. It is wrong; and what is wrong is not honest. The figures and considerations drive into a corner those who, with parrot-like reiteration through brevity of reason, give utterance to that pusillanimous excuse as to the responsibility of the ratepayers for the capital. For any such hypothetical responsibility the ratepayers of Manchester (*quâ* ratepayers) have been well paid; and they are, in effect, the debtors now of the gas consumers for the remainder of the capital liabilities, and the difference between this sum and the £2,918,585. In other words, the responsibility has been discharged by the gas consumers having placed in the hands of the ratepayers more than sufficient to liquidate all the gas loans. That is what, in common sense, it amounts to when there is talk of the ratepayers' responsibility. Supposing (regarding the matter from another point of view) all this money that has been appropriated for the rates could have been legitimately allowed to accumulate at compound interest, the capital debt on the undertaking would long since have been extinguished; and at what price then could gas have been supplied to present-day consumers? This, admittedly, would not have been fair to past consumers, who have had as much right to the most economic service as the consumers of to-day.

There has never been a valid argument for profit appropriation as has been witnessed on the high scale at Manchester; and those grey-with-age arguments that only had plausibility as a recommendation have not now for support—in view of the figures advanced by Mr. Newbigging—even the shadow of the original character that gave them passing acceptability. The best thing that Manchester can do is to cry “quits” as between ratepayers (as ratepayers) and gas consumers (as gas consumers), and let the policy of the future be that fullest economic service—a service which would bring in its train other advantages than the one of cheapness—that will do much to repress the resentment that has been created in respect of the municipal conduct of gas undertakings. If there is not voluntary relinquishing of this policy of profit extortion, it is certain that Parliament will not permit it to go on everlastingly. The Salford and Oldham Bills in the current session of Parliament herald the warning; and, in the opinion of Mr. Newbigging, the withdrawal of the Salford Bill was not in the best interests of municipal gas enterprise. The Bury Corporation have taken the voluntary course. At their own instance, they

have this session brought themselves under an obligation to divide equally any excess gas profits between the general fund and the consumers of gas, while the gas undertaking is to repay to the general fund any deficits that may henceforth be made good from the fund. This is another form of control, though rather more loose than that proposed in the case of Salford and imposed in the Oldham Act. However, there is plain speaking in the President's address; and, indeed, it incorporates one of the most cogent cases that have ever been submitted for reform. And reform is requisite. In a very short time through it, Manchester could be supplied with gas at a uniform rate of 1s. 6d. per 1000 cubic feet; and there is a large undeveloped field of usefulness lying around for gas at so low a price. Given the one essential of greater cheapness, the President foresees in the future of the gas industry a more conspicuous utilitarian success than ever it has yet attained. This subject of policy and service is only one of several in an address packed with illuminating interest.

The Gas Workers' Strike in Italy.

THOSE who have read in the "JOURNAL" columns of the fateful struggle that is proceeding between the Union des Gaz (with the Continental Union Gas Company) and the men in their employ at the Italian stations, will be disposed to be heartily thankful that their lot is cast in places where the workers are animated by a greater reasonableness. In other columns, we have endeavoured to review the situation as dispassionately as the extraordinary demands of men already endowed with exceptional power as employees will permit. They are now out on strike hoping to imperil the gas supply of Milan, Genoa, Alessandria, and Modena to enforce their most remarkable claims; while the Company, recognizing the vital issues involved, are rightly resisting—and successfully, we are pleased to say—the attempt that is being made to cause them to finally surrender such liberty of control as they now possess in regard to labour, and to take upon themselves additional financial burdens which, under the conditions subsisting between them and the towns supplied, would considerably reduce the barely fair compensation now received for the service and character of enterprise in which they are engaged. In their resistance so far, there has been success; and the sympathy and best wishes will go out to the Company and to their executive officers—particularly Mr. Clement Hovey, the Chief Engineer at Milan, and the General Manager, Signor Grüss, upon whom has fallen, with the Consulting Engineer, Mr. A. F. Phillips (who is a Director), the burden of active participation in the conflict, through which, at the time of writing, they have not by any means completely passed. The Company and their officers were prepared for the tussle. The clouds that have been gathering for some time past warned them that it would not be long before they burst, and burst they have with violence. There have been anxious times the last fortnight at Milan; and the claims on physical endurance have been great. But the citizens (and the same may be said of other places) have suffered the minimum of inconvenience. Full credit and congratulation for this to the loyal executive staff, and to those workmen—British and of other nations—who went out to help (with willing Italian workmen) to resist the tyranny of the labour extremists who were responsible for the singular demands presented to the Company's Directors. The Company must not give in; and they will not do so while they are so well supported by officers and men, both faithful and honest.

The difficulty is to regard temperately the demands of the men that have resulted in the fight now proceeding. Upon those demands, it would be idle to attempt to negotiate terms; for only men bereft of reason and all sense of integrity could have preferred them. They ask, in the name of justice, for the exorbitant this, and the impossible and impracticable that; but where in any one part of their demands has justice swayed the men? We fail to put a finger on any one part. They eschew arbitration; they want to have the power of selection of the men, and of decision as to the number of men, to be employed conferred upon them; they want the right to determine questions of labour expediency; and to have referred to their judgment all proposals for dismissal through incompetence or other cause. They are to be, or rather they desire to be, the sole arbiters as to employment in connection with the Company's works. Increased wages are desired, and additional help to do the allotted work, as well as an augmentation of wages after 21 years' service. Besides the

weekly rest day, an annual holiday, with full pay, of 24 days is required. There has been a large increment of personal advantage to the men in the past, while the work has yearly been made easier. The imagination, inventiveness, and selfishness that these extremists have brought to bear on their demands must have displaced all common sense; and certainly there can be no sense of honour among them. They are now seeking to enforce their claims by rebellion against law and order; and between them and the Company's property the authorities have had to interpose very necessary military protection, and this upon a somewhat large scale. These strikers are the men on whom the Company have showered concession and consideration. Equal pay for less work than in this country; and all the benefit funds, pensions, holidays, and so forth—just as are found at home. But all to no good. The men are irresponsible to it all. If anything, the more they receive, the more they want. Success in one appeal spurs them on to ask for still more. In this attempt to reverse the common order of things—the employee controlling employer, and making exactions that cannot be borne—we have the maturing fruit of socialism. The attempt must not succeed. The duty of the Union des Gaz and of the Continental Union Gas Company, it is clear, is to stand firm, at whatever financial cost; and the proprietors must support the Boards. The issue of this struggle is vital to the future of the Companies as commercial concerns.

Paving the Way.

DEALING last week with certain technical questions raised by the paper by Mr. J. H. Coste, F.I.C., on gas calorimetry, read before the London Section of the Society of Chemical Industry, there was one general point that was reserved for separate reference. It is the almost (if not entire) universal agreement that exists among the chemical specialists identified with the gas industry as to the illuminating power standard for gas being of practically no moment now, and a calorific power standard being a fit and proper substitute. The recognition of this extends to the Chemical Department of the London County Council, under whose charge is the gas testing of the whole of the Metropolitan area, other than the City. This recognition is no less pleasing than significant. Some months ago Professor Frank Clowes, the Chief of the department, writing in "The Times," spoke of the restricted importance nowadays of the illuminating power test, and of the rising importance of calorific power, and referred to the probability of calorific power being the future standard for gas. In precisely identical terms, his chief assistant (Mr. Coste) wrote in his paper; so that we may look hopefully to the London County Council, in due season, lending a hand to remove the shackle of the illuminating power standard, and (as Parliament is bound to insist on some standard in substitution) in setting up a reasonable calorific power one. The gas industry and the business of gas supply have been for some time ripening for the change. The President of the Institution of Gas Engineers (Mr. James W. Helps), during the discussion on Mr. Coste's paper, pointed out that, if gas undertakings had a calorific power test, instead of an illuminating power one, they would be satisfied; and he further said that, in his opinion, it would not be long before the gas industry had a calorific power standard substituted for the present one. Dr. H. G. Colman hopes that the day of the change of standard may come soon; and Mr. W. J. Dibdin (Professor Frank Clowes' predecessor at the London County Council) says that the time for change has already arrived. There is no question that this paper and the discussion have lent a hand in helping forward the change.

But there is something to be done before the change can be brought about. It is recognized by all who are qualified to pronounce an opinion upon the matter, that no common standard for calorific power can be applied, nor that from the indications of illuminating power tests can the calorific value of a gas be assessed. This was made abundantly clear in the paper and the discussion, as was also the point that it is possible, by variations of manufacturing process, to degrade illuminating power and improve calorific power. This being so, it is imperative that gas authorities should commence at once the systematic testing of their gas for calorific value, as was done for three years in the Metropolis before the Gaslight and Coke Company consented to be placed under a penal calorific test; the official informative testings being still carried on in the areas of the other two Companies. As Mr. Coste says, it is quite clear, from investigations that

have been made, that no standard for calorific power can be satisfactorily fixed for any supply, unless the gas is thoroughly tested and determinations of the calorific power are made over a period. The present is the time for such preparation; and, through the calorimeter, the technical staff of every gas undertaking should bring themselves into contact with all the lessons that are to be obtained from its use in connection with the gas produced day by day under the special conditions of the concern. The President of the Institution believes that it will not be long before every gas authority—company or municipal—will be using calorimeters to a much greater extent than in the past; in fact, it will be absolutely necessary for them to do so. For its own information and protection, every gas undertaking must do its part in paving the way. The calorific test is inevitable; but it must only be by supersession of the present standard, for between the two there is no real affinity. Sooner or later the parliamentary authorities will take up the matter through the repeated attention bestowed upon it; and it will be well for every gas undertaking to thoroughly understand its own position.

Suggestion for the Refractory Materials Committee.

IN a communication elsewhere in this issue (p. 464), Mr. W. R. Herring supplements the interest that has been aroused on the question of the relative virtues of fire-clay retorts of British and German origin. It is not the first time that our correspondent has dealt with the subject of the life of retorts; but on this occasion the matters under consideration are on different lines. From a wide experience, Mr. Herring is confident that retorts at least fully equal to German manufacture can be procured from "a few" British makers; so that he is not disposed to admit the apparent hopelessness of the position so far as British retorts are concerned. The employment of the expression "a few," and the succeeding admission that "there is considerable room for the application of methodical scientific methods in the preparation of fire-clay goods for the many different purposes for which they are now used," are sufficiently expressive to show that there is lurking somewhere in the writer's mind the feeling that all is not so well with the methods of the British fire-clay industry as it might be. The rectification is entirely in the hands of the fire-clay makers themselves. Like Herr Körting last week, our correspondent this week thinks that the weight of censure that has been placed upon the retorts should possibly be spread over setting design and the materials other than retorts used in the settings. The treatment of the retorts, and the weight of coal carbonized in them, should also be taken into account. The quantity of coal carbonized in retorts, of course, affects their lives just as much as the amount of coal passing over the belt of a projector affects its life. Engineers have been heard to speak of the greater number of days' work they get out of their projector belts in comparison with other works, forgetful that at the other works the quantity of coal dealt with every day may be two, three, or more times greater than in their own works. Mr. Herring puts his finger upon certain weaknesses and influences that he considers affect the life of retorts apart from their own constitution. Herein he supplies a sufficiently strong case to show that, as Herr Körting also submitted last week, there are insufficient data available as to the causes affecting the durability of retorts for any fair and accurate judgment being arrived at on the matter. In this respect, our correspondent is of opinion that the Refractory Materials Committee of the Institution of Gas Engineers could usefully enlarge the sphere of their operations. Perhaps they will take the suggestion into consideration. Certain it is, that many gas engineers would be willing to render assistance in filling the complained-of gap in the requisite data.

Novel Prepayment Methods.

IN this country, prepayment gas methods have settled down on a bed of principles that are much the same in every city and town; and therefore it will be refreshing to our readers to consider the article by Herr Kobbert, of Königsberg, published in other columns, on the subject of the "Economic Aspects of the Slot-Meter System." We are afraid the day has passed, owing to the already large adoption of the prepayment system in this country, when some of the almost revolutionary methods advocated by Herr Kobbert could be applied. But still there are places where the question of expediency could be put to the test on a tentative scale.

There are two fundamental points that have to be grasped in considering the contents of the article—the one being that it is now generally recognized in Königsberg that gas is the fuel of the people of small incomes, and that experience has led to the conclusion that the economical value of the prepayment meter lies chiefly in the method of payment which allows the consumer to reckon up exactly his expenditure on gas. In both respects, there is a reversal of British notion and custom. It has not yet been generally recognized by gas men here that their primary product is a heating fuel for people of small means, other than for cooking; but the idea is unquestionably growing with an increasing economy in the application of gas as fuel. Nor, to be frank, is it commonly considered advisable to be constantly reminding prepayment consumers of the amount they are spending on gas. Sufficient is it that they are content, at the time they deposit their pence, to pay for the comfort and the convenience.

Herr Kobbert uses the prepayment system, in conjunction with a price lower than that charged for lighting, with splendid effect in developing the gas-heating business. But his prices for gas are high in comparison with the general run of charges in this country. The high lighting price appears to compel recourse to some such system as that described. That it is successful, the figures given in the article attest. For while the ordinary meters for lighting have been nearly stationary the last few years, and the slot meters for lighting have only reached a numerical strength of 2370, the ordinary meters for gas for cooking and heating have nearly doubled (being now 6619), and the slot meters for cooking and heating have mounted up from 486 to 14,178. This is a remarkable showing; but the duplication of the meters and piping must represent a large capital cost, and the meter inspection and collection, together with the clerical work, must also involve additional working expense. There is not much interest in the figures Herr Kobbert gives as to the increase of gas consumption per head of the population; seeing that population is not a stable base for comparison.

The lower flat-rate prevailing in this country for gas for all purposes would, we are afraid, put Herr Kobbert's system to a large extent out of court; but we are not sure that a differential price, with discount meters, would not be beneficial in more ways than one in giving a fillip to the heating business, and indirectly be of assistance to the lighting business. A lower price than the ordinary is always seductive, and influences trial, for a new purpose; while the separation of the lighting and fuel accounts would be of great advantage in exhibiting the real smallness of gas lighting bills. It is not (though it is difficult to avoid it) to the benefit of the gas business in the competition with electricity that the gas accounts should show in one item the consumption for all purposes, while the electricity account only shows the cost for one purpose. However, we do not think Herr Kobbert's plan is the most economical one for effecting differential charges. On the other hand, the figures show the vast difference that exists between the consumers using the gas for lighting and those using it for heating and cooking—the latter, including both ordinary and prepayment, exceeding the former by no less than 12,456. This is certainly remarkable; and therefore one hesitates to suggest that Herr Kobbert, under his special circumstances, has not taken the most prudent course. The big number of slot meters in excess of the ordinary for heating and cooking also indicates that the system of prepayment has helped to create the extraordinary showing. We will not enter into the details of the practices at Königsberg in relation to the slot-meter system; but readers will not overlook that preference is given there to the collection of sealed slot-meter money-boxes rather than of the money in the boxes. This novelty furnishes part of the interest to be derived from a perusal of the article.

The Gas Companies' Joint Standard Burner Bill.

We are informed by Mr. Fred E. Cooper, the Secretary of the Gas Companies' Protection Association, that up to midday yesterday forty-eight Companies, representing between them an annual make of gas of about 20,500 million cubic feet, had signified their intention of joining in the Bill which is to be promoted in the next session of Parliament to authorize the substitution of the "Metropolitan" argand No. 2 burner for the burners now used by the different undertakings that may be associated with the measure. There is thus ample assurance that the Bill will be a powerfully supported move in the direction of clearing away a

state of affairs which it is generally felt imposes great hardship on the gas undertakings to which it applies. The accession of Companies since the last issue of the "JOURNAL" went to press is most satisfactory; but we are hoping that, when the matter is finally put into shape, it may be found there are some further additions still to the list of names of undertakings joining in the promotion.

Construction of Unauthorized Works—The Barnet Case.

As briefly announced in the "JOURNAL" last week, the Barnet District Gas and Water Company have been successful in their appeal against the decision of Mr. Justice Ridley in an action brought by the Attorney-General, on the relation of the Marquis of Salisbury, to restrain them from sinking a well at Colney Hatch, on the ground that they had no power to do this. It was submitted on behalf of the Company that their Act of 1904 conferred the power; but it was argued on the other side that all they had authority to do was to take water from the authorized works shown on their deposited plans. If, in connection with these works, and ancillary to them, they wished to sink a well, they had a perfect right to do so; but they were not entitled, because they had power to purchase land by agreement, to obtain some in any part of their district, and sink a well there. As the well in question was $6\frac{1}{2}$ miles from the nearest authorized works of the Company, it was submitted in the Lower Court that its construction was *ultra vires*, and that the case was governed by the Frimley and East Grinstead cases. Put shortly, the question before Mr. Justice Ridley was whether Parliament had or had not authorized the carrying out of the particular works he was asked to stop; and his Lordship decided that it certainly had not. Before the Court of Appeal, it was contended by Sir Alfred Cripps that, in the construction of the section of the Company's Act bearing upon the question, the principle of the Frimley case—viz., that Parliament did not give a water company a roving power to construct a well anywhere they pleased, but only to carry out the works authorized—was decisive, and that Mr. Justice Ridley was right in granting the injunction. On the other hand, Sir Robert Finlay submitted that the circumstances of the two cases were entirely different. He showed that under the appellant Company's earlier Acts they sank wells; and he argued that it was inconceivable that when, in 1904, the Legislature found that this had been done, and passed a Bill which reproduced the authorizing language of one of those Acts, they did not intend to permit the Company to do similar work. The learned Counsel's contention, however, received the approval of only two of the three learned Judges before whom the appeal was argued—Lords Justices Buckley and Kennedy; Lord Justice Vaughan Williams holding that Mr. Justice Ridley was right in regarding the Frimley case as a precedent for deciding the one before them. It is unfortunate that their Lordships were not of one mind on the question; but the fact only shows once more how difficult it is, even for those who are "learned in the law," to construe the language of Acts of Parliament. The decision in the Frimley case was as disturbing in its effects as that given some years ago upon the "annual value" question, at the instance of Mr. Dobbs, inasmuch as it has necessitated, as our columns have shown, applications to Parliament for the confirmation of works carried out, as was generally supposed, under legislative sanction, but for which, as it now appears, no such authority had been given. As the Barnet case will, in all probability, go to the House of Lords, further reference to it may be left. Meanwhile the Company can go on sinking their well; but they must not draw water from it if this is likely to be detrimental to the district.

More Revelations.

Among the wreckage of the flotations of the Eaton promoting gang is the Rawcliffe (Yorks.) and District Gas and Coke Company, Limited, a meeting of which was held last Tuesday. In this instance, the vendors—Eaton's Water-Works, Lighting, and Power Investment Corporation—have not, through the public being unappreciative of the benefits to be secured from what Eaton himself confesses is only a patched-up rotten gas-works, been able to squeeze much financial advantage from it, though the expenditure incurred in obtaining a small amount of capital was heavy. In connection with this capital-getting, it is interesting to learn that there is not a single opening that is missed through which Eaton

and his associates can extract some monetary benefit. It has always been known that the lists of shareholders of reputable gas companies that this promoting gang obtain are used for circulating prospectuses; but, according to a Rawcliffe shareholder, one of the Eaton concerns through which operations are conducted, charges the promoted companies for lists of the names of likely shareholders. In the case of the issue of the Rawcliffe prospectus, it is understood that a list, consisting of about 60,000 names, was supplied and charged for at the rate of 50s. per 1000, or £150 in all. How often, we should like to know, has the same list been sold in similar manner to other promoted companies? The Act giving the power to shareholders to obtain lists of their fellow-shareholders never contemplated that they would be used for traffic in this way. From the report that is published in other columns of the proceedings at the Rawcliffe meeting, it will be gathered that there was much trivial speaking on the occasion. It is also seen that the same old haziness that has been found surrounding the Ticehurst and other concerns of this particular parentage, has been carefully cast around the proceedings of the Rawcliffe Company by those interested in concealment; but, through the report, the delinquencies of those responsible are open to the light of day. Therein is the only justification for the publication of a report of the extraordinary length (for such a Company) to which we have gone this week. Among other points brought out—and we are glad to see this—it is clear that this particular Company and others of the same group have become pariahs in the commercial world. Many trading firms, despite warnings, have entered into business relations with these Companies. But once bitten, twice shy. The report presented by the Directors at the meeting was not adopted. In our view, the best thing the shareholders of these concerns can do is to appoint some gas engineer of recognized standing to make a thorough investigation of their affairs. But the man appointed must not be one of Eaton's nominees, but someone of good reputation in the gas industry proper, and not in that section represented by the undertakings of parasitical company-mongers.

Brockenhurst Again.

Witness has been borne by our columns lately to the fact that the St. Stephen's Chambers group of promotions are restless again just now—more money being required in various quarters. Only as recently as June last, the Brockenhurst Gas Company (upon the directorate of which are names—Philpott, Capes, and Brown—that are now getting greater publicity through appeals for capital than they at one time received) were out with a prospectus. Well within six months, the Directors issue another, offering a further 250 shares of £10 each, ranking for dividends up to 10 per cent. Printed in red at the top of the prospectus is the usual "sprat": "Six months' interest at the rate of 6 per cent. per annum will be paid to the purchasers of the undermentioned shares on the 7th December, 1909 . . . in accordance with the guarantee hereinafter referred to." On the face of the prospectus are also the words in red ink: "Six months' accrued interest, payable 7th December, 1909." As this prospectus is largely composed of matter appearing in the one previously issued, readers may be referred to the comment passed upon the concern in our issue for June 15, p. 696. By the way, Mr. A. F. Painter never complied with the request made on that occasion. That is unkind of him.

The Westminster Technical Institute.

Last Friday evening, between fifty and sixty of the students in the Gas Supply Classes of the London County Council Westminster Technical Institute visited the Essex Street compressing station of the Gaslight and Coke Company for the purpose of examining the plant used for the high-pressure lighting of Aldwych, Kingsway, and Fleet Street. Full explanations of everything to be seen there were offered by Mr. G. Dodimead, the Chief Lighting Inspector of the Company. After seeing, and duly appreciating, the lighting installations, a move was made by the party, who were accompanied by their tutors (Messrs. J. G. Clark—who takes the advanced class—P. Smithers, H. Rothwell, and Bevis), to the Tudor Street valve-room, where their guides made them fully acquainted with the system of governing the gas which is driven from Beckton. The proceedings closed with a hearty vote of thanks to the Gaslight and Coke Company for permission to make the visits, and to the tutors for accompanying the party.

Mr. W. J. Smith, who recently took up his duties as Gas Engineer to the Bolton Corporation, has been elected a Vice-President of the Bolton Municipal Officers' Association.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 484.)

THE Stock Exchange has not had at all a cheering week. Though an improved gold position relieved the monetary strain, Consols and their class were heavy, and closed decidedly flat. Some of the speculative lines had a bad time. The brightest quarter was our Railway Market. Business on the whole was very quiet and sensitive to light influences; and the feeling in general was disposed towards gloom. It was account week. The adjustment was not a heavy affair, but one small failure was announced. The opening on Monday did not augur well for any one market, and depression prevailed throughout all. Tuesday was a more cheerful day for most of them. Consols rose $\frac{1}{4}$; and Railways began a steady recovery, which lasted fairly through the week. Business was far from active on Wednesday. The higher class departments were steady; but there was a good deal of jumpiness about the speculative lines—such as South Africans and Mines. The position of things remained much the same on Thursday, with further weakness in those which had given way the day before. Business fell very quiet on Friday; all markets being inanimate and dull. Consols lowered $\frac{1}{4}$; and Railways lost some of their rise. This state of affairs continued on Saturday; and Consols had a further fall. In the Money Market, there was a good demand, and rates for short loans stiffened up nicely for lenders. Discount rates, after some little unsteadiness, moved downwards. Business in the Gas Market was much on a par with the week before—i.e., below a fair average rate of activity. Changes in quotation were irregular—about as many one way as the other. The losers were the secured issues of the Gaslight and Coke and the South Metropolitan Companies; and, as a corollary to the former, West Ham secured issues went with them. But several issues, widely distributed, advanced; Ilford being conspicuous with a large rise. Transactions in Gaslight and Coke ordinary ranged from 102 $\frac{3}{4}$ to 103 $\frac{3}{4}$; in the maximum, from 87 to 88 $\frac{1}{2}$; in the preference, 104 and 104 $\frac{1}{2}$ were marked; and in the debenture, 83 $\frac{3}{4}$ and 83 $\frac{3}{4}$. South Metropolitan was very quiet, changing hands only about four times at figures ranging from 120 $\frac{1}{2}$ to 121 $\frac{1}{4}$. The debenture was done at from 82 to 83 $\frac{1}{2}$. In Commercial, the only transactions were two in the 4 per cent., marked at 110 and 110 $\frac{1}{4}$. In the Suburban and Provincial groups, Brentford old was done at from 255 to 256, British at 42 $\frac{3}{8}$, Ilford "A" at 145 and 145 $\frac{1}{2}$, Portsea "B" at 129 $\frac{1}{2}$, ditto "C" at 120 $\frac{1}{2}$, South Suburban at 120, and West Ham debenture at 108. In the Continental companies, Imperial was done at from 180 $\frac{1}{2}$ free to 182 *cum div.*, and from 176 $\frac{1}{2}$ to 178 *ex div.* Union realized 97 $\frac{1}{2}$ and 98 $\frac{1}{2}$, and European fully-paid 24 $\frac{5}{8}$. Among the undertakings of the remoter world, Buenos Ayres changed hands at 13 $\frac{1}{2}$ and 13 $\frac{3}{8}$, ditto debenture at 96 $\frac{1}{2}$ free and 97, Hong Kong at 17 $\frac{3}{8}$ and 17 $\frac{1}{2}$, Primitiva at 7 $\frac{1}{2}$, ditto preference at 5 $\frac{1}{4}$, and River Plate at from 16 $\frac{1}{2}$ to 16 $\frac{3}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

The Suppression of the Carbon Filament—Metallic Filament Lamps in Street Lighting—Insane Costs—Inefficiency Testimony—Allowance in Price for Waste—Hiring and Wiring.

FROM the early days of the incandescent gas-lamp, electricians sought by queer devices to maintain that electricity was cheaper than gas; but, if we are to believe what is now being said, the metallic filament lamp only came along just in time to save from total destruction the lighting business of the electrical undertakings, in places where people want a cheap bright light. Now that the metallic filament lamp is with us, there is talk in electrical circles of the unsatisfactory lighting and costliness of the carbon filament lamp; so that the proclamations of old were false, and wittingly so. The failing in this respect has become a kind of second nature with some of the electrical fraternity. We no not know why it should have been necessary, in admittedly an uphill fight, for them to have sought the aid of obliquity. But so it was; and the habit sticks. Carbon filament lamps are, excepting where retained for decorative purposes, fast finding their way to the scrap heap, or to the dustbin. A statement at the recent meeting of the the Edison-Swan Company is illustrative. The Company's carbon filament lamp sales show a decline of 6 per cent., and in value of 17 $\frac{1}{2}$ per cent. Thus it is not to be marvelled at that the Edison-Swan Company have entered upon the manufacture of metallic filaments. It is a matter of life or death with some of the carbon filament lamp makers; and wisely they have decided that there is no use in trying to swim against the tide. Continuance of that game is sure to end in fatigue and collapse. So they are going in unison over to metallic filament lamp manufacture; reducing their output of the old form of incandescent lamp as the demand shows signs of decline. But the chances are that the makers will not do so well out of the new lamps as they have done out of the old—that is to say, the largely increased cost of manufacturing the metallic filaments compared with carbon filament lamps, combined with the clamour of electrical engineers for still cheaper metallic filaments, will have an effect in whittling-down profits. The metallic lamps are also producing an adverse effect on the arc lamp business. Several electrical engineers are turning out the arc lamps in the streets,

or have determined to limit them to main roads; replacing the evicted arcs by high-power metallic filaments, on the ground that they are lower in initial cost, in replacement expense, and in annual running outlay, but they say nothing of the lower efficiency. Very little, too, is said about the expense of maintenance for street purposes; but more is heard of this from private consumers. Just before this paragraph was written, in conversation with two users of metallic filaments, one of them stated that he had just had to fix two new 50-candle power lamps and the other owned to having replaced four, which had "gone" simultaneously one evening, though running "quite brightly" just before. The replacement of these four lamps cost this consumer 17s.; and, failing to see that there was much in the talk as to consumption saving when a bill of this kind dropped on one, he did not forget to talk about the matter. Mr. A. C. Cramb, the Electrical Engineer of Croydon, has lately been writing on this subject. He thinks the price of the metallic filament lamps is too high. "From some cause or other," he says, "a lamp breaks; and a consumer is asked to pay out 4s. 3d. for a new one. The result appears to be that, instead of having a satisfied consumer, the gas company is more likely to obtain an addition to their number."

We have lately had to comment on the question of public lighting—in particular, pointing out that, where electricity undertakings are in the hands of municipal authorities, they spend heavy sums in converting the street lamps to electric lighting, without any care as to whether the ratepayers are going to really obtain benefit from the change. In places, too, annual inclusive prices are quoted by the electrical department without any calculation as to whether or not they are paying ones. Prices per unit are in some cases quoted for the current that are below, or perhaps only equal to, works' costs, without taking into account any of the capital and administrative charges; and the haphazard system has also found favour of offering to do the lighting at the same price per lamp as the gas lighting, without regard to whether or not it will pay. These are treated as small matters so long as the lighting is removed from the control of the detested successful gas company. Epsom only reflects many other towns in respect of indifference to financial and other consequences. There Mr. H. Ross Hooper, of the Local Government Board, finds that the District Council have been carrying on a system of lighting without even knowing the cost. "There has been a loss," he recently remarked at an inquiry in the town, "on both the public and the private lighting; and the position in regard to the former is that the price charged has never been worked out." It would not be so bad if this were an isolated case; but unfortunately it is not. This sort of thing only shows the strength of gas in public lighting, given a fair field and no favour, and if competitive terms did not mean losing terms for electricity. It was only the other day that the Electrical Engineer of Dundee was complaining that he was driven to competition, for "if ever he got anything, he had to fight hard for it against gas." His idea of competitive terms is, in the case which gave rise to his plaint, to quote £9 each for 16 flame arc lamps, which he asserts will give 3375-candle power apiece! He might just as well have made it 30,375 candles while he was about it; for one may as well be spiked for a big as a little thing in these matters, if spiking there is to be. The total cost of his 16 flame arc lamps per annum was to be £144; and the reputed aggregate candle power 54,000 candles! The City of London Companies have not yet—inflated as have been their claims—gone to the length of the Dundee Engineer. For this lighting the Gas Department quoted £156 for 31 lamps of a total of 11,000-candle power. And we venture the opinion that, for efficiency and uniformity, these 31 gas-lamps would have been, despite the electrical candle power claim, much superior to the 16 flame arc lamps.

However, arc lamps are not in strong favour just now for street lighting; and metallic filament lamps are having an innings. The Hastings Corporation have put some up in one of their thoroughfares, in which a good contrast can be made of their efficiency and that of ordinary incandescent gas-burners. That was a diplomatic fault on someone's part; for already letters have appeared in the local papers (as mentioned in our "Miscellaneous News" last week) complaining that the spending of the ratepayers' money has produced something less efficient than they had before. Mr. Angelo Lewis says that "no one ventures to say the new light is better than the old one—indeed, anyone with eyes in his head can see for himself that it is far poorer." That is the opinion of a man who appends his name to the view he expresses. He also speaks of the diffusive power of the metallic filaments as demonstrated to be less than that of the incandescent gas-lights. Another correspondent says the result of the lighting is a lamentable failure; the lighting is distinctly worse than before. This is what was proved by the Beckenham experiment [see "JOURNAL" for Jan. 12 last, p. 93]. Then what are ratepayers getting for the money that the Corporation have spent in commencing this conversion of the public lighting, without the consent of the Local Government Board? And what is the electricity undertaking gaining? What, too, becomes of the boast made in the local papers regarding the wonderful things that the metallic filament lamps were going to do for the electrical undertaking? For it salvation was once going to be obtained through the flame arc lamp. But the flame arc did not come up to the scratch as a redeemer. Then the metallic filament lamp was going to do the trick. The loss on the concern last year was £380! As we have said before, the current attention that is being bestowed on the question of public lighting is due partly to

the action of the local bodies in favouring at any price which they think will excuse the change the conversion of the street-lamps, possibly believing that some ulterior advantage will accrue to their electrical undertakings; partly to the advances in inverted gas-lamps; and partly, again, to the gradually descending prices for gas. The two latter causes have apparently caused Mr. W. A. Jackson, Engineer of the West Bromwich Corporation Electricity Department, to abandon hope. Writing to a contemporary recently, he asserted that it is not possible to develop street lighting in West Bromwich by means of metallic filament lamps, owing to the fact that gas is sold for the purpose at 1s. per 1000 cubic feet. Energy is chiefly supplied there for traction and power purposes; but lighting in competition with cheap gas and inverted mantles is becoming a secondary matter. The inverted gas-lamp has given the electrical industry a shock; but it is not out of place to mention here that, in recent travels, we have seen some ugly examples of shop inverted lamps, which will do gas lighting no good. The circumstances under which they were fixed and are maintained are not known to us; but where there are such lamps, gas managers should see what can be done to remove something that is distinctly against the interests of their undertaking, and substitute it by something that is creditable and slightly.

We like originality and truth. The combination is found in some of the writings of Mr. R. Borlase Matthews. In two places in the last batch of "Central Station Commercial Notes" in an electrical contemporary, the unity of the two qualities is found. We must first point out what leads up to the point that has specially attracted attention. The question of rates for heating and cooking and for minor devices in which heat is required is being discussed. The difficulties of the situation are shown. The great thing is to get the appliances tried; and then there must be "careful nursing" to ensure that the apparatus does not fall into disuse. This shows the ticklish job that overhangs the perpetuation of use. Then with high prices, "one of the things that must be carefully pointed out is that the waste of current is to be avoided, and also that it does not do to leave the appliances in the hands of servants, or else the bills will be high." Then at special power and lighting rates of 2d. or 2½d. per unit, the veracious Mr. Matthews asserts, "any electrical appliance, even an electric oven, can compete with other methods of heating and cooking, if *great care* is taken to avoid waste of current." Can compete! In a previous budget of notes Mr. Matthews was talking about the deficiencies of electric ovens and temperatures (*ante*, p. 382). But at these prices the wonderful economical electricity is only competitive for heating and cooking with other systems when, we read, it is under the direct control of the mistress of the house, or where the servants are extremely careful. Cheaper rates are, however, essential; for with all the "careful nursing," "great care," and "direct control," there must be failure of electricity for heating purpose, in view of its low thermal value as an agent in this direction, if the price does not partake of the quality of the thermal value. This brings us to the combination of originality and truth. "If the income of the electricity supply undertaking is to be still further increased, there is no question but that the rates will have to be reduced or altered, so as to permit *waste* of electricity; for until people feel free to be careless, the consumption will be very restricted." Mr. Matthews reiterates this later in the notes, by remarking that "the whole situation can best be summed up by saying that, whatever the price charged for electricity, or the form the charge may take, it must permit of *waste* by careless domestic servants." That is the point; and we compliment Mr. Matthews upon his sentient acknowledgment. The whole case for electric lighting, heating, and cooking, is built up on the hypothesis that the agency of electricity eliminates all waste. But it is not so; and it is well to recognize that human nature steps in to upset the hypothesis. This is occasionally appreciated by our electrical contemporaries and central station engineers, when they make the point that strict discipline in the use of electricity is as essential to commercial success as the electric lamp is to the obtaining of light from the current. Strict discipline *plus* a margin for waste; and even then in heating and cooking the chances of electricity are small.

The discussion still rages as to what is best to be done to supplement electricity demand for private purposes. There is a fear that the current half-year's trading accounts of electricity undertakings will disclose a heavy falling off in the lighting units, owing to the considerable change-over to metallic filament lamps before the long lighting-hour days set in. The question of municipal hiring and wiring has been taken up by the "Electrician," and the views of station engineers have been canvassed. There is a general feeling that more must be done to foster consumption. But the question is, How? Opinion oscillates over the point as to whether or not municipal authorities should take up municipal wiring and hiring. It is, however, rather a matter for observation that there has been no conspicuous cry of anguish from the municipal electricity undertakers over the defunct permissive wiring and hiring powers that were proposed in the Electric Lighting Acts (Amendment) Bill. Judging from the opinions in our contemporary, there appears to be a feeling that the better course for municipalities is not to interfere with the wiring business, but to get hiring powers, under which they can hire-out and connect appliances, and subsequently make periodical inspection. In this way, the hiring facilities it is thought would benefit the wiring contractors' business, and at the same time help to boost the day consumption. The wiring of houses as part of municipal enter-

prise, there is no doubt, is a risky business—financially; and so we think is the hiring-out of electrical appliances. Their first cost, the wear and tear, and upkeep expenses, are all heavy; and yet for the supply of such appliances, electricity, it is proposed, shall be sold at a cheaper rate than for lighting. The most remarkable thing is how level-headed business men can fancy they see an ultimate financial advantage in the hiring-out business under such conditions. The contractors will not touch it. They have not the capital, or the facilities for dealing with it. If anything, it is a more risky business for them than for the electricity suppliers—bad as it is for them. Altogether, electrical contractors do not get much encouragement. But they are free lances. Their business is to make a living; and they have not much care whether a customer wants electric wiring or gas piping and gas fittings, or whether connection is to be made direct to the electricity system, or to the gas system, or whether a private electric generating set is to be put down with an engine driven by town or suction gas. Their favours veer with customers' preferences; and the bigger the job, naturally the bigger their profit. On top of all is the displeasure of the electricity supply industry, save in the highly favoured districts, with the current position of affairs.

PERSONAL.

Mr. R. J. LUKEY, the Secretary of the Australian Gaslight Company, was one of the delegates for the Falmouth Chamber of Commerce to the seventh Congress of the Chambers of Commerce of the British Empire, held in Sydney, N.S.W., last September. Mr. Lukey is a native of Falmouth, and was formerly Secretary of the Falmouth Gas Company. It must have been gratifying to him to have been so kindly remembered by his fellow townsmen on such an interesting occasion.

At the meeting of the Tunbridge Wells Town Council last Wednesday, Mr. WILLIAM HENRY DELVES, J.P., was elected an honorary freeman of the borough, in recognition of his eminent services during the twenty-seven years he has been a member of the governing body of the town. He has been an alderman since 1892, Chairman of the Finance Committee since 1887, and was Mayor in the year 1900-1. Alderman Delves made the customary declaration, and received from the Mayor (Mr. H. M. Caley) a scroll recording the appointment. The address, beautifully illuminated on vellum, was enclosed in a double-door frame, covered with green velvet calf, lined with silk, having silver mounts, with monogram and the arms of the borough. Alderman Delves, who was very cordially received, said that he was deeply grateful to the Council, and especially to the Mayor, for the kind words with which they had recognized any little services he might have been able to render; and it would be an incentive to him to continue to use his best endeavours in all things for the benefit of the town in the few years he might have to live. Alderman Delves is the Chairman of the Tunbridge Wells Gas Company; and at the monthly meeting of the Directors on Wednesday, opportunity was taken to congratulate him on the honour which had been conferred upon him by the Town Council.

OBITUARY.

The death is recorded in our American contemporaries of Mr. THOMAS J. HAYWARD, the President of the Bartlett-Hayward Company of Baltimore and New York, well-known contractors for the erection and equipment of gas-works. Mr. Hayward surrounded himself in his business with young and capable men, who were trained, under his guidance, in the manner which he knew would make them the most useful to themselves as well as to him; and to his sons and to them the business will now be passed over.

We regret to record the painfully sudden death, last Tuesday morning, at his residence, North End House, Portsmouth, of Sir JOHN BAKER, the Chairman of the Portsea Island Gas Company and of the Woking Water and Gas Company, and a Director of the Portsmouth Water Company. Sir John, who was apparently in his usual health, rose at his accustomed hour. After breakfast, his housekeeper went to him to receive his instructions, and while she was speaking he fell back in his chair, and never spoke again. A doctor, who was at once called in, attributed death to syncope. Sir John Baker, who was in his 82nd year, was a native of Portsmouth, and head of a prosperous woollen business; and his services to the town were manifold. He was a member of the Corporation for more than fifty years, a Justice of the Peace, a member of the Hospital Committee for twenty years, and formerly Chairman of the Board of Governors. He was for twenty-one years Chairman of the old School Board, was a Guardian of the Poor for eighteen years, and a Governor of Portsmouth Grammar School. He was twice elected Mayor and three times member of Parliament for the borough, which he represented at the time of his death. He was also the senior alderman. Sir John received his knighthood as a New Year honour in 1895, and was made a freeman of the borough in 1901. The funeral took place at Kingston Cemetery, Portsmouth, on Saturday, and was attended by the Mayor and Corporation, the Magistrates and public officials, representatives of the various bodies with which the deceased had been connected, and a large gathering of townspeople.

THE STRIKE OF GAS WORKERS IN ITALY.

A Review of the Position—The Amazing Demands of the Men—Practically Full Supply of Gas Restored.

By dint of foresight and good generalship, the citizens of Milan, as well as the other towns, the gas supply of which is controlled by the Union des Gaz and the Continental Union Gas Company, have been spared the evil consequences of a collapse of the gas supply to which the remorseless and selfish conduct of the gas workers, in attempting to enforce irrational claims, exposed them. It is to Milan, the principal station, that our previous references to the matters leading up to the present position have been mostly directed; and in making a somewhat lengthened review of the unique conditions subsisting between masters and men, and the (if a comparative expression is here admissible) still more unique demands of the latter, the information and comments will be almost entirely confined to that city—more especially as visits to Milan in the past have made us cognizant of the conditions there. But it may be taken that what is said here has also, in the main, application to Genoa, Alessandria, and Modena. But in the forefront of this review, there ought to be acknowledgment and congratulation to the Chief Engineer at Milan (Mr. Clement Hovey) and to the General Manager (Signor Grüss), as well as to the whole of the staff, for what they have done in meeting an extraordinary conglomeration of affairs that is without parallel in the history of gas supply. The big strike, by the way, commenced yesterday fortnight at the largest works in Milan (the San Celso); and the latest advices assure us that everything is now proceeding satisfactorily.

THE MILAN WORKS.

Before, however, dealing specifically with the matter in hand, it may be of interest to give a few general particulars regarding the works at Milan. From the Municipality, the Company hold a concession, which runs to 1925; and this applies to the whole of the city. Gas is supplied at a very cheap rate—13 to 15 c. per cubic metre; and this price, no matter the condition of the markets for raw material or residuals, cannot be raised. This rigid limitation of price is a condition under which British gas undertakings are fortunately not called upon to operate. However, for the price named, the Municipality insist that gas of an illuminating power of 105 litres per Carcel shall be supplied; and there is absolute strictness with regard to this. The population of Milan is 600,000; and it is rapidly extending. Naturally, under such circumstances, the Company are constantly augmenting the number of consumers; and a further effect is large extensions at the works. The new works at Bovisa have been generally described in our columns. Designed by Mr. A. F. Phillips, the first section of the plant there has a capacity of 2 million cubic feet per day; and the second section, which is now approaching completion, will have a capacity of 2½ millions. In connection with the latter, a new inclined retort-house is nearly finished—the contractors being the Stettiner Company—and gas will be made in it in a very short time. At the large works at San Celso, where the strike first broke out, inclined retorts are used exclusively in No. 2 section; and in No. 1 section the carbonizing plant is divided between horizontals and inclines. There are six batteries of retorts—eight in a setting, and ten settings in a battery—in the new, or No. 2, section. The total number of men who are required in this one works cannot possibly be less than 500. The third works are old; and in them horizontal retorts are used, with Arrol-Foulis machinery. The main streets of the city are lighted by electric lamps; but the major part of the public lighting is by incandescent gas-lamps, and, as we can bear witness, the lighting is exceptionally well done. In addition to Signor Grüss, the General Manager, and Mr. Clement Hovey, the Chief Engineer, there are other British and Italian engineers in charge of the works, all of whom must have rendered yeoman and faithful service during the present hostilities between the workmen and the Company, the former of whom have been working to assume complete control of employment in connection with the concern. It is fortunate for the Continental Union Gas Company and the Union des Gaz that, at this critical and anxious time in the history of the joint concerns, they have strong Boards of Directors in London and in Paris, and that their Consulting Engineer (who is also a Director) should be Mr. A. F. Phillips, and their Secretary, Mr. W. Martin, both completely conversant with the peculiar conditions affecting gas supply and labour in Italy, and both of whom have been working hard in these critical times.

THE POSITION OF THE GAS WORKERS.

Labour in Italy is in a perpetual seething condition. It is ever on the alert for obtaining additional advantage. There is no consideration for others; and selfishness is the dominant law. The gas workers of Milan pay no heed to the limitations under which their employers work and seek to comply with their obligations. The low and absolutely fixed gas price beyond which they cannot go—high market costs notwithstanding—is a factor that the men do not take into consideration. If the Company had a little more latitude in this respect, and enjoyed the same privileges as gas suppliers in Great Britain, then, possibly, there are sections of the workers to whom—though generally speaking all are well paid—there would be further concession made. The stokers, we believe, receive practically 6 frs. per eight-hour shift; and the labourers are paid up to 4 frs., and even more, per day. There

is nothing to complain about in these wages, more particularly considering, as we have had opportunity of observing, the amount of work that is performed per man. If it were possible for the Company to have the gas workers of other nations, they could successfully carry on their operations with a greatly reduced staff of men.

This disability as to labour and pay standing alone could be tolerated; but it is not the worst feature of the conditions ruling between masters and men. The Company, or their chief executive officers, cannot discharge men, without reference to a commission of the latter. The men are therefore the controlling authority, or masters of the situation so far as discharge from employment is concerned—a condition that is incomprehensible to gas authorities here, and is incompatible with economical and smooth working. But so it is in Milan. The Company have tried, in every conceivable way, to show that they desire to work amicably with their men; but the latter are insatiable. The end of forbearance has been reached; and the Company are now showing that they must control their own affairs, if they are to comply with their obligations to the city, and, at the same time, secure reasonable reward for their capital and services. That is all the Company want—nothing more. They are only paying fair dividends—not nearly the like of equally (in volume of business) prosperous companies in this country. Judging from reputable Milan newspapers to hand, public sympathy at this time of stress and anxiety is undoubtedly with the Company, inasmuch as it is recognized that they do give to their men good recompense for the labour accorded, as well as other generous treatment in the way of pensions, allowances in times of illness or suffering through injury, and the provision of comfortable environment on the works.

THE WEEKLY REST LAW.

Notwithstanding all this internal consideration, external forces come into play to add to the pressure of labour on the Company. This year, for instance, the weekly rest law has come into operation in Italy. As to gas-works, all men who are not working on eight-hour shifts must receive one day's holiday per week free from any work, and that day must start not later than seven o'clock in the morning. All other classes of labour the Company treated—after discussion with the men—in a most liberal manner. The labourers, the Company agreed to pay for a Sunday, or one day's rest, per week; they put on to eight-hour shifts many men who had previously been working for twelve hours a day; and they made other arrangements so as to meet the new conditions, in various branches of the service with the utmost consideration. The difficulties are seen when it is mentioned that, in Milan alone, the Company employ (we should estimate) some 1000 men. The stokers, it should be explained, have been on eight-hour shifts for some time; and the one-day rest law specially provides that men employed in gas manufacture are exempt from the necessity of being given the twenty-four hours' complete rest. This is perfectly correct in the interests of routine working, because the men change their shifts at the end of the week; and if their position is considered, it will be found that they receive at the change-over of shifts twenty hours' complete rest one week, twenty-four hours the next, twenty hours the next, and so on. Besides this, as is well known, gas stokers—especially those on inclined retorts—are not now subject to arduous work; and although the hours of work are nominally eight, they are actually only on the works, as a rule, about seven hours, and, during that period, they only work three to four hours. It is interesting to note in passing, that at the San Celso works, the hot coke is removed by labourers by means of waggons run on rails, which is a good system under certain conditions, especially if the plant is maintained in excellent order, so that the waggons may be easily propelled. From our own knowledge of the works, the plant is kept in the necessary condition to facilitate ease in working.

PRELIMINARY STOPPAGES AND CULMINATING BIG STRIKE.

As was reported in the "JOURNAL" for Oct. 19, there was a twenty-four hours' strike of the men engaged on coke work at San Celso works. It is evident this particular section of men have ever given the Company much cause for complaint. That, however, was the first of the series of recent strikes. But this action on the part of one section of the men did not meet with the approval of the other sections, who were offended with them for their impatience in not waiting for the Federation presenting their general demands for all classes of the men. But subsequently, as reported at the time, the malcontents agreed to waive their demand, if they were included in the general demands which were to be presented by the Federation. The second twenty-four hours strike was through a general one of all trades in Italy in protest against the execution of Ferrier in Spain. These two strikes happened within one week. Then on Nov. 1 came the big strike of gas workers at all the stations of the Company; and a large majority of the clerical staff, who are also members of the Union, together with the foremen, went out with the men. The general demands had been presented by the Federation, and had been submitted to the London Board. But, in view of the many concessions the Company had previously granted to the men, the Board rightly and naturally refused the exorbitant and wholly unprecedented demands. Hence the strike, which happily has

been coped with in most masterly fashion, and with a minimum of trouble to the consumers, in the cities and towns concerned.

THE DEMANDS OF THE MEN.

It is worth while, in view of their unique and ambitious character, to examine the demands of the men, which show the contempt in which they hold all the moral principles that should subsist between employed and employer. The principal of the demands were set forth last week (p. 388), and we will review them in the order presented.

1.—In the first place, the men demanded the abolition of arbitration. In 1907, the Company gave the men 10 per cent. advance in wages, with other generous concessions in connection with their scale of pay according to the period of service, &c., provisional on recourse being had to arbitration in respect of the conditions of labour, including the number of men employed on certain classes of work, examining claims of the men, verifying the complaints, with other minor matters. The Arbitrators, although appointed by the Syndics of the various towns, although, too, they have taken evidence since that date, have not issued their complete decisions, although, it should be said, that within our knowledge certain preliminary decisions have been issued, which were accepted by the men. From the present drastic move of the workers, it is not difficult, and it is fair, to infer that the men were apprehensive that the final decision of the arbitrators would not be entirely in their favour. Hence the apparent desire to suppress the remainder of the decisions by the abolition of the agreed arbitration.

2.—Then the men demand that all piece work should be abolished. On the face of it, this demand coming from a body of workmen who profess to be underpaid is extraordinary and ridiculous. It is known from what was recently published that the men rejected a system of co-partnership which was thought by them to be, as we previously expressed it, "an evil thing." This at all events gives some insight to British engineers and to engineers of other nations into the unreasonable ideas prevalent among the Italian workmen employed by the Company.

3.—As to abolishing the further engagement of contractors' men on any work connected with the manufacturing and distribution services or extensions. As already stated, the Company are making large extensions; and it appears to us that the abolition of contractors' men would mean that the Company would have to execute all such work themselves—no matter how uneconomical such procedure might be. We know, too, that the system exists in Italy of contract labour for such things as mainlaying, house piping, and placing of slot meters, as well as for such services as the carting of material. This system, we believe, is the vogue at the Company's various stations; and, under Italian conditions, it is a great convenience and economy, as it enables the Company—whose operations are rapidly extending, and who have large quantities of material to deal with—to negotiate this work, which is irregular in volume, in an economical and expeditious manner. Judging from the quantity of gas that the Union des Gaz now sell, they must import into Italy well on towards 400,000 tons of coal per annum. This indicates the importance of this particular work. The coal, which is practically all of it British, is received by boat. When large consignments arrive, it is natural the Company should deal with them through contractors; and we see no other system whereby—we repeat under their conditions—they could carry out the work with due regard to economy.

4.—The fourth request is about as monstrous in character as it well could be. It is that at each works there should be established a bureau, comprised of men of the Federation, who would solely have the engaging of the men. To concede this would be to surrender the last right of employers to engage for their service those whom they pay. We believe the Company's administration have already, by agreement with the men, allowed what are called Commissions of Vigilance to be formed at each station; and when any complaint on the part of the men is made, it is presented to the respective managers by the Commissioners. If we are right in this assertion, the men already have every opportunity of placing the case of any individual before the Managers in a complete manner; and it must receive—there is responsibility attaching which makes it imperative—attention in a just and careful manner. The men now, however, wish for a bureau composed of members of the Federation who would solely have the engagement of the men. Words fail to adequately describe the utter unreasonableness of this. It is the common recognized principle that the manager of a works should have the right to choose the number and description of men he may require. He has to take the double view of considering the interests of the company and fair dealing with the men in regard to the distribution and character of the work. The only true and proper regulation can be through the management. If this were not done, it is certain that no works could be carried on in a regular and successful commercial manner. To allow the men themselves to decide the number of men to be employed, and to judge as to the suitability of men in regard to character and competence, would lead to absolute chaos, and would open the door to all sorts of intrigue and injustice. If no other demand than this one were preferred by the men, it would be sufficient to justify the Company in their resolute attitude.

5.—Coming to the question of the non-dismissal of a workman unless it is in accord with a commission of the men. As already stated, a commission of the men at present discusses with the Manager any injustice—real or imagined—affecting the workers;

and naturally in this case, they would be able to seek redress by the powers already enjoyed. In any case, dismissal of the men should rest entirely in the hands of the Manager; and if there is any injustice done, there are always, on wrongful dismissal, the Courts to which anyone aggrieved can readily apply—in Italy as in England. From our knowledge, too, of Italian law and Law Courts, the whole procedure is much more elaborate, and inquiry is made in more detail—to the point of the trivial at times—than would be tolerated in this country, either on the part of masters or men. However, from what has previously been recorded in the "JOURNAL" as to the insubordination and indolence of the men—the latter of which is attested by their desire to reject piece work—it seems to us to be imperative that in Italy more than in any other country of which we have acquaintance, the power of dismissal or otherwise should be vested solely in the management. Only by this means can improvement be effected in the working of the concern, tending ultimately to the betterment of the workmen's conditions.

6.—As to the sixth claim, the men take a remarkable flight for a measure of leisure which many besides gas workers could enjoy, if it were reasonable. They ask for twenty-four days' holiday, with full pay to the stokers, in addition to the 37 days' rest allowed by law. The 37 days is not a correct figure, as calculation will show. The stokers, it will be remembered, were excluded from the day's rest, inasmuch as they get it to the extent of 20 and 24 hours at alternate week's changes of shift; and this, if computation is made, it will be found, represents nearly 46 days. The law considers that one day's rest in seven is ample. But the stokers are asking for this additional twenty-four days with full pay. The law, as well as the practice in Britain and other countries, are against the men, whose claim is launched now though the conditions of labour are much easier than formerly.

7.—Coming to the seventh proposal of the men. After three months' trial, it is required that new men shall be employees. Any company recruiting men naturally engages them with as great care as possible under the circumstances of the moment. But inevitably a certain proportion of the men must be engaged with whom the employers are not satisfied for one reason or another. In other countries, when such men are engaged if they are not satisfactory, they are removed from their positions at the earliest practicable moment; and they are replaced by men who will give regular and efficient service for their pay. Reverting to claim 5 it will be seen that the men request that no man shall be removed from his position without the consent of the Commission. This leaves the decision as to whether a man is doing a sufficient amount of work, as to whether he is honest, as to whether he is a satisfactory servant entirely in the hands of the workmen, as represented by the Commission. Thus it is desired to remove from the hands of the Company all powers of selection and dismissal. We do not think that anything more ludicrous than this has ever been put forward by sane men in the whole history of labour.

8.—Again the desire for supreme control is seen here. The number of labourers, it is claimed, is to be according to the exigencies of the service, as decided upon by the men. It would be waste of time to comment on this further absurdity on the part of the men.

9.—To reduce the old age limit of insurance from sixty to fifty years for those who work in warm places. When all the arrangements are considered that are made in the way of provision for the men, all the care taken to ensure hygienic and comfortable conditions, in the retort-house as elsewhere, the claim is not one that would have been expected from a body of men so well favoured as these.

10.—Here we have another instance of the grasping tendency of the workers. They ask that after 21 years' service, all employees shall be paid 5 frs. per month extra for length of service. We know the Company have an agreement with the men called the "Organico," which is of a very elaborate nature, and specifies the conditions of work and of payment, pensions, &c. Already the men's scale of payment is according to their length of service—that is to say, a scale which gradually increases according to duration of service. For instance, the labourers are paid from 3 frs. to 4 frs. a day—at the lower rate on commencing service, gradually increasing to the higher. The same thing applies to the other classes of workers—of course, with varying payment for the class of work performed. Upon this now they want the additional 5 frs. per month after 21 years' service!

11.—We should compute that the claim for 24 days' holiday, if acceded to, would mean for the Company about 8 per cent. increased cost for labour; and the 5 frs. a month after 21 years' service, another 4 per cent. on labour costs. But that is not all. The eleventh demand is to the effect that those men who currently work ten hours per day are only to work nine hours from November to February. Again, a little reckoning shows that the length of service of each man would be reduced 10 per cent., or, in other words, that the number of men would have to be increased by one-ninth to accomplish the same amount of work.

12.—But the scheme of additional financial infliction on the Company is not ended here. The twelfth demand is that the wages are all to be increased 10 per cent. It is only two years ago the men received a 10 per cent. advance; and, if report is reliable, the men on presenting this new demand stated that they had reduced what they had originally intended to ask for, and therefore they hoped the Company would treat them justly!

13.—Coming to the special demands. The first request is for

one extra stoker per battery per shift of eight hours, equalling three per battery per day. Assuming that there are six men at present employed per battery (if memory serves us right, there are eight retorts in a setting, and ten settings in a battery), an increase of one man per battery would mean an increase of 16½ per cent.—that is, on the present cost, and, on the new costs proposed, it would be considerably more. The number of men employed was evidently considered by the arbitration arranged in 1907; and the number, of course, should be regulated by such arbitration. In England, instead of six men, we should expect the work to be done by five men, who would receive about 5s. per shift, while at the present time the Italian stokers receive about 6 frs. per shift for less work. This shows that they are already well paid, and that, if their number is six per battery, there should be complete satisfaction. But there is not.

Then the boiler men demand one extra man per shift for every two boilers. We know many places where one man attends to three or perhaps more boilers, depending upon the size of the latter, and the manner in which work is exacted of them. The present scale being one man for every two boilers, it is evident the request would increase the wages for boiler labour by 100 per cent.; and if the increased scale of wages be taken into consideration, then the amount would be still further augmented—in fact, it would reach beyond two-and-a-half times what it is now, equalling an increase of over 150 per cent.

The exhaustor men also want concession, by being treated as retort-house stokers, and having eight-hour shifts. It was seen by the table published last week that the motor men (as they are called) receive up to 5'50 frs. per day of longer period than eight hours—presumably twelve hours. Therefore, to treat them as retort-house stokers, would mean that where two men are engaged at present, there would be three in future, and all three would receive payment on the increased scale demanded by the retort-house stokers. And not only so, there would be the 24 days' holiday, &c. Exhaustor work is extremely light; so that the demand to be treated as retort-house stokers is altogether beyond reason.

The labourers are in the running. They ask to be considered as second-class stokers, and to have their numbers increased by one to every seven, also that their pay be increased in addition to the general 10 per cent. advance. It should be explained that the term "labourers," in this instance, means the men engaged in taking coke from the retort-house. Their demand for the addition of one man to every seven, of course, would represent no less than 14 per cent. cost to the Company without the other demanded special or general increases and considerations. The application to put them on the same plane as second-class stokers would also mean the raising of their scale of pay from between 3 and 4 frs. to possibly the equivalent, at present, of 5½ frs. per day.

Then it is asked that men should be promoted according to seniority in service, and not according to merit. It is a topsyturvy world of their own creation in which these Italian workers live. The proposal is altogether opposed to intelligent management, to the interest of the Company, and to the interest of the men themselves, in that, in the last regard, such a rule would suppress all encouragement to individual effort and improvement. It provides an interesting side-light on the perverted notions of the Italian gas worker.

Following is a demand for increases in the payments that the Company make on account of each man, so as to enable him to have a suitable pension at the age of sixty. All the workmen, clerks, &c.—all, in fact, of the Company's employees—are under the pension scheme; and this claim appears to be a desire to have the pensions considerably increased. It only shows that the men have not left a single channel unopened through which they hope to secure some advantage.

We will not proceed further with this criticism of demands. There was much more detail given last week, all pointing to the handsome consideration meted out to the Company's workmen. It is a surprising thing that the clerks should be enrolled with the men in these unreasonable demands. One would at least have expected from them a more intelligent appreciation and consideration of the position, and of what they owe to their employers. They are paid well, and have liberal treatment in regard to holidays, sick allowances, pensions, &c.; so that there is no tangible grievance that they can possibly have. At the bottom of it all is the dominating spirit of selfishness, and of such a misguided character that, if the demands were granted, it would mean an increase in the cost of working of about 40 per cent.; and this would result in nothing short of financial disaster.

THE BIG STRIKE AND THE SUCCESSFUL CONTINUITY OF SUPPLY.

It was in the evening of Monday a fortnight since that the great trouble burst over the Milan stations. The stokers ceased work at San Celso, and they were at once requested to leave the premises, which were immediately placed under military protection by the authorities. This stoppage was followed during the evening by the cessation of work by the men at the other two Milan stations—Bovisa and Porto de Nuova. The Company's officials, including Mr. Hovey and Signor Grüss, took prompt measures (for which they were prepared) for carrying on the work by other men. It is patent that some very smart work was performed in this direction, because the city has been supplied with gas every evening, during the principal lighting hours, since the notable day of the outburst. If there had been any delay in carrying on the

work, it is evident the retort furnaces would have gone out, and the retorts would have become cold; and the supply of gas to the city could only have been from the stock which was in the holders at the moment of the strike, and that would not probably have been more than sufficient for an evening or two. But from advices to hand, we learn that the supply of gas to the city was only interrupted to the extent of the gradual reduction of the pressure for the first three or four days of the strike; and then it began from that time to improve until, on Monday evening last week, the Company had so much gas in stock that they resumed the lighting of the lamps in the streets. At the time the strike occurred, all the lamps were alight; and, the lamplighters striking with the other men, the lamps were left burning. These were not extinguished the following morning. This was deliberately done in order to waste gas, and make it more difficult for the Company to maintain a proper supply to the consumers. This would naturally have handicapped the Company very considerably, by retarding the increase in the stock of gas, so as to be able to again give the city an ample supply. As has been said, the Company again lighted the majority of the lamps on Monday evening last week; and the whole city received a full supply of gas at almost normal pressures from the fifth day after the strike. The inhabitants were still receiving an adequate supply at the time of our latest information.

The working staff of the Company cannot be less than 1000 in Milan; and the condition of things in regard to the carrying on of the manufacture and distribution reflects the highest credit on the officers of the Company, particularly upon the Chief Engineer and the technical staff under him. It must be remembered that this work has been carried on under a cloud of difficulty. There were the ineffable influences of the strikers outside the works; a sense of anxiety brooded over the operations; and above all within the works the staff of men the Company had provided could not have been all accustomed to the details of the retort-house and of gas manufacture generally. It is almost inconceivable that such a large staff of men could be organized and set to work in such a short space of time. It was done, and done in Milan. But it could only have been by the control being, within the works, directed from one point, and, of course, by good and loyal assistance. We know that men have gone out to Milan from British gas-works; and we venture to say that they have been, and are, rendering a good account of themselves. But the total number of men now engaged on the works must be much smaller than the staff of workmen that the notions of the Italian gas workmen place as desirable. In the new staff are, we believe, men of other nationalities; and they, too, are showing how to give an honest day's work for an honest day's pay. The Italian papers also mention that many Italians have also been employed; and, to their credit be it said, they are working under good control and discipline. This information applies to all three works. But considering these matters, we repeat that the control to keep the new staff in working order, and to maintain them on the works (because naturally it would have been impossible for them to go into the city without endangering their lives), must have been very complete. As has been seen from the daily papers, men have been attacked by the strikers in various ways; but exaggerated statements have appeared in the press, and they must all be taken with a grain of salt. Naturally, there have been the usual accompaniments of such occasions—attack by stick, stones, and other missiles, and other cowardly acts by large groups of strikers. The authorities, however, have done, and are doing, their part in the matter of extensive military protection, which it was found necessary to augment last week. In the interests of peace and order, and the defence of legitimate business, it is the duty of the authorities to provide proper guard; and it is hoped nothing will be neglected to allow the men who have engaged themselves to the Company in this time of conflict to pursue their work without molestation. Besides this the public safety and convenience in respect of the multitudinous services rendered by gas in domestic, industrial, and public life, demand that there shall be the fullest protection. So far as the public are concerned, they have taken any little inconvenience occasioned with the greatest of patience, knowing that any small defection in supply will be rectified when peace is restored. The notices for the discharge of the men were posted at Milan and Genoa last week, and probably in the other towns as well. Naturally this caused much excitement; and it was thought likely that it would be necessary to provide against other contingencies, and attempts at injury on the part of the strikers.

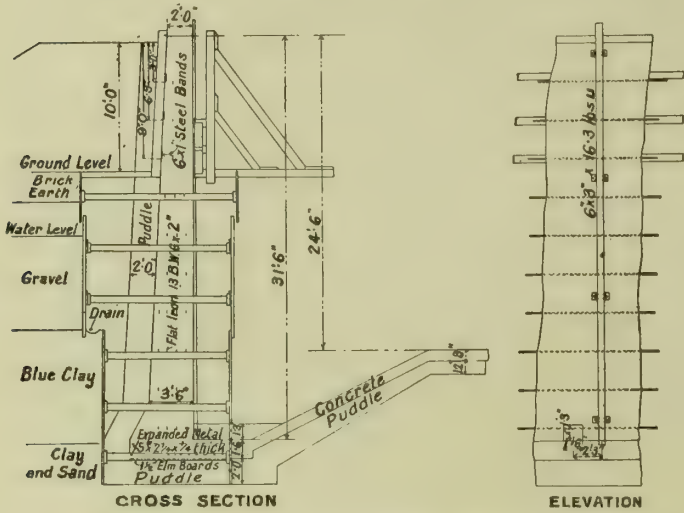
It is with the greatest pleasure we are able to report such remarkable progress in so short a space of time; and upon it all we congratulate the Company and their executive staff who have worked with such good result to meet this vital struggle in the history of the Company. It is a struggle for control being vested in the rightful hands, for release from oppression from the workers, and for the perpetuation of fair conditions. What has here been written principally applies to Milan, being the largest station; but in Genoa, Alessandra, and Modena, the Managers, Engineers, and their staffs have equally done their part within their own spheres. The vertical retorts at Genoa, owing to the few men required for their operation, have been of great assistance; and at all the towns, a fair supply of gas has been maintained. At these places, too, the authorities stepped in, and did their part in the matter of protection. But upon Milan eyes must be kept; for from Milan the workers at the other stations will take their cue in the matter of future procedure.

NEW HOLDER FOR THE ENFIELD GAS COMPANY.

THE new holder which has lately been erected by the Enfield Gas Company was brought into use on Monday last week by the Chairman, Colonel Sir A. P. F. C. Somerset, K.C.B., turning the gas into the mains serving the district. The whole of the work, of which some particulars are given below, was constructed to the plans of the Company's Engineers (Messrs. W. A. Valon and Son, of Caxton House, Westminster), under the supervision of Mr. Arthur Valon, who, as our readers are aware, is carrying on his professional work under the old style.

THE STRATA.

Previous to the preparation of the plans, a trial hole and two boreholes were sunk on the site; and it was found that from the top downwards the strata comprised brick earth varying from 2 ft. 4 in. to 3 ft. 4 in. thick, gravel from 5 ft. 9 in. to 11 ft. 3 in.

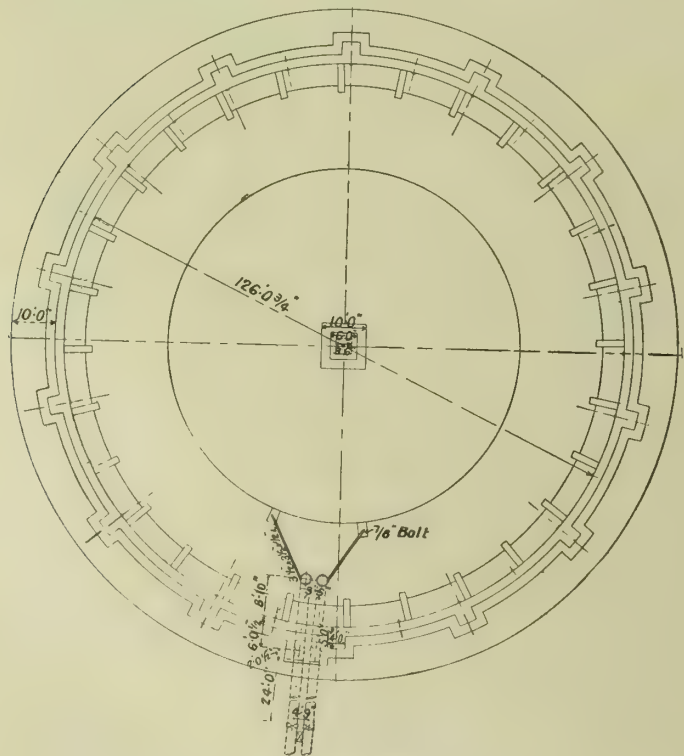


The Tank Wall and the Strata through which it was carried.

thick, blue clay from 7 ft. 9 in. to 11 ft. 3 in. thick, below this mixed clay and sand, and again below this sand. Although the thickness of each stratum varied so much, the level of the bottom of the blue clay varied only about one foot, being about 20 feet below the surface. The level of the water, of which the gravel contained a very large quantity, was only 5 feet below the ground level. Below the blue clay comparatively little water was found to a depth of about 20 feet; but further down the sand was full of it. Under these circumstances, it was decided not to sink the tank wholly below ground level, but to form an embankment 10 feet high, which would bring the bottom of the foundations of the tank 24 ft. 6 in. below the ground, and leave a bed of from 4 to 6 feet of light clay and sand above the sand and water.

THE TANK.

In excavating the tank, a trench of sufficient width to take the

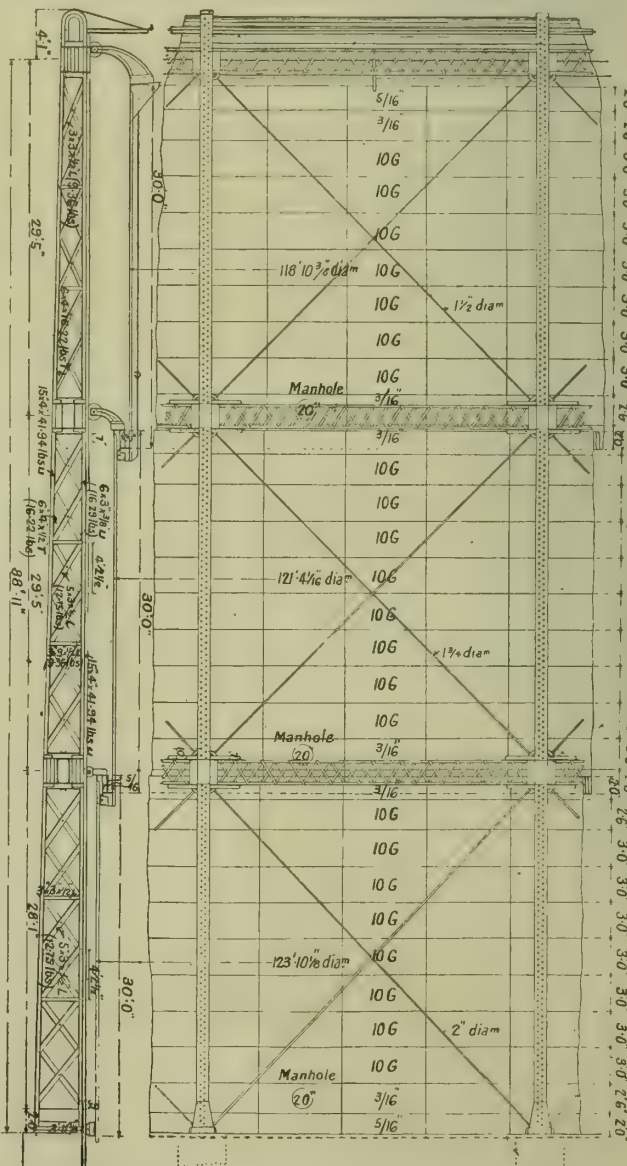


Plan of the Tank.

wall was sunk the full depth, and no material was removed from the interior of the tank until the wall had been brought up to ground level. The formation upon which the foundation was to be laid was composed of sandy clay of limited thickness, which, though quite safe when comparatively free from water, would be unreliable when saturated. It was, therefore, necessary to prevent the large quantities of water contained in the gravel above the blue clay from passing down as the excavation proceeded. The trench through the gravel was accordingly made wide enough to allow of a set-off on the top of the clay, upon which a drain was constructed round the whole circumference of the tank; the water from the gravel being thus collected and conducted to a sump, from which it was pumped. The whole of the excavation was close timbered except through the blue clay. The trench being completed, 2 feet of puddle was laid in the bottom, and on this 1 1/2-inch elm boards were placed to take the concrete.

The foundation consists of 2 feet of concrete carried under the wall and across the trench to the foot of the dumping; two layers of expanded metal being embedded in this. The concrete wall tapers from a width above the footings of 3 ft. 6 in. to 2 feet at the tank curb. Behind the wall is 2 feet of puddle. The concrete is composed of cement and ballast, in the proportions of one part of portland cement to six parts of ballast; the latter containing not less than 25 or more than 40 per cent. of clean, sharp sand. The whole of the ballast and puddle were obtained from the excavation. The timbering for the face of the concrete was composed of carefully-planed shuttering, formed to the curve of the tank; the concrete being carefully worked with a shovel against it. So successful was this method, that the surface of the concrete when set was almost as smooth as if it had been rendered. No stone was anywhere used in the construction. The rest-blocks for the holder were composed of concrete, the lewis bolts for the vertical guides were embedded directly in the concrete, and the standards were also bedded on the concrete piers without foundation stones. Over the dumping, the whole of the gravel was removed down to the clay, which was then puddled and a layer of concrete placed over it.

The diameter of the tank is 126 ft. 0 3/4 in., and the depth to the top of the rest-stones 30 ft. 3 in. No trammel was used in its construction; the setting-out being done by means of a steel



Details of the Sheet piling and General Outline of the Standards.



The Tank Completed.



The Gasholder Crown during Construction.

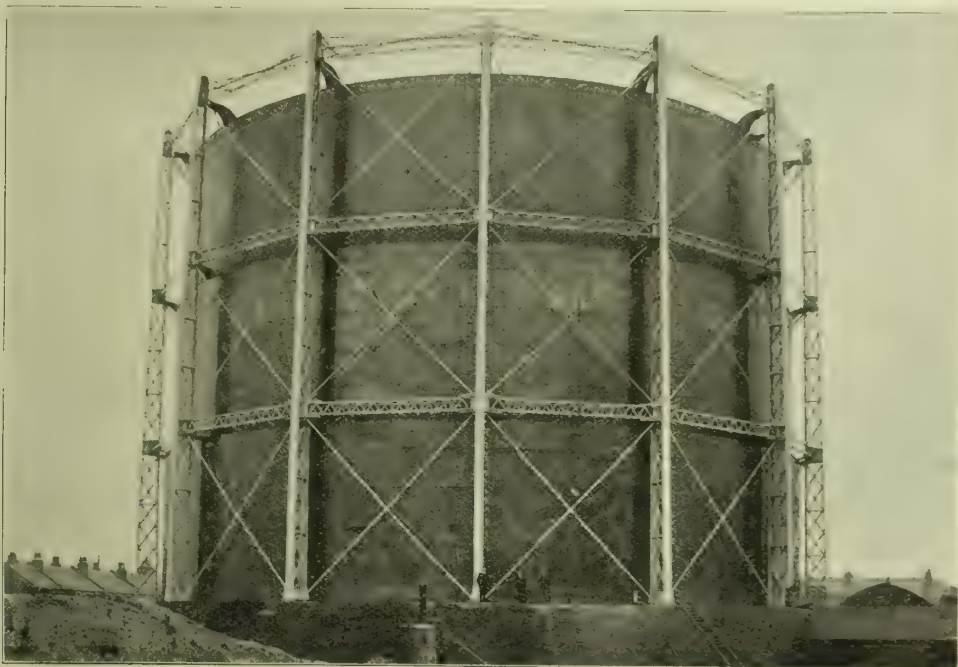
tape. When complete, the greatest difference between any two diameters was only one-quarter of an inch.

THE HOLDER.

Lifts.—The holder consists of three lifts, each 30 feet deep; the outer one being 123 ft. 10 $\frac{3}{8}$ in., the middle one 121 ft. 4 $\frac{1}{8}$ in., and

the inner one 118 ft. 10 $\frac{3}{8}$ in. diameter. It has a total working capacity of 1,004,786 cubic feet.

Strength of Material.—The steel was specified to have a tensile breaking strength of 28 to 32 tons per square inch, with an elongation of not less than 20 per cent.; but for bars to be welded the tensile strength was reduced to 24 to 28 tons, with an elongation



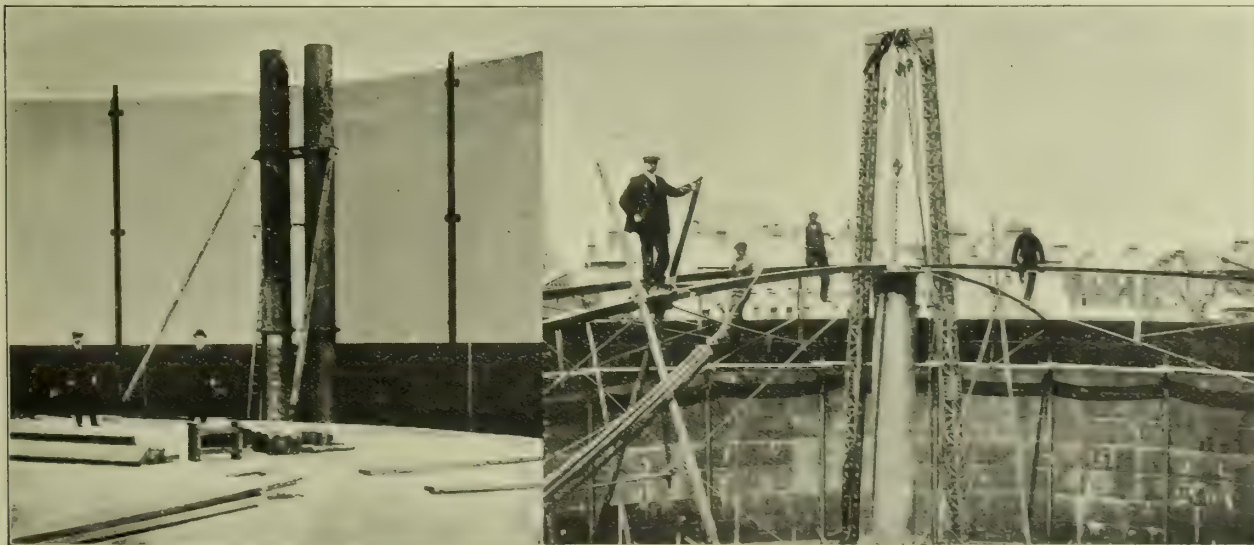
The New Gasholder Fully Inflated.

of 24 per cent. For the rivet bars the tensile strength was 26 to 30 tons per square inch, with an elongation of not less than 25 per cent. The conditions of the tests were in accordance with the British standard specification.

Guide-Framing.—The guide-framing consists of 14 lattice stan-

dards, braced together with three tiers of horizontal girders and diagonal ties.

Standards.—The standards are composed of two channels, 15 in. by 4 in. by 41 $\frac{9}{16}$ lbs., with T-steel 6 in. by 4 in. by 16 $\frac{1}{2}$ lbs. riveted to them. The lattice web is composed of angles; the two lower



The Inlet and Outlet Pipes and the Trussing of the Holder during Erection.

bays being 5 in. by 3 in. by 12·79 lbs., and the top bay 3 in. by 3 in. by 9·36 lbs. The back and front flanges are connected together with stiffeners at each alternate lattice bay.

Horizontal Girders.—These are constructed of four angle-steel, 3 in. by 3 in. by 7·18 lbs., braced together horizontally and vertically with warren lattice bracing of 2 in. by $\frac{3}{8}$ in. flat steel. Where they connect to the standards, a web plate takes the place of the bracing, and they are stayed to the back and front flanges of the standard.

Crown.—The crown is made of ten rows of plates; the centre plate being $\frac{5}{8}$ inch thick and 4 ft. 6 in. diameter. The outer row of crown plates is $\frac{1}{2}$ inch thick; the joints being butted together with cover straps. The next row of plates is $\frac{3}{4}$ inch thick; the remainder, No. 10 gauge. The top curb is composed of angle-steel 6 in. by 6 in. by 24·18 lbs. The crown is trussed with a light steel trussing, and all the principals run right through from the crown to the circumference, there being no half-principals. The vertical guides and the main rafters are connected together by gusset plates; the outer row of crown plates being riveted to the main rafter, and the top row of side plates to the vertical stays.

Vertical Stays.—These are composed of 6 in. by 3 in. by 16·29 lbs. channel-steel next to the shell, with a 7 in. by 4 in. by 16·01 lbs. H-steel at right angles to it. Where H-steel only is used as a vertical guide, it has an unpleasant tendency, unless it

be made very heavy, to fail sideways when it has to support the whole weight of the crown and trussing.

Bottom Plates.—The bottom plates in each lift have been made $\frac{1}{8}$ inch thick, as this row of plates forms one side of the cup, and between wind and water are more liable to decay. In order to further guard against this, it is desirable that these plates should be painted every year; and in this holder they have been finished a different colour, so that should in any year these plates only be painted, it will not spoil the general appearance.

Side Sheeting.—The top plates of the two outer lifts are $\frac{3}{8}$ inch thick; the side sheeting generally being No. 10 gauge.

Channel Guides.—The channel guides are continuous from the bottom of the tank to the top of the standard.

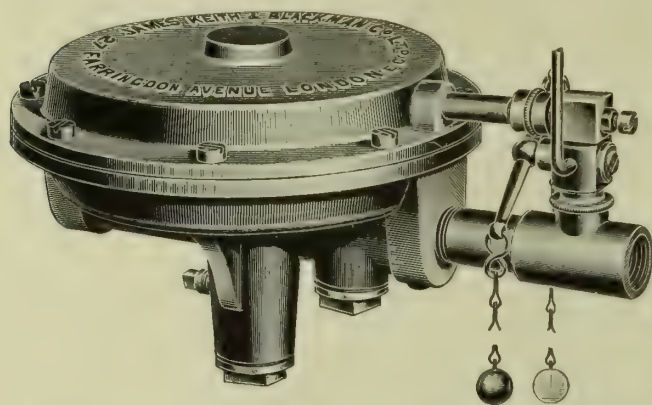
Bottom Curb.—This is constructed of two rings of angle steel 6 in. by 3½ in. by 15·31 lbs., with chairs attached on the inside so as to give a wider bearing on the rest stones.

The tank was begun on June 4, 1908, and completed on April 8, 1909; the erection of the holder being commenced on April 20, 1909, and completed on Oct. 30. The water was turned into the tank on Sept. 7; the filling being finished by Oct. 11. The total cost of the holder and tank is equivalent to £11 2s. 2d. per 1000 cubic feet of storage capacity. The Contractors for the tank were Messrs. Thomas Docwra and Son, of Balls Pond, N.; and for the holder, Messrs. Clayton, Son, and Co., of Hunslet, Leeds.

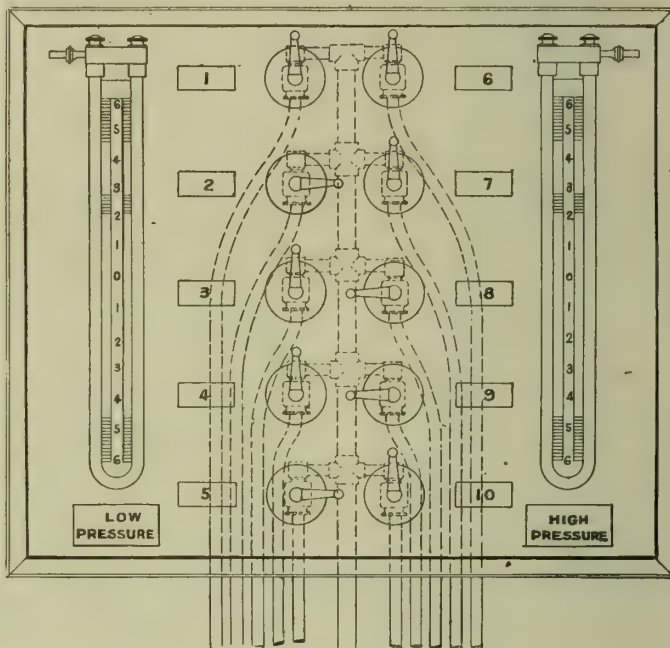
LIGHTING OF ALEXANDRA PALACE.

A Fine High-Pressure Installation.

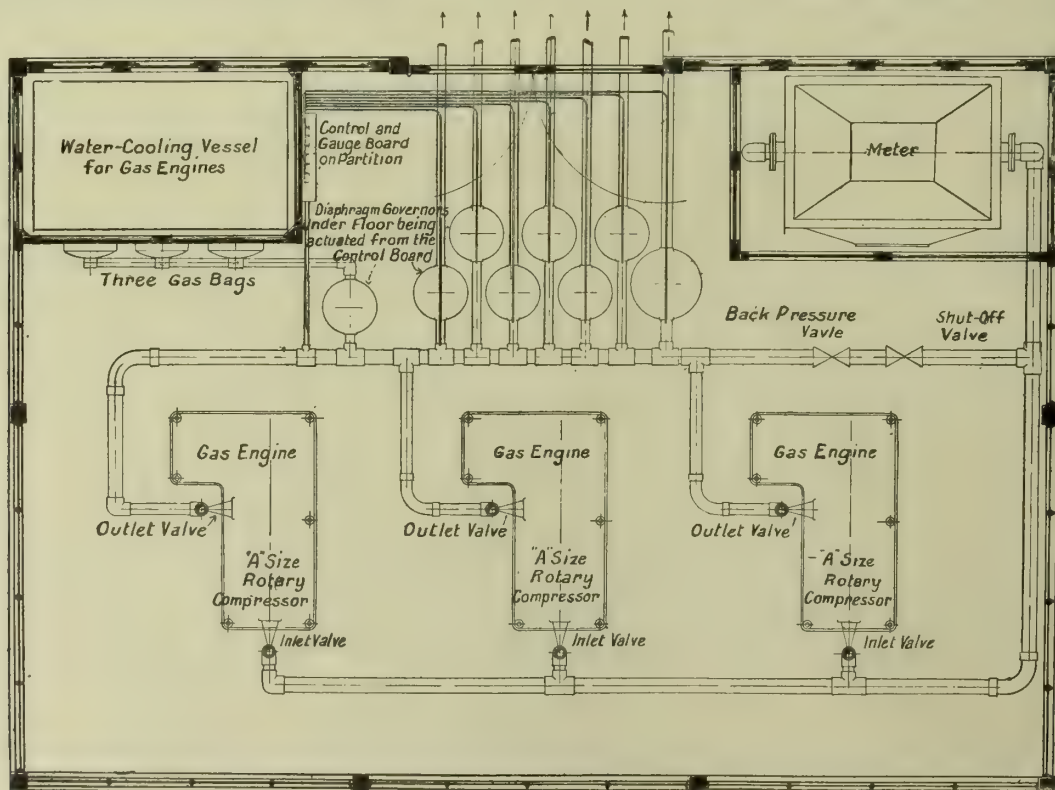
In the course of the discussion on the paper which was read by Mr. H. N. Clark at the recent meeting of the Southern District Association of Gas Engineers (as reported in last week's "JOURNAL"), Mr. A. E. Broadberry made reference, with justifiable pride, to a fine installation of Keith high-pressure lighting which had been put up for the Tottenham and Edmonton Gas Company, under his supervision, at the Alexandra Palace. This, he remarked, was giving a great deal of satisfaction; and the photo-



Diaphragm Gas-Governor arranged for Lighting and Extinguishing Lamps Fitted with Keith's Automatic Lighters.



Keith's Control Board.



Arrangement of the Gas-Compressing Plant.

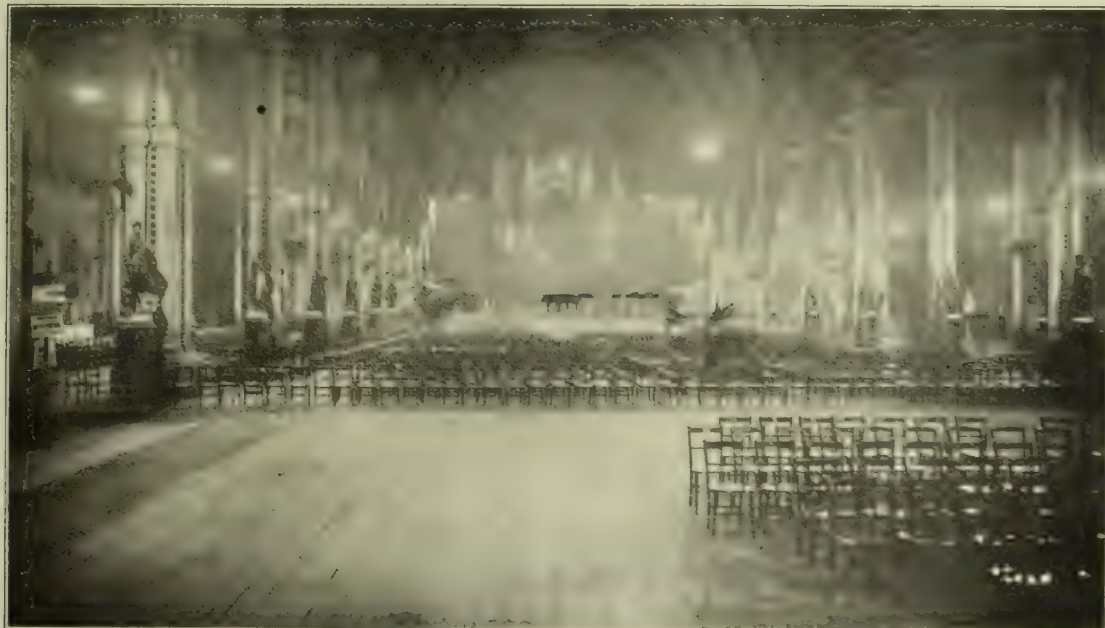


View of the Compressing Plant.

graph which we are now able to reproduce (through the courtesy of the James Keith and Blackman Company, the makers of the plant), will show how natural this satisfaction is. He stated also that the Palace authorities were delighted with the result; for they were saving a great deal of money as compared with the old low-pressure system of lighting. This is a condition of affairs on which both Mr. Broadberry and the manufacturers of the apparatus are to be congratulated; and it is also due to them to recognize the fact that a successful installation of this character is of much benefit to the industry generally, by reason of the practical demonstration which it affords of the capabilities, from the point of view of efficiency and economy, of gas as a lighting medium if subjected to up-to-date methods of utilization. The Alexandra Palace does not lie across the writer's line of travel; and therefore he cannot speak as to the number of people who may become personally acquainted with this excellent example of modern illumination. There must, however, be many visitors from time to time; and their interest in the matter is excited by the fact that they are able to get a good view of the compressors, which are

arranged in a glass case, as it were, in a prominent position in the Exhibition Hall.

The plant consists of three Keith compressors, direct driven by small gas-engines, with the necessary gas-meter, cooling tanks, governors, &c. These are all connected up in the usual manner, with the exception that the lighting is arranged in seven groups, each group having its individual control. That is to say, each group of lamps is provided with its own supply-pipe direct from the compressing station; and on each pipe directly after it leaves the high-pressure main, one of the Keith special control governors is fixed, having a small pipe-connection with a switchboard. In this way, complete control is given of the whole series of lamps on the one supply-pipe by the simple movement of a $\frac{3}{4}$ -inch cock. When the cock is in the "Off" position, and either high or low pressure gas is at the inlet to the governor, the governor outlet is at low pressure for supplying gas to the pilot-lights. To allow high-pressure gas to pass (when the compressor is running) and light the lamps, the cock is placed in the "On" position, which puts the governor out of action. The accompanying illustration



View Showing the Lighting of the Central Hall.

shows the control cock close to the governor; but, of course, it is quite immaterial at what distance away the cock is fitted, as it is merely a matter of running a small tube. In the present case, these cocks are all assembled on a switchboard situated in the compressing house; and this switchboard, it will be remembered, was spoken of by Mr. Broadberry in very favourable terms. It will be seen by the drawing that there are ten "points;" and this allows for an addition of three to the seven existing groups of lamps. Among the portions—and they include the principal parts—of the Palace now lighted by the high-pressure installation may be mentioned the Central Hall, the Bazaar, the Exhibition Hall, the Skating Rink, the North Terrace, and the South Terrace. It will thus be seen that the lighting is not confined to indoors; and, in fact, there is every reason to hope that ultimately the whole of the lighting, both of the buildings and the grounds, will be carried out on the same system. For this, no enlargement of the present compressing plant will be needed.

The gas is supplied at a pressure of 4 inches of mercury; and everything is of the Keith-Blackman Company's latest pattern. The majority of the lights—about one hundred in number—are of 500-candle power; but there are twelve of 1500-candle power. Four of these big lights (as shown in the photograph) are in the Central Hall; while there are six in the Skating Rink, and two outside the Palace. All the lamps for lighting the interior are fitted with side hexagonal screens, supported on the outer edge of the ordinary shade; and globes are entirely dispensed with. This arrangement not only gives a pleasing effect, but at the same time it materially reduces the maintenance charges.

In conclusion, it may be remarked that the installation (which has been in operation for about two months) is not claimed to give an exceptionally brilliant lighting effect. What is urged for it—and there is no fear of the justice of this contention being denied—is that it is a demonstration of practical lighting sufficient for all possible requirements at a minimum cost.

BRITISH AND GERMAN RETORTS.

By W. R. HERRING, M.Inst.C.E., of Edinburgh.

IN view of the interest attaching to this subject, we are pleased to publish the following notes communicated, in compliance with a suggestion, by Mr. W. R. Herring.

There is still a good deal to be said with regard to the causes affecting the durability of an ordinary gas-retort; and it must be admitted that but few data have, so far, been given that will enable a fair judgment to be arrived at. The durability of the retort of necessity depends as much upon the method of setting, the type of setting, and the materials used in the setting, as it does upon the materials used in the retort itself, as well as its after-treatment when in use.

I cannot illustrate this better than by pointing out my own experiences with first-class materials in Edinburgh. In former days, in the old works, using exactly the same materials as we use now, each 20-feet retort yielded, on an average, 354 days of work with only minor repairs, representing 700 tons of coal carbonized during its life; whereas at the present time the same materials used in the inclined retort-settings are giving a maximum life of 1335 days and an average life of 1200 days, representing six times lighting-up and letting-down, with a tonnage of coal per retort during its life of 2336 tons at a maximum and an average of 2100 tons. In both cases only minor repairs, such as pointing-up, have been indulged in.

The horizontal settings at the old works were settings of eights, machine-charged for the greater part of the year, set over regenerative furnaces, and carbonized 33 cwt. of coal per day. The inclined settings at the new works are settings of nines, set over regenerative furnaces, and carbonize 35 cwt. per day.

As to the type of setting. On the Continent, settings of nines are universal, or nearly so—that is to say, there is no large combustion chamber, nor are there cavities in the setting, which I have always maintained is a constructional weakness. The Edinburgh inclined settings are also settings of nines. I think I am also right when I state that the general type of setting in the South of England has a large Gothic arched or other form of combustion chamber, which I have always looked upon as a weak constructional feature. Then, again, the number of cross walls in a setting, the substance of the walls, whether they are 4½-inch or 9-inch, and their distances apart, necessarily affect very materially the life of the retort; and it is only by taking into account the whole of these data that any proper basis of comparison can be arrived at.

The incidents of lighting-up, and the care exercised in regular working, letting-down, standing-off, and the care with which all repairs are carried out, have a most material influence upon the life of the retort; to say nothing about the fatal influence of allowing fire-clay material to become saturated with rainfall before being set or laid.

There are a great many data that should be compiled, and perhaps the Committee now considering the fire-clay question could enlarge their sphere of operations in this respect. But after all, we must not lose sight of the fact that the mere lasting ability of a retort is not everything. Many a setting of otherwise good retorts fails in consequence of choked flues or occasional

local heating in a part of the setting that cannot be conveniently got at without pulling out at least some of the retorts.

Personally, I do not believe in repairing retort-settings where it is necessary to introduce new parts, as I am satisfied that it is cheaper to sacrifice the retorts and reset, as most of the bricks are again usable, and, in fact, preferable to new ones. The loss in gas production and carbonizing capacity owing to a defective setting is so much greater in money value than the actual cost of resetting, that nobody who keeps a continuing eye on the cash economy of the undertaking will hesitate to sacrifice a defective setting.

So far as my own experience goes, both in England and in Scotland, and also with Continental material, I am confident that retorts at the least fully equal to German manufacture can be procured from a few makers; and I am not disposed to admit the apparent hopelessness of the position so far as British retorts are concerned. I have always found retort-makers willing to adopt any suggestions that may be given them in the manipulation of their material for special purposes. At the same time, it must be admitted that there is considerable room for the application of methodical scientific methods in the preparation of fire-clay goods for the many different purposes for which they are now used, as what is advantageous to its application for one purpose is detrimental in another.

As regards vertical retorts, the experience in the shale-works in Scotland is that their durability depends primarily upon their power of resisting the frictional passage of the material through them; and although at the outset they are from 4½ to 6 inches thick, they are not renewed until they are about 2 inches. Twelve, fourteen, and fifteen years is a normal life; and there is no reason why a coal-gas retort constructed on similar lines should not last as long—excepting, perhaps, the upper portion, where the fluids resulting from carbonization are naturally greater, and may be more destructive to the fire-clay retort in the upper parts, which does not take place in the oil-retorts, as the upper section with them is of iron.

FLICKER PHOTOMETER AND THE EYE.

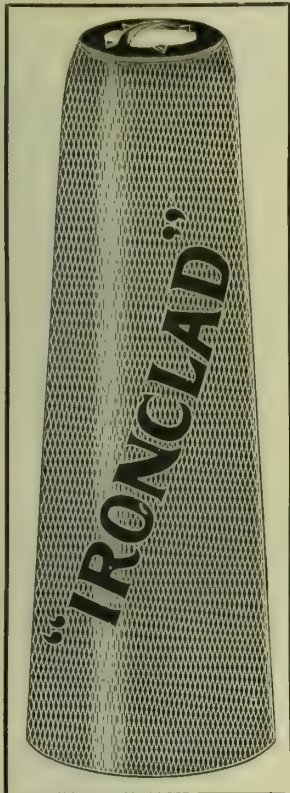
At the Meeting of the Physical Society last Friday, Mr. J. S. Dow, B.Sc., who is associated with Mr. Leon Gaster in the editorial department of the "Illuminating Engineer," read a paper on "The Physiological Principles underlying the Flicker Photometer." It furnished a more complete account of the researches that formed the subject of the article in the above-named publication which was summarized in the "JOURNAL" for the 2nd inst. (p. 319); and, taken in its entirety, it is a valuable contribution to the literature of the subject.

In a paper read before the Society in 1906, the author discussing some of the phenomena of colour vision which affect heterochromatic photometry referred to the theory, due to von Kries, of the action of the minute light-perceptive organs on the retina known as the "rods" and "cones," which is now applied to explain the "yellow spot" and Purkinje effects. It was pointed out that, when the comparison of two sources of light differing in colour was attempted, the reading of a photometer of the "equality of brightness" pattern would be found to depend upon the obliquity at which rays from the illuminated surfaces strike the eye, the distance of the eye from the surfaces, and the size of the surfaces. It was, however, also found that, for some reason, the effect was much less readily perceptible in the case of a flicker photometer; and this suggested that the physiological basis of such instruments might be found to differ from that of photometers of the ordinary variety.

In his later communication, the author summarized the results of further experiments on this point which seem to throw some light on the theory of the flicker photometer. He first of all recapitulated the main points in the theory of the action of the rods and cones on the retina, and afterwards made a comparison of the yellow-spot effect for quality of brightness and the flicker photometer. This instrument was then considered in connection with the Purkinje effect; and then the author passed on to deal with the theory of the "rod-flicker" and the "cone-flicker"—the former being the sensation received through the rods, and the latter that received through the cones. Following this came a few remarks on colour-blind observers and the flicker photometer, in which it was pointed out that in some cases colour-blind individuals have been observed to obtain correspondingly abnormal results with both flicker and "equality of brightness" photometers; and the author said that it would lead one to doubt the soundness of the principle underlying such instruments if this were not the case.

In his concluding remarks, Mr. Dow said he was conscious that the data presented in his paper were in many respects incomplete, and that other and more adequate experiments were needed before any decision as to the correctness of the suggestions brought forward could be taken. For instance, the results described were, like those contained in previous papers, obtained for the author's eye only. For this reason they were strictly comparable with the latter, and in some respects seemed very consistent. But he pointed out that, in order to be conclusive, experiments in photometry should be based upon observations

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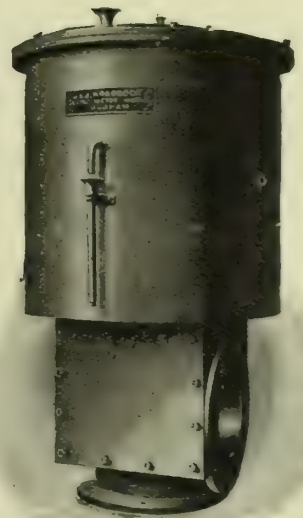


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PALATINE WORKS, WARRINGTON.

made by a large number of individuals, and upon a number of different types of instruments. His experiments were mainly carried out at the Central Technical College, South Kensington, during 1906 and 1907; and he had hoped to make the series of researches described in this paper somewhat more complete. As circumstances had prevented this, however, it occurred to him that their present publication might lead others to investigate the phenomena described more closely from the standpoint of photometry; and the need for gaining some insight into the physiological facts underlying the flicker photometer might, perhaps, give these experiments a certain suggestive value. The author acknowledged that the problem investigated was so essentially physiological in character as to be strictly only capable of being adequately studied by the combined efforts of the physiologist and the physicist interested in the problem from the photometrical side. Many points in connection with the theory of the action of the rods and cones on the retina (only the main essentials of which were referred to in the present paper) seemed to be still the subject of much discussion among physiologists, to whom Mr. Dow tells us we must look for the exact interpretation of their bearing on problems in photometry.

MILNE'S GAS FITTINGS AND LAMPS.

THERE are some firms who have a reputation for superlative quality and finish in connection with the goods they produce, and which quality and finish have, of course, to be paid for. But with the extension of gas lighting to smaller sized property—to the cottage and the tenement—there has grown up a considerable demand for a class of fittings that cannot possibly stand the extra costs that the higher types in design and finish must necessarily



involve. Among the firms who have recognized this are Messrs. James Milne and Son, Limited; but looking into their London show-rooms (at No. 59, Farringdon Road), it is seen that, in the cheaper lines of fittings that they now make, they eschew any notion that the middle-class resident in flats or the artisan in the best room of his cottage should be condemned, because his means are small, to a creation of ugliness in metal for use as a gas-fitting. We see some effective designs in low-priced fittings—pendants and brackets—the quality and finish of which will pass the most critical of eyes. So decidedly has the fashion turned from the upright to inverted gas-burners that, in this line of new

fittings (of which samples are illustrated), the designs are almost exclusively for the latter burners—the large or small size. In these cheaper lines of fittings, too, the demand in another respect follows the higher class goods—oxidized copper going better than anything else, solely on account of the reduced active influence of the heat of the flame and the products in producing discoloration. There are special fittings for the bijou form of burner; but the firm are of opinion that the popular burner of the future for domestic purposes will be the bijou size. Brackets are made to match all the popular designs of pendants. One of the illustrations depicts a new design in hall lights, with a straight cylindrical globe, for the inverted burner. It is very effective.

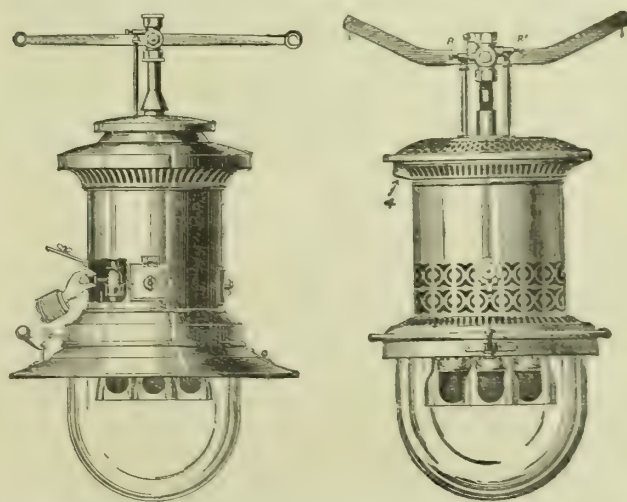
The firm, while trading generally in inverted burners, make a speciality of the "Milton" No. 2 (large sized) burner; and they are just placing on the market a cheap form which will be known as the No. 6 inverted. This is made of polished brass, and is very neat. In the crown there is a protecting cap of porcelain, which also diverts the products from a direct upward course, and so prevents contamination of the primary air supply. The injector is provided with a needle-regulator; and the head of the spindle working it is made of a non-heat conductor. An air-collar is provided for controlling the air supply; the bunsen tube contains a mixing-chamber; and the burner-nozzle and mantle carrier is a heavy one of refractory material, so that a long life shall be the portion of the burner. For these and other burners, glassware to suit all tastes is on view. The firm have a good range of outside inverted lamps, well made, and excellent in finish—the outer casing being in colours or black. The stocked lamps (which are known as the "Viaduct") are made for one to four burners; and their duty may be taken as approximately 125 candles for a consumption of $3\frac{1}{2}$ cubic feet per burner. For both indoor and outdoor lighting, for inverted or upright burners, the firm's "Viaduct" mantles are securing largely extended patronage.

A great stock of all manner of fittings—large and small—is carried at the show-rooms, and it would be useless to describe any one sample in detail. The firm are laying themselves out more specially for show-room customers; and any gas company, ironmonger, or plumber are at liberty to send customers, with an order to supply goods, so that they may make choice direct from stock, under the usual conditions.

For country mansions beyond the reach of town-gas mains, the firm make special fittings and burners for use with acetylene or air gas. In this notice we have confined ourselves to the firm's lighting fittings; their other departments—dealing in gas meters, plant, and appliances of many descriptions—being devoted to what is in the nature of all-the-year-round business, while lighting is more of a seasonal affair, and that a present one.

THE "VENUS" GAS-LAMPS.

THERE are several points that can fairly be urged in favour of the "Venus" outdoor and indoor lamps, and which have combined to bring them an encouraging amount of favour from gas managers and others who have subjected them to working tests. This, of course, we have not done; but we have done the next best thing—inspected the lamps in operation at the extensive show-rooms of Mr. B. Cars, at No. 124, Tabernacle Street, E.C.



The "Venus" Outdoor Lamp.

The "Venus" Indoor Lamp.

The outdoor lamps are made in three, four, and five light sizes, and the indoor pattern from one to five lights; and a lighting efficiency of 125-candle power is claimed for each inverted burner, with a consumption of from $3\frac{1}{2}$ to 4 cubic feet of gas per hour. The general construction of both patterns will be sufficiently gathered from the illustrations, and therefore it is unnecessary here to say anything on this head, except to remark that they are strongly made; while at the same time there is nothing about them which leads to high cost of production, and so it is possible to market them at extremely moderate prices. All the fittings are universal; and any kind of mantle of the necessary size can

be used—although, of course, Mr. Cars has his own well-known make of "Venus" mantles.

In the outside lamp, it will be noticed that there is a small door, giving access to the gas and air regulating arrangements. One of these doors is provided in connection with each burner. This, while not in any way interfering with the air-tight and the weather-proof qualities of the lamps, affords the readiest possible access in the event of any adjustment being required; and such facility is, it will be admitted, a decided advantage. With the indoor pattern, the gas and air regulation is accomplished from the outside. Both forms of lamp are provided with an external lighting arrangement as well as a permanent bye-pass flame, and are fitted with lever cock control. The outside lamp can be fitted with a side lever, which permits of the use of only one burner or the whole number. This lever is moved round, for lighting, until the temporary bye-passes become ignited through the permanent bye-pass; and another movement lights up all the burners and extinguishes the bye-passes. Should, however, only one burner be required, a still further motion is given to the lever, to its extreme position; and full lighting or complete extinguishing is, of course, secured by reversal of the motion. This renders the lamp suitable for the positions in which the full lighting effect is not always required, and where it is consequently a very great convenience to be able to turn on one or more burners as desired.

Gas v. Electricity for Cooking and Heating.

In the "JOURNAL" for the 26th ult. (p. 246), attention was called to a letter which was being sent out by one of the District Inspectors of the Gaslight and Coke Company, directing the consumers' attention to the many advantages of gas for the heating of business premises. He has followed this up with a circular setting forth more fully the arguments in favour of gas as compared with electricity. Without going deeply into scientific calculations, he shows that a unit of electricity is equivalent to 3410 B.Th.U., and that a cubic foot of gas as supplied by his Company is equal to 570 B.Th.U. Consequently, 6 cubic feet of gas will give as much heat as a unit of electricity, at the cost of one-fifth of a penny, compared with 1d. for electricity purchased at the lowest rate at which it is supplied for heating or cooking purposes. The writer of the circular cites, in support of his argument in favour of gas, the fact, which our readers will doubtless remember, that at an electrical exhibition a seven-course luncheon was cooked for 65 persons at a cost of 4s. 8d., for which 5 cwt. of kitchen coals or 1600 cubic feet of gas could have been bought. He thinks further comment is quite unnecessary.

Specific Gravity of Coal.

Herr O. Mohr has recently published, in a German journal devoted to brewing ("Wochenschrift für Brauerei"), the conclusions at which he has arrived from comparisons of the elementary composition and the specific gravity of a large number of different kinds of coal. While he finds that no simple relationship exists between the specific gravity and the composition, he nevertheless is able to draw the following conclusions: (1) The specific gravity of air-dried samples of the chief types of German and English coals lies between 1.27 and 1.45. (2) The specific gravity is affected by the proportions of water and ash in the coal and by its elementary composition. It generally is lower as the amount of carbon increases and as the proportion of ash decreases. (3) With dried coals the specific gravity increases as the proportion of carbon falls. A diminution of the proportion of hydrogen has the same effect. Coals containing a moderate amount of ash—i.e., not more than 10 per cent.—have their specific gravity affected to a greater extent by the amount of carbon and hydrogen they contain than by the percentage of ash. (4) The composition of the coal substance does not appear to have any appreciable influence on the specific gravity.

A Name for the International Light Unit.

Further correspondence on this subject, to which reference was made in the "JOURNAL" for the 5th ult. (p. 50), appears in the current number of the "Illuminating Engineer." A writer who adopts the *nom de plume* of "Athos" considers that, for the present, it will be preferable to avoid attaching to the international unit the name of M. Violle or of any other scientist, however eminent. In his opinion, M. Blondel's suggestion that a Greek word, such as "pyr" or "phos," should be selected is the better plan. M. Laporte, the Sub-Director of the Central Laboratory of Electricity in Paris, thinks it desirable to await the time when we shall be in a position to propose a satisfactory international standard before attempting the solution of the question of a new name. Replying to the criticism of Mr. Clifford Paterson, M. Blondel remarks that the proposal to give the international unit of light a special name, as he suggested, has nothing in common with the question of the value of standards of light in general, nor with the value of the Violle standard in particular. He points out that it is the general rule, in the nomenclature of physical quantities, to utilize either a Greek term or the name of some celebrated man; and he says he is not aware of any argument which can be advanced to explain why we should depart from this practice, and adopt an expression denoting a material object solely in the case of the unit of light, especially when this term is differently expressed in the various languages involved.

SOME ASPECTS OF THE GAS INDUSTRY.

By J. G. NEWBIGGING, M.Inst.C.E.

The Inaugural Meeting of the current session of the Manchester Association of Students of the Institution of Civil Engineers was held last Wednesday, when Mr. J. G. NEWBIGGING, M.Inst.C.E. (the President), the Chief Engineer of the Manchester Corporation Gas Department, delivered an address, of which we reproduce the main portions.

Gentlemen,—In considering the choice of a subject for my address this evening, I must confess to have been in some difficulty in coming to a decision. But looking through the list of Past-Presidents, I found that although almost every branch of engineering has been represented, I am the first gas engineer to occupy the chair; and the occasion appeared to me to be an appropriate one to deal briefly with some aspects of the gas industry—an important branch of the public service.

It is only a few years since the Centenary of the discovery of gas lighting was celebrated. Prior to its introduction, attempts had been made in all ages to banish darkness by various primitive devices; and the problem had sorely perplexed mankind. But the discovery of gas lighting changed all this. The practical application of gas for lighting was first effected by William Murdoch, a working engineer, at his house at Redruth, in Cornwall, in the year 1797.

Interesting as is the history of the discovery epoch of gas lighting, from the researches of Shirley and Clayton on the properties of carburetted hydrogen or coal gas, to the time when Murdoch first applied it to practical use, and onward through the pioneer age, it is not possible in the time at my disposal to-night to dwell on this part of the subject. It is, however, of more than passing interest that I should briefly refer to the researches at the beginning of the Nineteenth Century of Dr. William Henry, contemporary and friend of Dr. John Dalton, founder of the atomic theory, the logical basis of modern chemistry.

Dr. Henry was born in Manchester on the 12th of December, 1774. His father, Mr. Thomas Henry, F.R.S., was a former President of the Manchester Literary and Philosophical Society, and was an ardent worker in chemical science. In 1797, Dr. Henry submitted to the Royal Society an experimental memoir with the object of re-establishing the title of carbon to be ranked among elementary bodies, in opposition to the conclusions of other eminent chemists. In 1803, he contributed a further communication to the Royal Society on the results of exhaustive experiments on the quantity of gases absorbed by water at different temperatures and under different pressures. This ratio of the quantity absorbed to the pressure supported the theory of Dr. Dalton that the absorption of gases by water is due entirely to mechanical agencies. In the year 1804, Dr. Henry delivered a series of lectures in Manchester demonstrating the method and facility of reducing gas from coal, and showed the advantages of its use as a means of obtaining artificial light. He afterwards analyzed its composition and properties; and in the course of his numerous experiments he produced gas from a variety of substances—coal, wood, peat, oil, wax, &c.—and endeavoured to arrive at the relative value of each description of gas for lighting.

From continued researches on the various compounds of hydrogen and carbon, Dr. Henry ascertained the constituents which contributed to the illuminating power of coal gas; and he propounded many suggestions tending to improve its production and purification, which have been of great value to the industry. He was a distinguished Manchester man, and a prolific writer on various scientific subjects. For these reasons, I have brought for your inspection one of his original note-books, in which are recorded the workings of a number of his experiments and investigations on gaseous compounds, and other chemical work, some of which were carried out in conjunction with his friend, Dr. John Dalton. The book came into the possession of one of the chemical staff of the Manchester Gas-Works some ten years ago.

It was not by the work of practical mechanical men alone that the progress of gas lighting was slowly but surely advanced. The gas industry—in common with many other industries—is indebted from its inception to distinguished chemists for their researches and discoveries in connection with gaseous compounds, and the utilization of the residual products of gas manufacture. Even the electrical industry owes something to chemists in the recent success in diminishing the consumption of current by over 50 per cent. by the use of metallic filament lamps as against the carbon filament lamp, which has saved the situation with regard to the employment of electricity for lighting.

The plea of Professor Armstrong, the President of the Chemical Section of the British Association, in his address at Winnipeg last August—for the greater co-operation of the engineer and chemist—is one that might be taken to heart with advantage in the conduct of many industries where the research work of the chemist is essential to the practical work of the engineer.

The progress of the gas industry since Murdoch's time is one long record of unbroken success. During this period, it has served its ever-increasing *clientèle* efficiently, and yielded the investors in its stock a good, steady dividend—probably unequalled by that of any other industry carrying on operations on such a large and extended scale; and it has played no small part in contributing to the comfort and welfare of the community.

On the advent of the practical application of electricity to lighting in the early eighties, and even down to more recent times, there have not been wanting critics who, through lack of knowledge, have predicted the decay of the industry. But to-day there are many proofs of the stability of gas enterprise. To name only a few of these :

- 1—The Stock Exchange estimate of the value of gas stock.
- 2—The desire of local authorities to obtain possession of private gas enterprise in their districts.
- 3—The ever-increasing demand for gas, not only for lighting and other domestic uses, but for industrial purposes.

To those of you who have not a close acquaintance with the extent of the industry in the United Kingdom, it will be of interest to quote figures from the last "Parliamentary Returns" dealing with the year 1907, and compare the growth from the year 1897—a period of ten years. There are in the United Kingdom 771 authorized gas undertakings, of which 495 belong to private companies and 276 to local authorities. The position in 1897 and 1907 is shown in the following table:—

	1897.	1907.	Increase Per Cent.
Capital authorized.	£92,111,252	£150,907,311	63
Capital expended	£69,745,300	£113,865,050	63
Receipts	£20,207,453	£30,067,752	44
Working expenses.	£14,981,527	£22,724,104	51
Gross profit.	£5,225,926	£7,343,648	40
Tons of coal carbonized	12,616,153	15,406,753	22
Cubic feet of gas sold, in thousands.	122,219,674	172,889,147	41
Length of mains—miles	25,157	33,536	33
Number of consumers	3,025,376	5,665,176	87
Number of public lamps.	553,803	700,264	26

In addition to the capital invested in statutory gas companies, about £6,000,000 are invested in non-statutory gas companies—that is to say, companies working under arrangement with local authorities and not under Acts of Parliament. These companies use about two million tons of coal—making the total quantity used for gas making in the United Kingdom over 17,000,000 tons per annum.

Looking at the progress made in another way, the gas industry has doubled its business in twenty years. This expenditure on gas enterprise has given rise to vast industries, employing a multitude of workers, which have been brought into existence during the last quarter-of-a-century in the production of apparatus for the utilization of gas for cooking, heating, and motive power.

During this period (1897-1907), the electrical industry has expanded in a no less remarkable degree. In 1897, the number of English electrical supply undertakings was 115, with a capital of £10,157,109; while in 1907 the number had increased to 474, with a capital of £78,554,506. Parliamentary returns are not issued in connection with electricity in the same form as for gas; so it is impossible to analyze the working of electrical undertakings with the same completeness as gas undertakings. It will, however, be of interest to give you some figures showing the growth of electricity in Manchester, which is typical of the progress made in other large towns. Electricity was first supplied in Manchester on the 31st of July, 1893; and the progress is shown in the following figures for the year ended March 31, 1909:—

	Electricity.	Gas.
Capital employed	£2,568,993	£2,781,635
Total income	£367,240	£761,363
Total expenditure	£355,240	£735,256
Total units or cubic feet sold. .	66,924,864	5,380,025,000

Notwithstanding the remarkable development of electrical supply in Manchester, the increases in connection with the Gas Department during the same period have been as follows:—

Capital employed.	90 per cent. increase
Income	40 " "
Expenditure	42 " "
Gas sold	55 " "

The progress made by the gas industry during the ten years under review is all the more notable when it is remembered that the competition with electricity has been of the keenest character for many of the uses to which gas had, previous to the introduction of electricity, no serious competitor; and it is demonstrative of its resourcefulness and adaptability to competition.

It must be remembered that, as far as artificial lighting is concerned, not only was it handicapped in having to share any future development in this direction with electricity, but lost a considerable number of its most profitable consumers, who were attracted by the new-comer. It is true that during the last twenty years—particularly during the latter half of this time—the gas industry has made great strides in raising the duty of its main product (gas) as an illuminating agent, through the discovery of the application of the rare metallic earths, in conjunction with the mantle, to lighting, from an efficiency of 3 to 5 candles per cubic foot of gas consumed to 60 candles per cubic foot with high-pressure lighting. But for this, there is no doubt that the industry would not have maintained the position it has done in the race for supremacy proceeding between gas and electricity.

There is room, however, for the expansion of both industries in every direction; and in the case of municipal ownership of both in the same city or town, it is essential that they should be worked in friendly rivalry for the benefit of the general body of citizens—the one not being over-burdened more than the other, or receiving preferential treatment.

The question as to whether the municipalization of gas enterprise is in the best interests of the community, is one on which

there is great divergence of opinion. Its success attracted the attention of local authorities in the fifties; and the transfer of undertakings continued to grow up to the nineties—the only falling off being in the eighties, when there was some apprehension as to the effect of the electric light on the industry. During the twenty years ending 1907, the number of gas undertakings so transferred amounted to over 100.

It is argued by the advocates of municipalization that undertakings requiring the use of streets should be under the control of the local authority; and there is reason in this view. Some years ago, a statement was prepared to show the magnitude of the evil and the inconvenience to the public in the Metropolis, where the services of gas and electricity and water (the latter since municipalized) were in the hands of different Companies. It was found that in every mile of street in each Metropolitan borough there were no fewer than from 30 to 139 openings made every year; and investigation proved that the evil was much less pronounced where these services were municipalized.

This phase of the question is not, however, in itself a sufficient reason for the transfer of such services to public control. There must be something more than that. The great principle underlying the municipalization of any industry or commodity is, or should be, that it will give to the community a cheaper, and at least equal, service to that obtained under private enterprise; and unless this is achieved, it is not justified. The cheaper service—if a trading concern—cannot be secured unless it is allowed to conduct and extend its business with the same freedom from restraint which characterizes private enterprise; and this unfortunately does not always obtain. Without these conditions, municipal gas enterprise can never be as successful or as satisfactory to the consumers as private gas enterprise.

The advantages of manufacturing coal gas at a low works' cost, which can be effected at from 6d. to 1s. per 1000 cubic feet into the gasholder (according to local conditions), are rendered futile unless its subsequent distribution to the consumers is unfettered and characterized by strong commercial methods.

One of the greatest evils of municipalization is the transfer of gas profits in relief of rates; and the question has been a fruitful source of controversy for a generation past. It is a pernicious system of indirect taxation, which has been allowed to eat itself like a canker into this branch of the public service, in such a manner as to be well-nigh incurable in these days of advancing rates. But if it is not soon eradicated by the surgical knife of public opinion, it will cause irreparable injury to an important industry. Municipal gas undertakings have been too long the milch-cow of the ratepayers; and unless a broader and more enlightened policy is adopted, and that quickly, it will find its Nemesis.

To illustrate this evil, I give you some figures relating to the Manchester Gas Department for the year ended March, 1909—

Total expenditure on manufacturing and distributing plant	£2,781,635
Total liabilities	1,515,275
Total amount applied in relief of rates from 1844 to 1909	2,918,585

The sum applied to relief of rates exceeds the total expenditure on the undertaking by £136,950. These figures speak for themselves. What possibilities this sum of nearly three millions of money would have opened out for the supply of cheap gas, for which everybody is crying out nowadays to assit in purifying the atmosphere, if it had been diverted in the right channels!

It is argued by the supporters of applying gas profits in relief of rates, that money is borrowed at a cheaper rate for the purpose of municipal enterprise than would otherwise be the case; and that, in the event of obsolescence of any particular enterprise through the advance of science, the ratepayers should be recompensed for the risk by taking a share of the profits. If the possible obsolescence of gas—or, for that matter, of electricity—can be seriously entertained for one moment, then the large sums of money which are extracted, from gas undertakings particularly, year by year (and spent) is utterly wrong. These annual sums should be invested, and the interest of such investment only expended from year to year in relief of rates; the capital being at any time available to meet the liquidation of the department in case of obsolescence, because the assets would not realize the value appearing in the accounts—practically only the value of the land. If this principle is not carried out, the position of the advocates of relieving rates out of gas profits is untenable.

It is evident from a decision of a House of Lords Committee in the case of the Salford Gas Bill in the last session of Parliament, that a great change is coming over the view of the governing authorities in regard to this matter; and municipalities will in future be compelled to look elsewhere than to gas undertakings for funds in relief of rates. Through this decision, the Salford Corporation were limited in their contribution to the relief of rates from their gas undertaking to an annual sum equal to 1 per cent. on the existing debt, or about £6000, against a sum of about £24,000 which they have been accustomed to apply for the purpose. The Corporation withdrew their Bill, which is much to be regretted in the true interests of municipal gas enterprise.

Municipal authorities in Scotland are not permitted under the Burghs Gas Supply (Scotland) Acts, 1876 and 1893, to make any profit on their gas undertakings, but must adjust their finances from year to year so as to give a cost-price supply. This is a reasonable piece of legislation which might with advantage be extended to the whole of the United Kingdom.

The system of applying gas profits in relief of rates has been one of the most potent arguments against municipal trading; and it would be well for those advocates of its extension to devote their energies to the removal of this stigma before they can hope for any success in extending its scope. The question after all resolves itself into one as to which is best for the community—a cost-price supply, or a price at which a profit can be made for the relief of the rates; and the feeling is certainly growing that the former is the best policy.

Well now, our chief interest lies in the future of the gas industry, and how it can best be utilized in the service of mankind. With this millstone of contributing to the relief of rates removed from its neck, as regards municipal undertakings, and under careful management, it is destined to play an important part in assisting in the elucidation of one of the most pressing social problems of the day, by the extended use of the gaseous and smokeless solid fuels which are the main products of gas manufacture. These problems are not only important ones from our point of view as ordinary citizens, but are of equal importance from our special standpoint as engineers, in the conservation of the energy which Nature has so abundantly bestowed upon us in our coalfields, and in assisting in the reduction of smoke which has such a deleterious effect on the health and the comfort of the people, and on the architectural and engineering work in all our great cities.

An eminent divine recently said that the solution of social problems was in the hands of religion and science. It is certain that the physical well-being of the community is largely in the hands of practical scientists known as engineers, rather than in the hands of scientific dreamers and theorists. We are indebted to these men for pointing the direction in which engineers should apply their practical experience; but they are themselves often unpractical. Some of them are too ready in expounding their views, after the methods adopted by the penny showman, on such subjects as the near exhaustion of our coal supply—telling us of the terrible calamities that will befall us in consequence, and speculating as to our future source of heat and power.

These statements may be all very well to provide startling headlines for the newspapers; but they are of no real value to anyone. What we require are practical suggestions. What the future source of heat and power will be, will resolve itself in due course in the natural order of things. The important question to us is, whether we are utilizing our present resources in the most advantageous and economical way. If we are not doing this, we are not only injuring ourselves but future generations as well. We have no right to use 2 lbs. of coal to do the work of 1 lb.; and all our scientific work and energies should be turned in the direction of using coal to the very best advantage.

In this connection, a great deal of excellent work has been done by mechanical engineers, during the last quarter-of-a-century particularly, in economizing the consumption of coal, by the great improvements effected in boilers with their accessories, and in the steam-engine. Forty years ago, something like 7 lbs. to 8 lbs. of coal were required per horse-power-hour in the then steam-engine. The compound engine reduced this to about 5 lbs. per horse-power-hour. Following this was the triple expansion engine, with its consumption of 3 lbs. of fuel or less per horse-power-hour. And now we have the steam-turbine, with a consumption of less than 2 lbs. per horse-power-hour. Whether any further improvements will be effected, and the highest possible efficiency reached with a perfect steam-engine, no one can foretell.

In the same way, great economy has been effected in the improvements in internal combustion engines. In the Lenoir gas-engine of 1860, 100 cubic feet of gas were required per horse-power-hour. Now the same work can be done with 15 to 16 cubic feet of town's gas; and it is hoped that the labours of those who are working in the direction of further improvements and economies in internal combustion engines may be rewarded with success.

The reduction of loss of heat by radiation through the cylinder walls, and that carried off in the exhaust, and the evolving of some form of turbine motor actuated by gas, are among the problems which will ultimately be solved. The achievements of mechanical engineers are such that those associated with them may well feel proud, and why should not these economies be secured in other directions? The field is only limited by the number of purposes to which coal can be employed as the basis of heat and power.

In the consumption of fuel for household purposes, we stand practically where we did a century ago. Sir Oliver Lodge aptly described our existing fuel practice as the "uncivilized and essentially savage method of heaping a pile of crude coal together and setting a light to it." In doing this, not only are we creating a weapon of discomfort and destruction in the shape of smoke, but are wilfully wasting valuable products in the coal.

One speaks of the smoke problem with some hesitancy, as it has been discussed over and over again from almost every point of view; but as we live in a city reputed to be one of the smokiest and grimmest in the kingdom, the subject cannot be too often ventilated, if by this means we can contribute our quota towards its solution. And it is to engineers—particularly those associated with gas and electrical enterprise—that relief from this burden must be mainly looked for.

The law with regard to the smoke nuisance should be made so rigorous as to preclude the possibility of manufacturers (or even householders) using any kind of fuel in such a manner as to produce black smoke. But it is useless, and would be damaging to

the trade of a district, to frame such laws without first providing the community with a substitute which can be shown to be at least as economical as the smoke-giving fuel they are at present using. In the case of manufacturers, there are a number of excellent appliances available in connection with the firing of steam-boilers, which, if intelligently used, would tend to mitigate the evil. But as these appliances need controlling with a certain amount of technical skill, which is not available in every works, they are often discarded after a time as being too troublesome; and a return is made to the old smoke-producing methods.

It is a question, however, whether manufacturers are as great sinners as householders in the production of smoke. In Manchester, for instance, it is estimated that from 700,000 to 800,000 tons of solid fuel (mainly bituminous coal) are used per annum in domestic fires. If all this smoke-yielding material could be replaced by gaseous fuel, solid smokeless fuel, and electricity, what a change would be effected in the atmospheric conditions in Manchester! Some idea can be gained as to the extent of the change by observing the conditions of the atmosphere on any Sunday in the centre of the city, when the consumption is largely diminished. Every foot of gas consumed, and every unit of electricity used for other purposes than lighting, and every pound of smokeless fuel burned, will bring us nearer to relief from this thrall of smoke, and effect economies in our natural resources of heat and power; and it is our duty to encourage in every possible way their extended use. The best way to do this—in fact, the only way—is first of all to give these commodities to the public at the very lowest possible price, and, secondly, to provide efficient apparatus to enable them to get the best results from their use.

In ordinary town's gas we have a fuel at our command which, with proper appliances, will do perfectly, and without nuisance, all the heating required in domestic service—including fires, cooking, bath heating, washing, ironing, clothes drying, &c.; while for workshop use it is unequalled by any other fuels. Failures do occasionally occur in the application of gas to domestic and workshop purposes; but these failures are due largely to want of knowledge and experience in the men who supply and fix the apparatus. For this reason, such work should be entirely in the hands of Gas Departments, where officials with special knowledge and experience are employed; and unless it is in such hands, the use of gaseous fuel will not increase as rapidly as it otherwise would, or give complete satisfaction to its users.

In the direction of improving apparatus for the consumption of gas for household and industrial purposes, great progress has been made in recent years. This is evidenced by the increasing use of gas for other purposes than lighting; and still further improvement is confidently looked for from the labours of the various Gas Institutions, and the educating influence of the Chair of Fuel and Gas Engineering which has recently been founded at the Leeds University.

The gas industry has not received from the various Universities the attention it is entitled to, considering the wide use of its main product and its great possibilities. But this has been partially remedied by those connected with the industry in the raising of a fund to endow the Leeds Professorship of Fuel and Gas Engineering in memory of the late Sir George Livesey, who was a member of the Council of the Institution of Civil Engineers at the time of his death last year. Professor Arthur W. Bone, F.R.S., D.Sc., is the occupant of the Chair; and the research work which is being conducted under his direction cannot but result in the better application of gas for all the uses to which it is so eminently adapted.

Manufacturers of apparatus for the utilization of gas for lighting, heating, cooking, and industrial purposes, have realized that these appliances must be produced under the guidance of highly-trained technical men; and it is a rarity nowadays to find these works without such a staff, and thoroughly equipped experimental laboratories.

As an instance of how the encouragement of the extended use of gas can replace smoky fuel, we have only to look at our own city of Manchester. A few years ago the charge for the hire of cooking stoves was abolished; and the price of gas for gas-engines was reduced to 1s. 9d. per 1000 cubic feet. Up to that time, the quantity of gas used for these purposes was comparatively small; but now it is equal to the replacement of at least 50,000 tons of solid fuel per annum—mainly bituminous coal, which otherwise would have been used in open fires and polluted the atmosphere with its smoke. And this replacement of solid fuel is being augmented year by year. If this can be effected with gas at 2s. 3d. per 1000 cubic feet for cooking, and 1s. 9d. for power, how much more could be done if the price were reduced to 1s. or 1s. 6d. per 1000 cubic feet! An attempt was made recently to encourage the use of gas for the heating of offices in the city, by the letting out on hire of gas-fires at a small rental. This would, without doubt, have resulted in the replacement in a very short time of at least another 50,000 tons of coal. But the proposal was vetoed by the City Council under the erroneous impression that it would injure private enterprise. This much-desired reform is, I hope, only temporarily postponed.

With the removal of the impost on the Gas Department in Manchester of the contribution to the rates, and under a strong commercial policy, the price of gas could in a very short time be reduced so as to supply consumers for all purposes at 1s. 6d. per 1000 cubic feet; and its extended use would eventually make it possible to reduce the price still lower.

Parliament, in its wisdom, has in many recent instances decreed that the standard illuminating power of coal gas shall be 14 candles; and when undertakings are under compulsion in their Acts to supply a higher power, they have only to ask that they shall be permitted to distribute this lower quality, and, in spite of any arguments that may be adduced in opposition, it is granted without demur. In one case—that of the Gaslight and Coke Company of London (the largest gas undertaking in the world), a standard of calorific value has also been fixed—viz., a minimum of 500 B.Th.U. per cubic foot; and doubtless in course of time the illuminating power standard will be abolished throughout the kingdom, and a calorific standard substituted.

The justification for this is that the great bulk of town's gas is now consumed in bunsen burners for incandescent lighting, heating, and motive power; and the calorific power is, of course, the proper guide to its value for these purposes, rather than its illuminating power. Well now, provided that the whole of the saving effected in reducing the illuminating power of gas is given to the consumers in a reduction of the price, that a change is made in the pressure at which gas is distributed throughout the whole canalization of the district of supply, and the general use of flat-flame burners is discontinued, there is not much to say against the proposal to supply such low-power gas as that of 14 candles; but to reduce it to this low standard without these changed conditions would be to inflict injury on consumers.

Gas is ordinarily distributed at such a pressure from the works as to maintain at the consumers' premises a pressure equal to a column of water 2 to 3 inches high. But if this were increased to (say) 12 inches, it would largely neutralize the effects of a reduction in quality, and increase its efficiency for the bulk of purposes to which it is applied.

The effect of subjecting gas to such high pressure is to concentrate the flame into a small bulk of increased temperature; and this is what is required in the case of an incandescent mantle, and for most industrial purposes.

It appears to me that this question of generally distributing gas at high pressure at a low price, is the direction in which gas undertakings must look to maintain their prosperity, and increase the usefulness of their prime product. This system will, I have reason to believe, be put to a practical test in a district not far from Manchester.

A suggestion (by no means new) was recently made by an eminent scientist that gas-works should be erected in close proximity to the coalfields, and cheap fuel gas distributed to the great cities. Anyone with practical knowledge of gas manufacture and distribution knows perfectly well that such a scheme would not be a success from an engineering and commercial point of view; so the suggestion may be dismissed as worthless.

Even electricity works and gas-works cannot be said to be free from blame as smoke producers; but in the case of the former the gas-engine bids fair to oust the steam-engine in the production of electrical energy. In the latter, the continuous carbonization of coal in vertical retorts, with a total absence of smoke, is likely ere long to take the place of the older methods. Although Murdoch, the discoverer of gas lighting, attempted to distil coal in a form of vertical retort, it is only within the last two or three years that the system has become a practical success.

The dream of gas engineers has been to distil coal in a continuous manner so as to replace the present methods of intermittent carbonization in horizontal and inclined retorts, which necessarily result in much loss of gas and other valuable products through the periodical opening of the retorts for the purpose of discharging and charging, and also to bring the distillation process more in line with its subsequent purification process, which is practically continuous. The coal is fed into the top of retorts, 20 feet long, fixed vertically; and passing through at any desired speed—usually from $2\frac{1}{2}$ to 3 tons per 24 hours—according to the class of coal used, it gives off its vapours during its passage through the heated retort, and discharges the coke at the bottom. The whole process is worked automatically by the simplest of mechanical contrivances, and requires the minimum of attention. This new system increases the yield of gas, tar, and ammonia, per ton of coal, over the present systems, mainly through the absence of waste, and gives a coke of much better quality. By these improved methods of manufacture, the gas industry is doing its share in the direction of economizing our coal supply, and setting an example to other industries in carrying on their manufacturing operations without smoke nuisance.

One more suggestion in regard to municipal gas and electricity in large towns. Considerable economy would result by these undertakings making an extensive use of each other's productions at a cost price supply. There is no reasonable argument in favour of electrical undertakings under such circumstances commencing the manufacture of power gas, for the generating of electricity with gas-engines, with its large expenditure of capital, when gas plants are already in existence—particularly when the works are contiguous, and from which a supply could be obtained at a price at which they could not produce it themselves, when every circumstance is fairly taken into account. Again, electrical power is being largely adopted in gas-works for mechanical stoking in carbonizing plants, the transport of coke, and for other purposes; and there is no reason why such undertakings should commence the generating of electricity. There could, in fact, be in many cases a reciprocal arrangement which would not only be to the advantage of the departments concerned, but to the rate-payers generally.

Well now, having given attention to some means by which gaseous fuel might be brought into more general use, I should like to refer briefly to some of the solid smokeless fuels. The President of the Institution of Gas Engineers, in 1885, made a suggestion in the course of his address that, instead of coal being used direct for household and industrial purposes in large towns, it should first of all be taken to the gas-works and purified from its smoke-producing ingredients. By this means not only would the smoke problem be solved, but many valuable products would be recovered which are now lost.

Mr. Thomas Parker, the inventor of "Coalite," seems to have had this idea in view when he introduced his invention to the public about two years ago, and which attracted so much attention. He claimed that by first converting the fuel now consumed for household purposes into coalite, this country would be enriched by many millions sterling per annum. He estimated that 34 million gallons of motor spirit, a similar quantity of solvents and enriching and burning oils, 238 million gallons of fuel oil, and 1,700,000 tons of pitch, would be recovered by his process of distillation, which are now lost up the domestic chimney. A system with such economic possibilities claims our attention.

In the distillation of coal for the production of illuminating gas, the heat of the fire-clay retorts in which it is placed is maintained at about 1800° Fahr., and from 11,000 to 12,000 cubic feet of gas are produced, of an illuminating power of 16 candles. For the production of coalite, the retorts are made of cast iron, consisting of a nest of twelve vertical tubes to each retort, each tube being 9 feet long and tapering from 4½ inches at the top to 6 inches at the bottom, to facilitate the discharge of the coalite at the end of the period of distillation, which is three hours (against six hours in ordinary gas making). The retorts are maintained at a temperature of about 750° Fahr., and the production of gas is from 5000 to 6000 cubic feet, of an illuminating power of over 20 candles.

The only material difference between the composition of ordinary gas coke and coalite is that the former contains 2 to 3 per cent. of volatile combustible matter, as against 12 to 13 per cent. in the latter. The effect of this is that coalite is more inflammable than ordinary coke and can be lighted in the usual way in a domestic fire grate almost as readily as coal. On the other hand, coalite is retailed at about three times the price of ordinary coke—viz., 30s. per ton.

The ordinary gas-works coke has not received the attention it deserves as a fuel for household use. In many districts it is broken into suitable sizes for various uses, and thus commands a ready sale. Its lack of easy ignition when used alone has, however, been its greatest drawback, though certain processes have been recently introduced which remedy this objection.

The following is an analysis of coke and coalite as purchased in the open market, and of a sample of high-class Yorkshire Silkstone coal nuts, showing the difference in their composition.

Result of Analysis of Yorkshire Silkstone Coal Nuts, Coalite, and Gas-Works Coke.

	Coal Nuts.	Coalite.	Coke.
Moisture	1'15 per cent.	3'27 per cent.	9'85 per cent.
Ash	8'15 "	10'17 "	13'47 "
Sulphur	1'67 "	1'927 "	2'72 "
Volatile combustible matter	31'12 "	12'60 "	2'89 "
Calorific matter, B.Th.U. per pound of fuel	13,500 B.T.U.'s	13,000 B.T.U.'s	12,400 B.T.U.'s
Evaporative value, pounds of water per pound of fuel	13 96 lbs.	13'44 lbs.	12'82 lbs.
Comparative efficiency	100 per cent.	96'27 per cent.	91'83 per cent.

Coalite is deserving of greater attention than, I fear, has been given to it. Although one ton of the material is capable of doing more work than one ton of coal in actual practice, and is therefore of greater value, I am afraid the extra price will militate against its general adoption. Unless the producers of this material can see their way to sell it at the same price as coal, or thereabouts, it will never be largely used, which is a matter for regret, as it would, of course, materially assist in the abolition of smoke. A trial is being made with a coalite plant at the Plymouth Gas Company's works, to demonstrate whether it can be usefully employed in conjunction with the manufacture of town's gas, and the result of the experiment is awaited with interest.

Well, Gentlemen, in this somewhat discursive address, I have only been able to touch lightly on some aspects of the gas industry; many of the points being capable of more extended treatment. The industry received a great impetus on the introduction of the incandescent mantle; but I believe it is on the eve of perhaps as great a change as has been experienced since its advent—viz., in the direction of economical manufacture.

I imagined I could hear some of you saying while listening to my remarks, that there was more of commercialism about them than engineering, and I do not for one moment take exception to that impression. In my opinion, the commercial side of an engineer's education is much neglected. It may not be necessary for a commercial man to be an engineer, but it is essential that an engineer should be imbued with commercial instincts if he is to be successful in his work, because after all, in a very large number of cases, it is necessary in carrying out engineering work to keep in view whether it is going to be a commercial success or not. In conclusion, I trust I have been able to arouse your interest in an important branch of the public service.

SOME ECONOMIC ASPECTS OF THE
SLOT-METER SYSTEM.

A communication by Herr Kobbert, the Manager of the Königsberg gas undertaking, was published in a recent number of the "Journal für Gasbeleuchtung," in which he discusses a number of questions relating to the use of the prepayment gas-meter. Some of the points raised by him are novel and suggestive, and may prove of interest to English gas men.

Prepayment meters were first installed in Königsberg in 1898; but on April 1, 1899, only 105 burners were supplied through them. The following year, the number of burners had increased to 306, and the number of meters to 92. At that time differential prices for gas prevailed in Königsberg, according to whether the gas was used for lighting or for heating or industrial purposes. One lighting burner, however, was allowed on the supply at the lower rate in each room in which gas was used for cooking, heating, or technical purposes. The growth of the system of supply by prepayment meter, however, prompted the administration of the gas undertaking to revise these regulations, and abolish the minimum charge per annum which had hitherto been enforced on small consumers and to impose instead meter-rents. It was decided to allow two burners for illuminating purposes to be supplied with gas from the meter through which the supply for cooking, heating, or motor purposes was made. Consequently, consumers obtained gas for lighting so far as two burners were concerned at the lower rate of charge which was made for gas for heating purposes. The gas-rents were collected from ordinary consumers at intervals of six weeks, or, if they desired it, more frequently. It was decided that the same rent should be charged for prepayment meters as for ordinary meters, that they should be emptied once a quarter, and that no deposit should be required from their users. It was decided also to allow with the larger sizes of prepayment meters a number of lighting burners proportional to the size of the meter in addition to the two burners already referred to. A supplemental charge of 3½d. a month was made in respect of these burners. These regulations had the effect of giving prepayment gas consumers the advantage of the lower scale of charge which was in force for gas for heating purposes, though a reasonable proportion of the gas passing through the meter might be used for lighting. Statistics are given as to the number of households in Königsberg and the number of rooms requiring to be heated in each, and also of the number of householders having incomes above and below certain stated limits. These statistics show that more than six-tenths of the householders have incomes exceeding £60 per annum, but less than half have incomes between £60 and £150 per annum. Nearly 39 per cent. of the householders have incomes below £60 per annum. These figures have been borne in mind in making the arrangements for the supply of gas to as large a number of consumers as possible.

Prepayment meters were first introduced rapidly into the dwellings of three and four rooms, with a view to utilizing quickly the manufacturing plant which had been installed at the new gas-works in anticipation of the future growth of gas consumption. The experience gained with the prepayment system in Königsberg leads broadly to the conclusion that the economical value of the prepayment meter lies chiefly in the method of payment, which allows the consumer to reckon up exactly his expenditure on gas. This is contrary to the English ideas in regard to the system. Since the year 1902, the gas consumers of Königsberg have been at liberty to have either prepayment or ordinary gas meters according to their choice. In both cases they buy gas at the same rate, and consequently obtain the same quantity of gas for the payment of the same coin. For instance, a 5-light meter for gas for lighting purposes only will be provided, if required, with a 50 pfennige (6d.) slot, or a 3 or 5 light meter for gas for cooking purposes will be provided with a 10 pf. (1½d.) coin-slot, while 10 or 20 light meters for supplies to bath rooms, &c., will be provided with one mark (1s.) coin-slots. This arrangement has proved very satisfactory; and it is generally recognized in Königsberg that gas is now the fuel of the people of small incomes.

The following table shows the rapid increase in the number of meters both ordinary and prepayment which has occurred since the introduction of the latter, and also the effect on the growth of gas consumption per head of the population.

Year ending April 1.	Gas for Lighting.		Gas for Cooking and Heating.		Cubic Feet of Gas Consumed per Head of the Population.
	Ordinary Meters.	Slot Meters.	Ordinary Meters.	Slot Meters.	
1903	5376	—	3916	486	1863·6
1904	5973	38	4312	1,950	2080·1
1905	6129	682	4215	4,180	2247·5
1906	6303	1172	4308	6,486	2385·6
1907	5240	1603	5789	8,998	2473·5
1908	5322	2163	6468	11,652	2717·9
1909	5971	2370	6619	14,178	2720·0

The rate of charge for gas for lighting purposes only is 16 pf. per cubic metre (4s. 6½d. per 1000 cubic feet); and for gas for

cooking and heating, 12 pf. per cubic metre (3s. 5d. per 1000 cubic feet). It has already been mentioned, however, that a certain number of burners for lighting may be supplied at the lower rate where gas is consumed mainly for heating and cooking. Of the gas supplied to prepayment meters in 1908, 87·5 per cent. was sold at the lower rate. The average consumption per slot-meter was in 1900 only 9178·6 cubic feet; it reached a maximum in 1905 of 14,394·8 cubic feet; and in 1908 was 12,900·9 cubic feet. It may be asserted without fear of contradiction that but for the introduction of the prepayment meter, the greater part of the gas now consumed through these meters for heating and cooking would not have been sold at all.

The author next refers to the risk of loss to the gas undertakings through want of agreement between the records of the meter-index and the coins found in the box of the prepayment meters, and to various types of lock and coin containers intended to guard against the abstraction of money from the meters. Taking into account, however, the number of cases of loss incurred through theft or faults of the slot meters, and the magnitude of the staff required to supervise the prepayment meter system, and to collect the coin at regular intervals, he nevertheless comes to the conclusion that the system entails less trouble, a smaller staff, and less clerical work than does the dealing with the deposit system and the collection of arrears in the case of ordinary meter consumers. He next discusses the methods in which the coins may best be collected from the prepayment meters. He says that there are two methods in common use—viz.: (a) settlement of each prepayment meter account on the premises of the consumer; and (b) settlement at the gas-works. By the first method a collector goes from meter to meter, opens the coin-holder, and takes out its contents in the presence of the consumer. Any discrepancy between the coins in the holder and the record of the meter-index is thereupon settled with the consumer. The coin-holder is replaced and closed, and the collector goes on to the next meter. He reports the reading of the meter at the cashier's office on the gas-works, and pays in the money collected. This system, which is very general in the case of gas undertakings owned by private companies, entails supervision of the collector's work by inspectors, who must follow the collector from time to time on his round and note the readings of the meters. The method has the advantage of extreme simplicity. Nevertheless, it is possible in the course of time that large defalcations may occur under it; and for efficient inspection, one inspector is required for (say) every two collectors. The rent of gas-meters, boiling-rings, &c., is, as a rule, covered by an increase in the price charged for the gas. The method is eminently one in which the *personnel* of the collecting staff is of extreme importance, and it is necessary to decide to what extent chances must be taken or the cost of inspection be increased. It is less suitable for municipal undertakings where the administration of the cashier's department should embody the same safeguards as that of a national exchequer. Hence with municipal undertakings, the author prefers the second method of collecting and settling accounts which has been found, according to experience at Königsberg, to be no more costly than the first.

According to this method, a list of prepayment meters from which the coins are to be collected is handed at the office to a messenger from the cashier's department who at other times is employed in drawing up gas accounts. This messenger goes his round in company with a meter-inspector and a man who is in charge of an iron trolley mounted on pneumatic tyred wheels. This trolley has bars with spring lock fastenings (similar to the post office waggons which are in use in Germany), and is capable of containing about 200 coin-boxes. The requisite number of empty coin-boxes sealed at the office is placed in the trolley over night. In the morning, when the round is commenced, the necessary number of empty boxes is taken in a wire basket into each tenement house, and the messenger removes the full coin-box from each meter, replaces it by a sealed empty box, and notes the number of the box, while the meter-inspector reads the meter. The full coin-boxes are carried in the wire basket to the trolley, in which they are locked by the spring catches; and when the trolley is full, it is taken back by the man in charge to the cashier's department. As soon as the trolley is filled, the messenger from the cashier's office is free to attend to other work. The boxes are then opened at the cashier's office, and their contents counted and compared with the meter readings. Any discrepancies have, of course, to be settled afterwards with the consumer. According to the author, this method of collection costs only about half as much as the first. Each messenger is sent in turn to every district of the town, so that at Königsberg the same messenger does not go back to a particular district more than twice a year.

It is claimed by Herr Kobbert also that the economy of collection and of keeping the accounts, coupled with the freedom from arrears, makes almost any prepayment gas-meter system more economical for a gas-works than the system of ordinary meters, notwithstanding increased cost of the prepayment meter. He does not consider it necessary to success to combine the prepayment meter supply with the hiring-out of gas appliances, such as burners, boiling rings, &c. He considers that the chief advantage of prepayment meters lies in the method of payment and collection. In these conditions, the prepayment system has extended in Königsberg relatively to the ordinary meter system to the extent shown by the following details for the numbers of meters in use at the end of the year 1908: On gas for lighting at 4s. 6½d. per 1000 cubic feet, 5971 ordinary meters, 2370 prepayment meters;

and on gas for cooking and heating at 3s. 5d. per 1000 cubic feet, 6654 ordinary meters, and 14,178 prepayment meters.

[In regard to Herr Kobbert's arguments as to the best method of collecting the contents of the coin-boxes of prepayment meters, it should be borne in mind that the 10-pfennige coin (which is the working equivalent in Germany of the English penny) is of nickel and weighs only about half an English bronze penny. Hence the weight of the coins to be collected and conveyed to the cashier's office is much less in Germany than in Great Britain relatively to the amount of gas consumed through the meters.—ED. J.G.L.]

A BOOSTER SYSTEM AT ROCHESTER (N.Y.).

In one of the papers prepared for the annual meeting of the American Gas Institute, Mr. FRANK H. HELLEN, of Philadelphia, gave the following particulars of a booster system installed at Rochester (N.Y.).

About a year ago, the pressure conditions in the south-western section of the city of Rochester were such as to call for immediate attention; 14-10ths being the maximum in one part of the town. A 10-inch line running south showed a drop of 25-10ths in a distance of 3600 feet. Pressure readings taken on a 16-inch line at one point showed 4 inches; the drop in pressure from the works to this spot being exceedingly low, due to the fact that the feeders, consisting of one 16-inch and two 12-inch mains, were of ample capacity. There were two remedies to choose from—one being the extension of the 16-inch pumping line and the provision at the gas-works of an exhauster which would pump the gas at a high pressure, involving an outlay of approximately \$30,000; the other, the installation of a fan system, at an estimated cost of \$3000. As the congestion in the area to be dealt with was the result of changes occurring over rather a long period, and as there was nothing to indicate an early recurrence of these conditions, it was thought that the \$27,000 difference between the two figures could be put to better use than by sinking it in an exhauster scheme. The less expensive remedy was therefore chosen, in the belief that satisfactory results would follow its use; and in this the parties concerned were not disappointed.

A blower-house, 13 ft. by 22 ft., was erected; and in it were installed a 40 H.P. electric motor and a No. 10 Sturtevant fan, the inlet of which was connected with the 16-inch gas-main, while the outlet ended in the 10-inch main. It was arranged to pump from the larger main into the smaller one, and thence through other 10-inch mains to an 8-inch main. All the small mains on the route of the new pumping lines were disconnected, and the services on the 10-inch mains provided with house governors. Between Nov. 10, 1908, and March 1, 1909, the average duration of the pumping was three hours nightly; and the pressure carried on the outlet of the fan ranged from 10 inches up to 20 inches. The maximum pressure obtained at one point during pumping hours was 8 inches; while throughout the area in which the troubles from low pressure formerly existed, there was no difficulty in maintaining a uniform pressure of 3 inches. The maximum hourly discharge in this territory was 70,000 cubic feet.

The total cost of the installation—including fan, motor, house governors, street connections, and building—was \$3200; and by it a saving of \$2140 was effected in the first year, taking \$30,000 as the estimated cost of the alternative scheme.

Mr. Hellen stated that in Rochester they had been particularly pleased to think they did not continue the 16-inch high-pressure main into the booster district, for since considering as to doing so they thought they would probably need a 3 million cubic feet gas-holder; and if they built one, it looked as though it would be an outlying holder. In this event, the present 16-inch high-pressure mains would be ample for ten years to come; and the money that would have been invested in the main will be spent in putting up a storage holder.

Summing up the advantages of the booster system, Mr. Hellen said that in the first place they had saved money on the installation; secondly, they were not working at excessively high pressure, which meant a decrease in leakage and a maximum of safety; next, they had the advantage of making an installation that required only a moderate investment; and, finally, the large gas-mains which were laid to the heart of the city in order to ensure an adequate supply at the time when gas was used almost exclusively at that point, and which had long since outlived the conditions which compelled their installation, were utilized, and were therefore again a necessary part of the system—their value being nearly, if not quite, as great as it was when they were originally laid.

DETERMINING THE VOLATILE MATTER IN COAL.

Dr. H. Beck, the Chemist to the Concordia Mining Company, of Oberhausen, described, in a recent number of the "Journal für Gasbeleuchtung," a new method for the determination of the volatile matter in coal, which he contends gives more consistent results than the methods hitherto adopted.

He refers first to the proposal made by Professor E. J. Constat, of Zurich, in his paper before the International Congress of Applied Chemistry in May last [see "JOURNAL," Vol. CVI., p. 584], that the method of determination suggested by the Committee on Coal Analysis of the American Chemical Society should be recognized internationally as the standard method. The results obtained by the method are generally concordant within 1 per cent. for the same sample of coal. A difference of 2 per cent. is very rare. Other methods of determination differ considerably in their results, owing to the coal being more or less completely carbonized. The coke remaining in the crucible retains more or less the character of the coal according to the temperature and the duration of the heating to which it has been exposed. Thus the results obtained by Muck's and the Bochum methods are from 2 to 4 per cent. higher when a porcelain crucible is used than with a platinum crucible; and considerable differences result even with platinum crucibles, according to their dimensions or condition. The yield of coke is dependent to a nicety on the temperature and rate of carbonization; and these two factors are determined by the material and size of the crucible, the method by which it is heated, the quality of the fuel, and the quantity of coal taken for the test.

The low results obtained by the method of Hinrichsen and Taczak, according to which 4 to 5 grammes of finely-powdered coal is heated in a capacious Rose crucible in a stream of hydrogen—gradually at first, and subsequently with the full flame of a powerful burner—are explained by the gradual carbonization of the coal, consequent on the temperature being raised slowly, resulting in the yield of gas being low. The passage of a current of hydrogen through the crucible has no effect on the ultimate result, as coal can be carbonized in a crucible without any combustion taking place without the use of hydrogen. It appears necessary, therefore, that, in order to obtain comparable and unexceptionable figures for the yield of gas in a crucible, the method of carbonization in the crucible should be made completely independent of the material and size of the crucible, the mode of heating, the quality of the fuel, and the quantity of coal taken. The author has devised a method which he claims is wholly independent of the factors enumerated, and secures uniform carbonization throughout the test.

According to this method, from 1 to 5 grammes of the finely powdered coal is taken in a platinum or porcelain crucible provided with a well-fitting perforated lid. It is heated for a few seconds with the full flame of the bunsen burner, in order to start the evolution of gas. As soon as the products of gasification ignite, the rate of gasification is checked by diminishing the bunsen flame to such an extent that the combustible products escaping at the hole in the lid can be ignited by a small flame, while they will not continue to burn when the small flame is taken away. The bunsen flame is regulated throughout to preserve this condition of regular evolution of gas, so that the carbonization of the sample of coal proceeds at a uniform rate. When the volatile constituents have been so far driven off that they no longer ignite at the hole in the crucible lid, the heating is continued for one minute longer with the full flame of the bunsen. The gas thus driven off burns, in consequence of the high proportion of hydrogen in it, with a non-luminous yellowish flame. The end of this last period of carbonization is indicated by the yellow flame dying out. A coating which sometimes forms on the upper side of the lid of the crucible must be burnt away; but on the inside of the lid and on the sides of the crucible there should remain a deposit of carbon.

The figures obtained for the volatile matter in coal by this method agree very closely with one another for the same sample of coal; but they are from about 2 to 4 per cent. higher than the results obtained by Muck's method. They are completely concordant whether a platinum or a porcelain crucible has been used, and are independent of the quantity of coal taken. A number of results are given in tables for the same samples of coal carbonized according to this new method, taking (1) 1 gramme of coal in a platinum crucible and heating for 5 to 7 minutes, (2) 1 gramme of coal in a porcelain crucible and heating for 5 to 7 minutes, and (3) 5 grammes of coal in a platinum crucible and heating for 25 to 30 minutes. The results show very close agreement, though, on the average, the figures obtained with the porcelain crucible are nearly 0.1 per cent. lower than the others. This method of determination does not require the observance of particular conditions of heating, such as the size of the bunsen flame, the distance of the mouth of the burner from the bottom of the crucible, or a particular quality of fuel. The intensity of heating, and consequently the rate of carbonization, are controlled in each test by continuous observation of the inflammability of the escaping products, and are independent of multitudinous other factors that have to be precisely observed with the methods hitherto used.

The author next compares results obtained by duplicate tests of the same samples of coal according to the new method and according to Muck's and the Bochum methods. The results in

Royal Society of Arts.—Sir William H. White, the Chairman of the Council, will open the new session of the Royal Society of Arts to-morrow with an address, the subject of which will be "An Imperial Navy." Before Christmas, there will be four ordinary meetings of the Society; but the papers to be read are not upon subjects connected with the interests with which the "JOURNAL" is identified. After Christmas, however, Mr. Kenneth Gray will submit one on "Heating and Ventilation." On Jan. 5 and 12, 1910, Professor Harold B. Dixon, F.R.S., will deliver two lectures to juveniles on "The Chemistry of Flame."

all three cases agree with one another within about 0.1 per cent.; so that, in this respect, the new method presents no practical advantage over the other two methods. But when 1 gramme of coal is taken, the time of carbonization is about three times as long with the new process as with the others; and this gradual carbonization causes the cake of coke obtained to differ considerably in appearance from the residual coke produced by the rapid decomposition of the coal substance by Muck's or the Bochum methods. The latter methods yield a dense, grey, and shining cake of coke; whereas the coke from the new process has the grey, shining, dense characteristics only in its lower half—the upper part being black, friable, and powdery.

The results of crucible tests made according to the author's new method were next compared with the results of the carbonization of the coal in coke-ovens. The charge of coal for the oven was very carefully sampled, and the amount of water and ash contained in it was determined; while the yield of coke was estimated in the crucible according to the new method, Muck's method, and the Bochum method. The coke drawn from the oven was also carefully sampled and the moisture in it determined. Owing to the large mass of coke removed from an oven and some slight differences in the uniformity of quenching, it is almost impossible to say that the moisture determinations, however carefully the sample has been taken, are truly representative of the average amount of moisture found in the mass of coal. Of nine different coals thus examined, the yield of coke obtained in the ovens on the working scale is, for the first sample, 2 to 3 per cent. below the results of the crucible methods; for the second, third, fourth, and fifth samples, it is in fairly close agreement with the yields obtained by the Bochum method, and is con-

siderably below those obtained by the new method; while for the sixth, seventh, eighth, and ninth samples, it agrees satisfactorily with the results in the crucible by the new method, and is considerably above the results by Muck's and the Bochum methods. The figures obtained by Muck's method are in fair agreement with the practical results for the fourth and fifth samples, but not for the others.

It would appear that none of the three crucible methods used gives satisfactory figures to serve as an indication of the yield of coke which should be obtained from coal on a large scale. They demonstrate once again that it is impossible to draw conclusions from the results of small laboratory tests as to the results of carbonization in ovens. The conditions of working on a large scale can never be reproduced with a small quantity of coal in a small crucible in a manner to admit of practical comparison of the yields. The crucible results can at best only approximate to the yields of coke obtainable on a large scale. The value of the crucible tests appears rather to consist in the exact determination of the degree of volatility of the coal; and this determination is best made by the slow uniform coking of the coal in the crucible as carried out by the method proposed by the author. According to this, the volatility of the coal is the quantity of volatile matter yielded per 100 parts of the pure coal—i.e., the coal less the moisture and ash contained in it—by gradual and uniform carbonization in a platinum or porcelain crucible in the manner described. The results thus obtained, according to the author, make it possible to class the different coals according to the ease with which they decompose chemically. The volatility factor represents a constant for each description of coal which is useful in assessing the technical value of the coal.

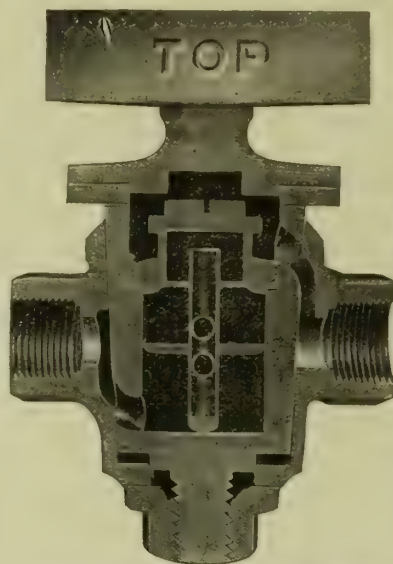
A COMBINED STOPCOCK AND GOVERNOR.

The Sutherland Meter Company, Limited, of Witton, Birmingham, have now got their new workshops into working order; the several departments having been organized on a fresh basis, and brought up to the highest efficiency, as regards workmanship, dispatch, and the introduction of up-to-date machinery.

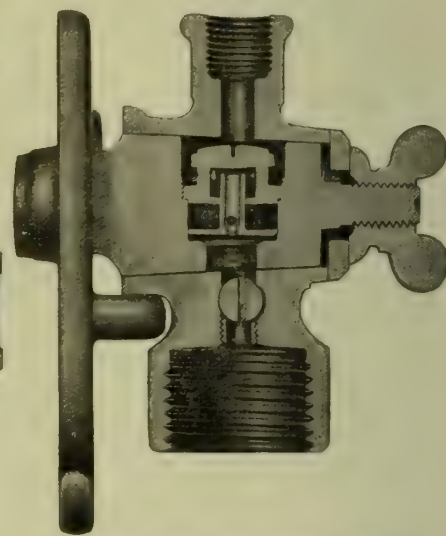
The firm have also added a fresh department to their business, and are now manufacturing the Purves patent stopcock and governor, which is a neat combination of stopcock and governor [see "JOURNAL" for Aug. 31 last, p. 582], and has met with much success with users, as it is designed for incandescent lighting, gas-fires, &c. The governor is constructed so that it may not be tampered with; and the value of this arrangement will be at once seen, as after the governor is set to its required quantity, no unauthorized person can alter it (the regulating mechanism being inside), and the requisite amount is delivered no matter what pressure is put on. This is claimed to ensure a saving of 25 to 30 per cent., combined with proper combustion of the gas used. The fitting up to the stove in this way entails less expense, as fewer joints have to be made. The cleaning can be done without turning off the gas at the main, but simply by shutting off the stopcock.

In addition to the above, mercurial and diaphragm governors are now being manufactured by the firm; and the new management are entering this field with a determination to turn out only first-class work. Arrangements are also in progress for the construction of retort governors,

district governors, and station governors; and as the works are well constructed and roomy, there is every facility for a further increase of business. It may be mentioned, too, that the company are now manufacturing the Hansford patent automatic recording meter, which makes out its own bill by suitable mechanism; and no reading of the index is required. Other novelties are also in course of preparation.



Combined Cock and Governor for Gas-Fires, Stoves, Radiators, &c.



Combined Lamp-Cock and Governor for Street-Lamps.

Fire-Clay Deposits in India.

We have received from Mr. Murray Stuart, B.Sc., F.G.S., the Assistant-Superintendent of the Geological Survey of India, Part II. of Vol. XXXVIII. of the "Records of the Geological Survey of India," which contains an article by him on "China-Clay and Fire-Clay Deposits in the Rajmahal Hills." It appears that fire-clay occurs somewhat plentifully on the western side of the hills. In order to test these clays, Mr. Stuart made some small bricks and subjected them when dry to a white heat (about 1600° Fahr.) for fifteen minutes in a blowpipe furnace. In this way, he was able to test both their plasticity and refractoriness. The results of his experiments led him to the conclusion that they would answer most, if not all, of the requirements for which Stourbridge clay is at present used. He gives tables indicating the localities where the clays are to be found, and says these are in many cases perfectly infusible, and of a texture quite as fine and uniform as that of the finest Stourbridge clay. He therefore sees no reason why they should not be employed in the manufacture of such articles as gas-retorts, as well as the simpler kinds of fire-bricks. In addition to the high-quality clays, there are many which are equally infusible, but which have not a sufficiently fine texture to be suitable for retorts; but Mr. Stuart says they would make fire-bricks which should be quite as satisfactory as those made from the finest fire-clays.

An Aluminium Gas-Stove.

A portable gas-heating stove of which every part except the burners is of aluminium is being made by the Elbard Stove Company; and though it is non-condensing and flueless, the claim is advanced for it that it is absolutely safe and pure. The stove, which is circular, is 20 inches high, and has a diameter of 12 inches at the base. The heating is accomplished by two flat-flame burners; and the stove acts on the regenerative principle. After being utilized to heat the dome-shaped top of the stove, the hot air passes out into the room. In the list before us, it is stated that the cost is only 1½d. for ten hours' heating; but no indication is given of the price of gas on which this calculation is based. The advantages put forward for aluminium in this connection are its extreme lightness and the fact that it does not rust. The stove is shown fitted with a flexible tube, in order that it may be moved about for use in different places as required.

We have received from Messrs. Emmott and Co., Limited, of Manchester, the "Mechanical World" Electrical Pocket-Book for 1910. The contents, which consist of a number of electrical engineering notes, rules, tables, and data, have undergone considerable revision; and in some instances the sections have been rearranged to give them a more orderly sequence.

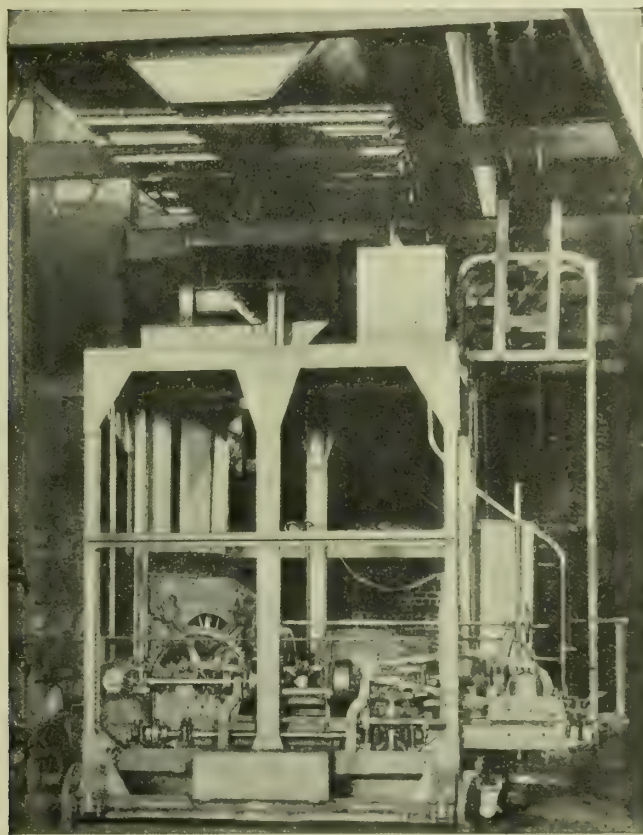
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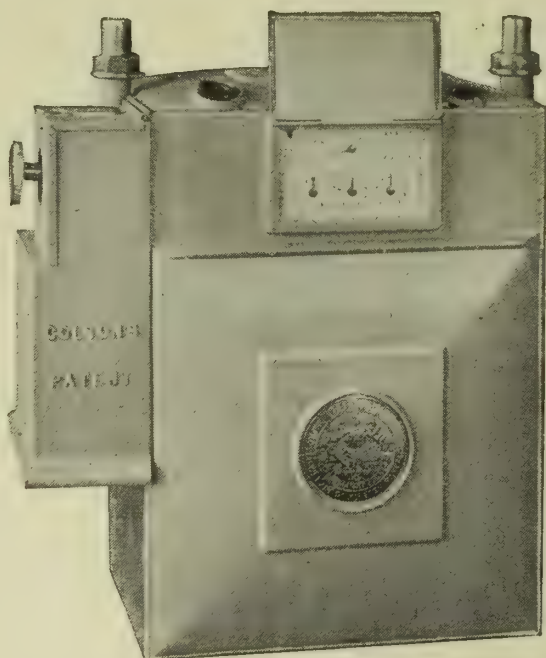
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LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Visit to Vauxhall.

On Saturday afternoon, the Association paid a visit to the Vauxhall works of the South Metropolitan Gas Company. The members, with the President (Mr. W. J. Liberty), were met at the entrance to the works by Mr. A. F. Browne, the Engineer, and his Assistants—Messrs. W. G. Head, J. Dickenson Gair, J. Pendeberry, G. Frost, J. Kneeshaw, M. Tysoe, and H. Sims—and Mr. Layton, from the Old Kent Road works. The party was divided up into four sections—Mr. Browne leading the first.

The works were not new to the members of the Association; for it may be remembered that the programme three years ago included a visit to Vauxhall, and this duly took place in March, 1906. However, the station is one that will well bear a second, or even a third, inspection; and the members greatly appreciated the opportunity thus kindly afforded by Mr. Browne of renewing their acquaintance with the varied plant that is under his charge. It was natural that a good deal of interest should be displayed in the altered method of carbonization which Mr. Charles Carpenter, the Chairman, announced in a letter to the "JOURNAL" some months ago had been in operation at the Company's works since the early part of the present year. This method consists of heavy charges, of twelve hours' duration; and the results are found to be eminently satisfactory. In addition to the other advantages of the system, there have since its introduction at Vauxhall been practically no stopped pipes; and trouble with pitched mains has been unknown. Of the four retort-houses (containing a total of 866 20-foot retorts, the maximum output being about 13 million cubic feet per day), there are three in which mechanical stoking is employed—by West's compressed air and the Arrol-Foulis hydraulic machinery—and one in which the retorts are charged and drawn by hand. The latter is being used less and less each season; and owing to the new method of heavier charges, the Arrol-Foulis system of charging is being extended, along with the Hunter-Barnett coke pusher.

The coal storage is 15,000 tons; the coal being brought by lighters, and unloaded by hydraulic cranes, one of which has a Hone grab carrying 15 cwt. per lift. In winter, a good deal of coal is stored in the open; and, of course, great care is exercised to prevent over-heating. As soon as the rods inserted for the purpose (which are examined every day) get too hot, the coal affected is at once removed to the retorts or else a drastic water cure is applied. If the latter plan is decided upon, 2-inch pipes spiked at one end, and drilled with $\frac{1}{2}$ -inch holes round them, at distances of about 6 inches apart, are inserted at intervals in the coal heap—the spiked end being driven almost to the ground level. The free ends of the pipes are attached to hose, through which the deluge of water that is required to put out coal fires of this character can easily be poured.

Unfortunately, there is at this station no room for outside producers; and the generator gas-furnaces are placed below the retorts and fed direct with hot coke. Two producers supply four beds, or 40 retorts, with gaseous fuel of the following composition: Carbonic oxide, 29 per cent.; hydrogen, 6 per cent.; carbonic acid, 4 per cent.; nitrogen, 61 per cent. The depth of coke in each furnace is about 4 feet, and the grate area 28 square feet, or 0.7 square foot per mouthpiece. The hydraulic mains are of the shallow type; and the drain valves are designed to maintain a liquor seal. Relief mains (18-inch) are provided on the top of the retort-settings; and within the hydraulic and relief mains an exhaust of about $\frac{3}{4}$ inch water column is maintained, controlled by 8-inch retort-house governors. The whole system of tar and liquor service pipes about the works, and all the storage tanks, have been undergoing reconstruction during the last eighteen months; and this work is now practically completed. All the pipes are turned and bored; and each joint is held by an iron clip to prevent expansion. The object, of course, has been to get every pipe carrying tar and liquor absolutely "bottle tight"—and the same with the tanks, except for the necessary ventilation. To prevent the loss of ammonia which would ensue from this ventilation if it were open direct to the atmosphere, there has been provided in connection with the vent-pipe a small coke-scrubber, which is kept supplied with water. This arrests any ammonia in the fumes.

The condensers are of the hydraulic tower type, designed by Mr. Charles Carpenter. They are 10 feet in diameter and about 40 feet high. In each there are 120 3-inch tubes, through which the gas passes. At the top is a distributing arrangement for the tar, designed to supply each 3-inch tube with an equal quantity. The spaces outside the tubes are filled with water, which, after having done duty, passes to the top of cooling towers, and is subsequently circulated afresh. With the tar, too, a constant circulation is kept up; the same tar passing several times through the condensers. The three cooling towers, to the top of which the water is led from the condensers, are filled with expanded metal. The water stream is thus broken up, and meets with a blast of air as it travels down. By this means, the water is cooled again to atmospheric temperature, or very little above it. Every gallon of tar leaving the retort-house does duty in these condensers, for the purpose of washing the gas for the extraction of naphthalene. The result is that the amount of naphthalene which has to be removed either on the works or in the mains at the Kennington

distributing and storage station has been reduced to a negligible quantity. To finish the operation, there is another solvent used, besides the tar.

From the condensers, the gas passes through three Livesey washers; and then through three tower scrubbers, filled with thin boards on edge, and through which large quantities of gas liquor are passed. The final traces of ammonia are removed in Kirkham, Hulett, and Chandler rotary washer-scrubbers. Oxide of iron is, of course, used for purification, with Weldon Mud in the last two vessels, as a final catch. On leaving the purifiers, the gas passes through three naphthalene washers (of the same construction as the Livesey washers), charged with a solvent oil.

A point that strikes one on the works is the considerable number of rope drives; and inquiry elicits the fact that in many positions these are found much more convenient than straps. The exhaust-house is a really notable example of the fitting-in of machinery; and to find space there for another piece of apparatus, however small, would certainly be an impossibility. There are six exhausters, driven by Donkin's Farey condensing engines. Four are of 200,000 cubic feet per hour capacity each, and two of 100,000 feet. Still further provision is being made for the comfort of the men, by the erection of new stokers' lobbies, lavatories, &c., in a central position, instead of having them scattered over the works as hitherto.

The gas manufactured at Vauxhall is transmitted to the Kennington storage station, one-third of a mile away, where there is gasholder capacity of 10½ million cubic feet. In the winter two Sturtevant fans driven by steam-engines draw the gas from the works, thus reducing the pressure upon the purifiers; and for the purpose of raising the pressure of the gas at the inlet of the district governors to a pressure higher and more constant than can be obtained from the gasholders, four similar fans are employed. Two of these are of a capacity of 600,000 cubic feet per hour, each driven by a 37 I.H.P. Crossley gas-engine; one of 450,000 feet capacity, driven by steam; and one of 250,000 feet capacity, driven by an 18 I.H.P. gas-engine.

At Kennington as elsewhere, the exactions of the Metropolitan Water Board have led to the sinking of an artesian well to a depth of 400 feet in the chalk. As the result of this enterprise, the Company have secured an ample supply of good potable water. It is a little harder—perhaps 4°—than the Board's supply; but the necessary softening is easily carried out. There is also at Kennington a steam fire-pump connected with hydrants all over the station. This derives its water supply from the gasholder tanks; and the pump is capable of throwing a 1-inch jet to any height that is likely to be required.

After the members had inspected the works, they were accompanied by Mr. Browne on tramcars to Kennington, to go over the storage station; and then returned to Vauxhall, and were entertained at tea in the works. After tea,

Mr. J. R. GALE (Mill Hill) proposed a vote of thanks to Mr. Browne and his Assistants for their kindness in having them at their works that afternoon, and referred to the order and method observed at Kennington, and the strict discipline carried out. In fact, everything seemed up to "concert pitch." They had the example of the two systems of stoking before them—viz., hand charging and machine charging. He presumed it was inevitable that mechanical stokers should be introduced to the displacement of labour.

Mr. ERNEST SCEARS (Hampton Wick) supported the resolution, and said the Association had been honoured by Mr. Browne's presence, not only on this, but on other occasions.

Mr. T. F. CANNING (Ilford) also supported the resolution.

Mr. S. A. CARPENTER (Mill Hill), in supporting, spoke of the lessons that were to be learned at the works by the attention to details which they had all observed.

Mr. J. G. CLARK (London) added his testimony to that of the previous speakers, and said they were reminded that afternoon of what Mr. Corbet Woodall had said at the opening meeting of the session—that new problems were often old problems in new disguise. He advised members to always make a note of what they saw.

Mr. L. F. TOOTH said Mr. Browne and his Assistants that afternoon had shown them some very practical work.

The PRESIDENT, in putting the resolution, said many were for the first time making the acquaintance of Mr. Browne and Vauxhall; for the status, if he might use the word, of the Southern Junior Association had somewhat altered since the last visit. Previously the membership was largely confined to the London area, and chiefly connected with the distribution side of the industry. Now the members were drawn from the works of Companies outside the Metropolitan radius. It might be interesting to know that there were eighteen new members from gas-works chiefly outside London, waiting to be received in that afternoon. Mr. Browne had taken more than a passing interest in the Association, and was no stranger to the Cripplegate Institute. It was with regret that they learned of the breaking of the official link between Mr. Browne and the Southern Seniors, by his resignation of the position of Hon. Secretary. It was to the Southern Seniors that they as Juniors were keenly looking for advice and sympathy. The latter he believed they had, as evidenced by the fact of such gentlemen as Mr. Corbet Woodall, Mr. H. E. Jones, Mr. J. W. Helps, and Mr. A. F. Browne giving up their time and coming among them and offering them words of wisdom and counsel. If the Southern Seniors were the parent Association, then the Junior Association were their children; and as the child looked to its

parent for support and help, so the Juniors looked to the Senior Association for help and some closer connection. What this closer connection could be, it was not for him to speak of then. Certainly, these Saturday afternoon visits to works, with Seniors taking them round, were one way. He thanked Mr. Browne and his Assistants for what they had done, and for the hospitality extended to them.

The resolution having been carried with acclamation,

Mr. BROWNE thanked the members for the kindly way in which the vote had been expressed. With regard to Mr. Gale's remarks as to mechanical stokers, it was by stoking machinery and by mechanical charging that the best results could be obtained. He felt that he was addressing a party who were quite at home in a gas-works. They had various people who visited their works. Young gentlemen who took up the science side of college education, and even parties of young ladies who had a thirst for knowledge, visited them. He gave five distinct reasons why the full retort was advantageous over the six-hour charge: (1) A greater make of gas per ton of coal; (2) better coke; (3) absence of stopped pipes; (4) better tar, it being free from water; and (5) no pitch in the hydraulic main. It had been a great pleasure to meet them that day; and he trusted that in the future they would come again.

MIDLAND JUNIOR ASSOCIATION.

Visit to the Foleshill Gas-Works of the Coventry Corporation.

On Saturday afternoon, the members of the Midland Junior Gas Engineering Association, to the number of about fifty, paid their second visit to Coventry. Since their first visit, three years (almost to a day) had elapsed; and the intervening period has been an eventful one at Foleshill—which, of course, on both occasions was their objective. In 1906, it was mainly a question of learning what was going to be done on the extensive site, 3 miles from the centre of the city, which had been prepared for the erection of new gas-works for the Corporation; though the water-gas plant, two holders, and the chemical works were even then completed. They went on Saturday to inspect a complete works, from which the whole of the gas consumed in Coventry has now for some months been supplied. On arrival at the station, a tramcar was in readiness to take the party out to Foleshill, where they were met by Messrs. P. N. and C. G. Langford and J. H. Hardy, Assistants to the Engineer and Manager (Mr. Fletcher W. Stevenson). Dividing into three groups, headed by one of these gentlemen, the inspection was at once commenced—the guides explaining everything in the fullest possible manner. Of the works themselves—which were erected to the designs, and under the superintendence, of Mr. Stevenson—it is unnecessary here to speak in detail, seeing that they were fully described and illustrated in the "JOURNAL" at the time of the formal inauguration last June (p. 716).

Much praise was bestowed upon the works generally; and the openness of the site and roominess of the buildings were greatly appreciated. Remark, too, was made as to the harmony of design throughout the works. The last building contract, which is now practically completed, is for the offices and laboratory. In the retort-house (which has a capacity of some 4 million cubic feet per day), the members were able to make close acquaintance with the Fiddes-Aldridge stoking machine for discharging and charging at one operation. The working of the apparatus was closely watched; and note was taken of the evenness of the 7 cwt. coal charges. A good deal of time, also, was spent over the coal-handling plant, which is of a most complete character, from the hydraulic capstans for drawing the waggons to the hydraulic tippers, to the coal-stores and the retort-house overhead hoppers. Then the coke hauling and screening plants were inspected; and in connection with them it was pointed out that the system in use for removing the coke from the retorts and quenching it in cages underneath, which afterwards discharge into side-tipping waggons, works very satisfactorily indeed, and leaves the coke in excellent condition. The carburetted water-gas plant, consisting of two sets capable of producing $1\frac{1}{2}$ million cubic feet a day, was not in operation; but a visit was paid to the building, and the spaciousness of the stage-floor was seen. In connection with the chemical works, it was pointed out that the plant which was originally used for the manufacture of sulphate of ammonia had, by means of slight alterations, been converted, with highly profitable results, to a concentrated liquor plant. If at any time found desirable, the re-conversion of the apparatus so as to turn out sulphate of ammonia will be quite a simple matter. A small, but useful, feature which was noticed was that drawings of the different parts of the works, framed and glazed, were hanging on the walls in the different departments to which they referred.

Provision for the comfort and welfare of the men employed was everywhere noticeable, but nowhere more so than in connection with the canteen, in which, at the conclusion of the inspection, the members sat down to tea, at which pleasant function they were joined by Mr. Stevenson. The canteen is a large well lighted room, with seven tables on each side, arranged for the seating of ten men. There is thus accommodation for 140 men at one time. Each seat is numbered by means of a brass tablet; and corresponding with these numbers there are tin pans and cans. Meals are all supplied at fixed charges; or the men can have their own food cooked or warmed for them. The canteen is

merely made self-supporting; and all the men are asked to pay for the use of it is 1d. per week. After tea,

The PRESIDENT (Mr. A. O. Jones, of West Bromwich) remarked that they were now about to separate after their pleasant visit; but before doing so, he would like to offer a word of thanks to Mr. Stevenson and his Assistants for the kindness that had been shown them while at the works, and to the Corporation Gas Committee for allowing them to make their inspection. They had been over that day a works complete which three years ago they had seen in partial existence. They were now a very fine works—beautiful, without being over-embellished. Everything appeared to have been laid out on a most ample scale—with splendid provision for extensions in the future; and so far as juniors could judge of the work of their superiors, the planning-out seemed to be first rate. Everything was ordered for doing the work on the most economical lines. He was sure they had all enjoyed the visit; and he had much pleasure in proposing a hearty vote of thanks to those who had given them such a treat.

The SENIOR VICE-PRESIDENT (Mr. R. S. Ramsden, of Burton-on-Trent), who seconded the vote, said they all felt that they had learnt a lot that afternoon. The workmen in the employ of the Coventry gas undertaking were to be congratulated upon having such a fine messroom for their meals, and upon the attention that was paid to their comforts generally.

The proposition having been carried by acclamation,

Mr. STEVENSON, in acknowledgment, said thanks were chiefly due to his Assistants, who had gone round the works with the members that afternoon. He had felt that, as they were members of the Association, it would be much nicer, and perhaps more convenient, if they met the party and acted as guides, and then he himself afterwards joined them at tea. It was a great pleasure to all the members of the staff who had had anything to do with this matter to see visitors at the works. It was regarded as a compliment that members of Associations like theirs should wish to see what was being done at Coventry. At Foleshill, they were not, of course, up-to-date now; they were old-fashioned. (Laughter.) It was necessary to go to St. Helens to see the very latest thing. Perhaps next time the members came, and there was anything fresh to show them, it might be really up-to-date. But they could not all have the very latest things; and when his hearers got into positions of greater responsibility, they would realize (if they did not do so now) that it might be better to try and obtain the finest results possible from what they already had than to make changes simply for the purpose of having the newest forms of plant. They must first figure the matter out, and see whether they were going to save by the change. They must be quite confident that they were going to realize all that people told them they would. It was not always the most modern and up-to-date works that were the most successful. He well remembered many years ago when the members of the Gas Institute went to Sheffield (it was before he himself became connected with the Company) the price of gas there was at that time comparatively low—one of the lowest in the kingdom—and there was then absolutely nothing modern on the works. When regenerative firing was coming in, they did not touch it—all open fires were used. The standard, with the 15-hole burner, was 16 candles, which was a high one. After the visit to the works, the late Sir (or Mr., as he then was) George Livesey remarked that what they had seen only showed them that they did not need modern plant to sell gas cheaply. Something else was wanted; and if a gas undertaking was not worked well, it would not matter what the plant was. He was much indebted to his Assistants for the good working at Coventry. The designing of the place was his in the first place; but those who were on the works now were just as responsible as he was for the results that were being obtained. For whatever might be achieved at Foleshill in the way of working, the credit would be due to his Assistants just as much as to himself.

The party then left the works as they had come, by special tramcar; and all were agreed that a most instructive and enjoyable afternoon had been spent.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

Visit to the Dunfermline Gas-Works.

A Quarterly Meeting of the Eastern District Division of this Association was held in Dunfermline last Saturday; and it was attended by about forty members. They first paid a visit to the Corporation gas-works, where they were received and shown round by Mr. A. Waddell, the Engineer.

The party were greatly interested in Mr. Waddell's novel method of conveying material, which, as already described, consists of an elaborate series of narrow-gauge railways on each "floor" of the works, and also underground, on which run small trucks, made to tilt to either side, and a hoist or lift which serves all the floors. The conveyors receive the coal from the breaker, carry it either to any part of the store or direct to the hoppers on the retort-bench; and they receive the coke from the quencher, which is a box immediately underneath the charging-stage, into which the coke falls on being drawn, and carries it either to the screening-machine or for storage in the yard. By means of the

railway in a tunnel, the branches of which extend in all directions below the coal-store and the coke-yard, coal or coke can be taken from any part of the works and conveyed to any other part where it may be required. At present a large coke-receiver is being constructed, of concrete, over a siding of the North British Railway, to be used for the storage of screened coke. Its capacity is 250 tons. The lift which serves the existing screening plant will be carried 20 feet higher; and from the trucks the coke will be emptied into the hopper of the screening-machine, which is a revolving drum. The breeze will fall into a hopper outside the receiver, and be dealt with as required in the works. The drum will then carry the screened coke forward over the receiver, until it reaches the centre, where an ingenious arrangement, somewhat of the pattern of a ladder with broad sloping steps, situated in a shaft running to the bottom of the receiver, will take it, and deliver it on whichever side of the shaft is desired. This arrangement is made with a view to giving the coke only a short fall at a time, and so preventing it being unnecessarily broken. It will fall from step to step, and "bing" itself by the operation of the law of gravitation. The new receiver is being erected chiefly for the service of shipping orders, which are generally required to be executed with great despatch. By its use, if the Railway Company provide waggons, it will be possible to load the entire contents of the receiver (250 tons) in three hours; thereby doing away with demurrage charges. The cost of the new plant is a little over £400. The existing screening plant is to be retained, to deal with small orders. The ingenuity of the new structure consists in the novel arrangement for causing the coke to trickle down gently, and in the construction and arrangement of the delivery ports in the bottom of the receiver.

Among other new provisions in the works is a sulphate-house and workmen's room, which have been erected in the centre of the yard; the situation of the former sulphate-house, beside the engine-house, having been found to be objectionable. The plant installed is Wilton's patent, and it is capable of dealing with 2 tons of sulphate per day. The workmen's room is a very comfortable apartment, well furnished and warmed, and provided with lavatory and bath accommodation. The arrangements for compressing the gas which is sent to Charlestown, and which have been already described, were shown and explained.

THE BUSINESS MEETING.

The Business Meeting was held in the Masonic Hall, in New Row.

The PRESIDENT (Mr. H. Rule, of Falkirk) said he was pleased at seeing so large a gathering of members. He hoped those who had had the pleasure, which he unfortunately had not, of visiting the gas-works had found something of interest for them there. They were to be favoured with a paper by Mr. Chalmers, of Alva. Mr. Chalmers was a new member, and he (the President) was sure they were all very pleased that he had so early come forward to give them a paper.

Mr. R. B. CHALMERS (Alva) then read his paper, which was entitled—

NOTES ON MONEY-SAVING DEVICES FOR SMALL GAS-WORKS.

In bringing before you this subject, I think the better way would be to describe a few of the appliances in use at the Alva Gas-Works.

Beginning in the retort-house, I was troubled with thick tar collecting in the hydraulic main; and not being blessed with a tar-column, I hit upon the following plan in seeking a remedy for this defect. Being one day in a plumber's yard, I saw lying on the scrap heap an automatic flushing cistern as used in old-time lavatories, and purchased it for 5s. This I erected at one end of the hydraulic main, and connected it to a supply-pipe from a small liquor pump used for supplying liquor to the scrubber. The tank, of 5 gallons capacity, was adjusted to empty five times in an hour, and the outlet connected to a seal-pipe in the main. As the difference in the levels of tar and liquor in the separator in the tar-tank was fully 2 inches, I adjusted the tar-overflow of the hydraulic main to 2 inches below the liquor level in same, by this means ensuring that tar would leave the main first and leave a liquor seal only. As the flushing tank supplied about 25 gallons of liquor per hour, and the amount of tar deposited was only a few gallons, a constant liquor seal was assured for the dip-pipes, and all tar was constantly flushed out. The saving effected by this appliance was—the hydraulic main required very little attention, less gas was lost by leaking retort-lids owing to the uniform seal, and so far no deposit of carbon has been found in any of the retorts.

Passing the condensers to the exhauster-house, I here fixed on each exhauster three 1 pint automatic sight-feed lubricators, with seal-pipes of my own design, ensuring constant and uniform lubrication. The steam, before entering the engine-cylinder, is dried in a home-made steam-drier. This consists of a cast-iron box 6 in. by 6 in. with cover bolted on. The steam on entering the side of the box is divided into two streams, by means of an M.I. T-piece, and impinges on the sides of the box, thereby depositing any water, which drains to a trap connected to the bottom of the drier. The dry steam is taken from the top of the drier to the engine. The result of this is that the packing around the piston and slide-valve rods lasts indefinitely, and the rods do not get scored with the action of water. Efficient lubrication of the cylinder and rods is more easily accomplished, and the packings

now in use have not been touched for two years and are still perfectly steam-tight.

As to the Livesey tar-extractor and washer, I have here fixed a row of steam-jets inside the casing—one jet entering the bottom division of each perforated tube; and now the whole apparatus can be steamed and cleaned in a few minutes without any trouble, and every tube is sure to get its own share of steam.

Passing the scrubber to the oxide purifiers, I may say I have been very successful here. Our last clean purifier was turned on to work in October last year, and is not passing dirty gas yet. During that time it has passed 25,000,000 cubic feet of gas. The oxide used is Albion oxide mixed with soft wood sawdust, 40 bushels to the ton. The oxide is in two layers of 2 feet, and gives no trouble with back pressure. The air used for revivification is put in at the inlet to the purifiers. The holder pressure being about 4 inches, I had to use some positive means of injecting the air; and not wanting to buy a rotary blower, as it would require power to drive, or use a steam-injector direct, because of the steam wetting the oxide, I adopted the following plan. I had two 9 feet lengths of 4-inch cast-iron flanged pipe; and bolting these together, and flanges on each end, I inserted a length of 2-inch M.I. steam-tube, thus forming a jacket round the 2-inch tube. This condenser was laid on the floor of an old lime-shed; and from the top of each end of the jacket was carried a 1-inch pipe to the gasholder tank, the top of which is 6 feet above the apparatus. One tube enters the tank 1 inch below the water-level, and the other 2 feet lower down. Into one end of the 2-inch pipe is fixed a small air-injector, worked with steam. The mixture of air and steam travels through the pipe, and all the steam is condensed by means of the cold-water jacket. As the jacket water heats, the cold water flows from the tank down the lower pipe, and returns warm through the upper pipe. This ensures a constant supply of cold water to the jacket; and the steam being all condensed, there is a good supply of practically dry air. The condensed steam flows to waste through a seal-pot. The warm water returning to the holder tank saves using live steam to prevent freezing in time of frost. The air passes through a 20-light meter, fitted with a 1 minute observation dial and back-pressure valve. The steam used for working the injector does treble work, as it heats the benzol carburettor, works the injector, and heats the holder water. I find 2 per cent. of air at the purifier-inlet does more real revivifying than 4 per cent. at the inlet of the condensers.

Steam is used for heating all the buildings in the works; and we have a very efficient steam system. The boiler is of the Cornish type, fitted with Meldrum's furnace. We use all sweepings and breeze for fuel. The boiler-flues are built extra large, so as to give slow travel to the waste gases. The feed water is heated to 180° Fahr.; and this gives great economy. The exhaust steam from the exhauster and scrubber engines, tar-pump, and feed-pump is collected in a cast-iron box 2 feet deep by 18 inches diameter. In this box is fixed a coil of copper tube 1 inch diameter by 20 feet long. This box is placed 2 feet below the feed-water tank, which holds 200 gallons; and the bottom end of the coil is connected to the bottom of the tank, and the top end 2 feet higher up. The water in the tank constantly circulates through the coil, and thereby gets heated. The feed-pump, which is a 2-inch Tangye duplex, is supplied from this tank; and the supply pipe leaves the tank half-way up the side. On this pipe inside the tank two knees are fixed forming a swivel joint. Into this joint is screwed 2 feet of tube; and on the end of this is fixed a T-piece and an 8-inch copper float. The float keeps the T-piece end of the delivery pipe drawing water from the top of the tank; and as warm water is lighter than cold, the pump is always being fed with the warmest water in the tank.

The cold-water storage tank, of 1200 gallons capacity, is on pillars 16 feet high, and is fed through a float-valve from the town mains. From this tank a 1-inch pipe takes the water to the feed tank. This 1-inch pipe is encased in a 2-inch, and then in a 3-inch pipe. The 1-inch pipe is connected to the bottom of the storage tank, and the 3-inch to the same tank 2 feet higher up. The surplus exhaust steam flows through the space between the 1-inch and 2-inch pipes. The cold water flows through the 1-inch pipe, and returns to the tank through the space between the 2-inch and 3-inch pipes, condensing all the exhaust steam, and enters the storage tank very warm indeed. This preliminary heating deposits a large proportion of the solid matter in the water, and helps to prevent the formation of scale in the boiler; also it drives off the gases dissolved in the water, and thereby prevents grooving and pitting of the boiler-plates. To prevent any scale being deposited in the boiler, a small quantity of ordinary treacle is put in the feed water every morning, and the boiler is blown off every two days. The inside never requires chipping. This hot water feed is a great economy; and I think we are saving about 15 per cent. of fuel. All the appliances were fitted up by our staff.

The boiler is worked up to 80 lbs. pressure; and the steam is reduced to 40 lbs. for the works, and to 30 lbs. for the retort-bench. This gives us very dry steam, at a constant pressure, and greatly facilitates the regulating of the engines. All the steam-mains are fitted with expansion-joints; and we have no trouble with steam-joints leaking.

As you know, 1 inch should be allowed for expansion in every 50 feet of steam-pipe; and if not provided for, leaky joints are sure to be the result. The steam-pipes all drain to steam-traps, so as to get clear of condensed water, and thereby prevent water-hammer and burst pipes and joints; and being covered with

non-conducting composition, they give no trouble. The steam used for heating some of the buildings passes through a coil of 1-inch pipe inside the cart-weighing machine; and this keeps it dry and prevents rusting.

The coke-quenching plant consists of two 20-gallon tanks fixed 13 feet high; each tank being fitted inside with a syphon and connected to two copper roses, 15 inches diameter. The stoker pushes the coke-barrow under the rose, and pulls a handle; and the tank empties through the syphon, shuts off automatically, and refills ready for the next barrow.

[The author very fully and skilfully illustrated his remarks by drawings on the blackboard.]

Discussion.

Mr. A. WADDELL (Dunfermline) expressed his pleasure that the members had come to Dunfermline. Referring to the paper, he said that Mr. Chalmers had, he considered, laid a number of most interesting matters before the meeting.

Mr. W. B. M'LUSKY (Perth) said it seemed to him that the seniors in the gas industry were indebted to the juniors for meeting in the way they did, as their gatherings were very instructive. He had been very much struck with the paper read by Mr. Chalmers. What he had brought before the members would be useful to everyone; at all events, there was something in the paper which would be of use to some. He had been able to assemble a good many devices, and had shown them what he had succeeded in doing. He thought that in the method of treating the feed water, and not only economizing steam but preventing nuisance, Mr. Chalmers' contribution to their "Transactions" had been very valuable. The author did not make one point, which was very important. He did not mention how he trapped the grease, which sometimes gave considerable trouble.

Mr. J. D. KEILLOR (Lochgelly) was sure the members all appreciated Mr. Chalmers' paper, and would agree with him that it was unique in more ways than one. He thought the author was entitled to their congratulations for the success of the various devices—they might say his own inventions—employed by him with a view to effecting economy. Economy was a subject to which they had all given serious consideration; and in these days of keen competition it was perhaps more necessary than ever. It was not good enough to say—but he supposed there were some who did say it—that so long as they were able to make large profits to pay high dividends there was no need for anything else. Gas plant was not in such a state of perfection that stringent attention to details was unnecessary. No doubt modern plant was made with a view to economy; and it demanded more careful attention than ever. He would like to ask Mr. Chalmers a question about the size of his purifiers, and how many he had.

Mr. FORBES WADDELL (South Queensferry) said the first thing that occurred to him to do was to congratulate Mr. Chalmers on the clearness and conciseness of his paper. He had certainly done himself credit, and by his blackboard illustrations had made his communication a good deal easier for the members to follow. The simplest arrangement for the hydraulic main overflow would, of course, be the best to adopt; and all the time he had been a gas manager he had used a syphon or a U-pipe to take the tar from the bottom of the main. The liquor never got down to the bottom; there was never any tendency for it to get down underneath the tar. At South Queensferry, five years ago, he fitted up the hydraulic main with a U-pipe; and it was a much simpler arrangement than Mr. Chalmers had mentioned. The liquor overflow and the tar overflow were quite separate; and, in his experience, this worked with absolute reliability. In regard to the arrangement for condensing the mixture of air and steam going to the purifiers, if they considered it necessary that the water should be taken out, it was a very clever idea; but he had this experience, that when he put purifiers into the works at Forfar—they were 18 feet square, and big when compared with the make—he found that it was necessary to introduce live steam into them to get the purifying material warm enough. If they had purifiers of ample size for the make, it occurred to him that the steam heat would be better spent on the material inside the purifier. He was not troubled with the water; it was simply drained off in the ordinary way. If they required to warm up the purifiers, the steam, when it went into the purifiers, would liquefy, and give up its nascent heat. In his experience, this had proved of very great value. [Mr. Waddell, on being requested to do so, sketched on the blackboard his arrangement for the tar and liquor overflow, and mentioned that the relations of the tar and liquor never varied from year to year. He considered that if a simple arrangement could be got, there was no need to have an elaborate one.]

Mr. R. W. COWIE (Dalkeith) said Mr. Chalmers had been very considerate with the members in the matter of time, because no doubt he had at Alva quite a number of other appliances and arrangements which he could have shown them, and in which they would have been as much interested as they had been in those he had brought before them. He had had the pleasure of going through the Alva Gas-Works more than once, when the various appliances had been pointed out; and on no occasion did he find any of them sticking. Whatever system of working they adopted, they had to make it suit their existing connections; and Mr. Chalmers had shown his genius by, wherever he found a natural law, bringing it into play, in his arrangements.

The President added his appreciation of Mr. Chalmers' paper. He said it was one which had the merit of appealing to the mem-

bers in this respect—that they all had similar problems confronting them at some time or other; and Mr. Chalmers had proved to them that if apparatus were effective it was not necessary that it should be elaborate or expensive. In fact, he clearly made out a case for the home-made article; and if a gas manager could save many pounds by the exercise of a little ingenuity in utilizing a waste product, such as exhaust steam, he would be appreciated. Mr. Chalmers had shown them a method of flushing the hydraulic main by which the pitching of the tar was prevented; and he was to be congratulated upon the arrangement. In this respect he (the President) considered Mr. Chalmers was ahead of many larger works. The idea of injecting air into the purifier, in conjunction with the heating of the water, was an ingenious one. He fancied it would be easy to adopt the same principle in supplying water to a boiler. He would add that they had greatly appreciated Mr. Chalmers' drawings on the blackboard. It said much for him that he had gone out of the beaten track in the matter of illustrating his paper. He asked the members to give Mr. Chalmers a very hearty vote of thanks for his paper.

Mr. CHALMERS thanked the members for their vote. He said he had absolutely no trouble in getting quit of the grease in the water. The exhaust at no time came into contact with the feed water. His purifiers were 15 feet square and 5 feet deep. Originally built to contain four layers of lime, each 1 foot deep, he now used only two layers of oxide, each 2 feet deep. He had never found it necessary to heat up the purifiers in any way to get the requisite purification. He once, by way of experiment, connected a steam-pipe with a purifier, put in a very small quantity of steam, in a short time took off the purifier, and found that the bottom layer of the material was like mud, and was causing back-pressure. He therefore did not require any steam at all. He found that, with the air entering at the inlet and oxidizing the iron, there was sufficient heat to do all that was wanted in the purifier. The only difference between his method of providing for the overflow from the hydraulic main and that described by Mr. Waddell was that the flushing-tank was fitted on to one end of the main, the liquor overflow at the far end, and the tar overflow one-fourth of the distance along. The liquor running in gave a flow of liquor to the far end of the main; and at the same time, if they should be working with wet coal or at high heats, and less tar was being formed, he found that, using a tar overflow adjusted as low as 2 inches down, the liquor was apt to overflow, but by using the liquor flushing-tank it was made sure that the thing could not become unsealable.

Mr. M'LUSKY added that he thought there was nothing better than a column—a plain pipe standing at the end of the main, with all the tar gathering into it. It could be cleared out twice a week; and there would be absolutely no thick tar in the main at any time.

At the close of the discussion,

The President intimated that the Council agreed to vote £5 towards the purchase of books for a circulating library. Mr. Herring had sent two books of his own—"The Granton Gas-Works" and "The Construction of Gas-Works"—and had promised others. They expected the library to be ready for use by the members in about a month.

The visitors were entertained at "high tea" in the Royal Hotel. The President expressed their thanks to the Corporation of Dunfermline for allowing them to visit the gas-works, and for the hospitality which had been extended to them.

Establishing a Gas and Fuel Testing Laboratory at Vienna.

It is announced by the Board of Education in Vienna that a laboratory is being established at the Technical College at Vienna for the investigation of gas-lighting appliances, fuels, and heating plant. Its establishment is the result of representations made by the Association of Gas and Water Engineers of Austria-Hungary; and it will be attached to the Chair of Chemical Technology in the College, and will therefore come under the supervision of the Professor, Baron von Jüptner. The laboratory will be equipped with all necessary apparatus of the most recent type; and the work to be undertaken is intended to include the testing and photometry of burners and lamps of all kinds, the making of analyses for gas-works, and investigations for controlling the working of plant on gas-works which do not possess their own chemists, as well as the carrying out of exhaustive trials of new apparatus and new inventions relating to methods of lighting other than electrical. Heating appliances, especially gas-fires, will be examined, and fuel testing of all kinds for the control of furnaces will also be undertaken. The fees chargeable for the tests are to be low; and the hope is expressed that, accordingly, the services of the laboratory will be freely utilized, and that abatement of the smoke nuisance and economy of fuel may consequently be achieved as a result of its activities. As an experimental works, it is intended to work on the same lines as the experimental works of the German Association of Gas and Water Engineers at Karlsruhe. It will be provisionally established in old buildings of the Technical College; but when the re-building of the Chemical Institute is completed, there will be accommodation for the laboratory in that. The experimental works and laboratory will be under the immediate charge of Professor H. Strache. It is anticipated that the laboratory will commence work before the end of the present year.

REGISTER OF PATENTS.

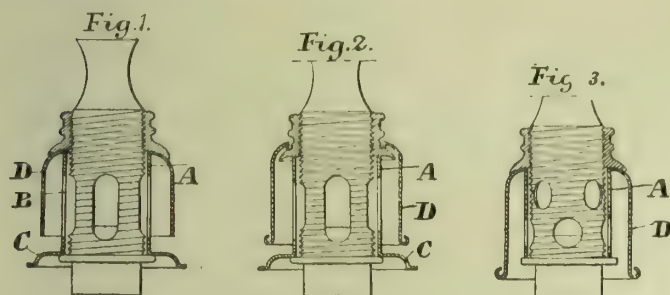
Burners for Incandescent Gas-Lamps.

LECOMTE, J. M., and ROY, M., of Paris.

No. 21,669; Oct. 13, 1908.

Under this invention, the perforated sleeve around the inlet pipe is secured in position by a nut screwed on to the lower screw-threaded part of the mixing-tube. This nut presses the sleeve downwards and holds it firmly on the flange of the injector, in such a manner as to prevent it from rotating.

Three forms of the burner are illustrated.



Lecomte and Roy's Incandescent Burner.

In fig. 1, the lower part of the mixing-tube is cylindrical in form, and is externally screw-threaded. It is perforated with holes for the admission of the air and surrounded by a sleeve A with a smooth body formed with corresponding perforations B, and which at its base comprises a milled washer C of large diameter. The lower edge of the sleeve rests upon the flange of the gas-nozzle, which is screwed into the base of the mixing-tube. A bell-shaped part D rests on the upper edge of the sleeve, and serves to conceal the holes in the sleeve, upon which it is held by a milled nut. The nozzle being screwed home and the nut being slackened, it is possible to regulate the air admission with precision by turning the sleeve by means of the washer C; and without releasing the washer, the nut is tightened so as to hold the regulating sleeve in place.

Fig. 2 shows that the bell D, instead of being held between the sleeve A and the nut, rests freely upon the latter. In this case, the bell can be touched without risk of disturbing the adjustment.

Fig. 3 represents a burner, the sleeve of which forms an integral part of the bell.

Purifying Gases Generated by Dry Distillation, and Obtaining Bye-Products Therefrom.

BURKHEISER, K., of Aix-la-Chapelle.

No. 21,763; Oct. 14, 1908. Date claimed under International Convention, Oct. 14, 1907.

This invention relates to improvements in the process described in patent No. 20,920 of 1908—see "JOURNAL," Nov. 2, p. 326. Substantially, that process consists in conducting the gas, after the separation of the tar, over a heated, continuously or intermittently regenerated oxidizing agent, so that the sulphuretted hydrogen is oxidized, to produce anhydrous sulphurous or sulphuric acid, which reacts with the nitrogen compounds to produce thio-ammonium salts. For the separation of the tar, or the greater portion of the tar, it is necessary to considerably cool the crude gas; and this causes a liquor to be deposited which contains a great amount of ammonia; also the so-called "fixed" ammonia—i.e., ammonia combined with the acids (sulphuric and hydrochloric) present in the crude gas.

One object of the present invention is to recover this precipitated ammonia and incorporate it with the gas mixture to be treated by the process referred to; but no general claim is made to the recovery of ammonia from ammoniacal liquor by means of a stream of gas passing through the liquor to the purifier. Another object of the invention is to secure more effective or complete reaction of the anhydrous acid with the ammonia.

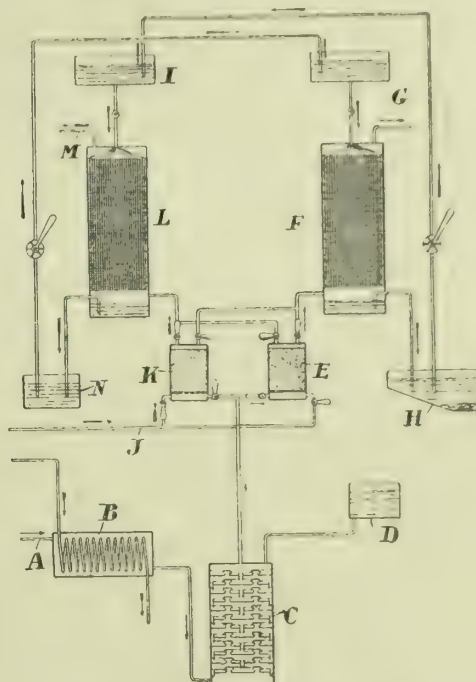
Several means of effecting these objects are described. One method of recovering the ammonia from the precipitated liquor consists in treating the liquor in the usual manner in a distilling apparatus, with steam and lime, and adding the vapours generated to the gas mixture. A modification of the method consists in separating the ammonia without steam, and charging therewith the crude gas or the air or oxygen used for regenerating the oxidizing agent. By this means, the carrying of a considerable quantity of water, and the presence of residual liquor, are avoided. For this purpose the ammoniacal liquor is heated in a suitable apparatus (distilling column), if necessary with milk of lime, or in the presence of some other substance adapted to decompose the fixed ammonia. Air, oxygen, coal gas, or coal gas mixed with air or oxygen, is then passed through the liquor, and becomes charged with ammonia, whereupon it is added to the gas to be treated in the oxidizing chamber.

In carrying out the process on a large scale, the heat of reaction is not sufficient to preserve the required temperature, so that continuous heating is necessary, and the requisite heat is preferably carried by the stream of ammonia-laden air, oxygen, or gas. If desired, the whole of the ammonia may be purposely separated before the gas passes to the oxidizing agent—for example, by means of a scrubber—and may then be re-added to the gas, with a stream of air. This method may be convenient where ammonia washers and the like are already available when the process is adopted.

A modification of the process, with intermittent regeneration, con-

sists in bringing the streams of gas and air alternately into contact with a washing liquid after passage over the oxidizing agent, so that the liquid alternately absorbs constituents from the gas and the air. During the passage of the gas over the oxidizing agent, the sulphur combines with the iron, and the gas carries free ammonia into the washing liquid. During the passage of the air over the oxidizing agent and sulphur compounds, anhydrous acid is formed; and this acid is then carried to the liquid. The ammonia carried by the gas and the acid carried by the air are both given off to the washing liquid, and combine therein. The washing liquid gradually becomes saturated with thio-ammonium salts, without containing at any stage of the process any great excess of free acid or ammonia. The slight alternate excess of acid and ammonia renders the liquid more capable than pure water or the like of absorbing the ammonia and acid.

To allow of continuous working with intermittent regeneration, separate chambers containing oxidizing agents are preferably used, with a washer for each; and the washing liquid is kept in continuous circulation through both washers. Each chamber is alternately traversed by air and coal gas; air passing through one chamber while coal gas passes through the other. The gas and air are separately treated in the washers; but the circulation of the liquid brings the acid and ammonia together. While the gas is passing out of one washer, for further use, the residual nitrogen is passing out of the other washer into the atmosphere. When the oxidizing chambers are changed the washers are also changed, so that the process is continuous.



Burkheiser's Dry Distillation Purifier.

Apparatus for carrying out the process in this manner is diagrammatically illustrated.

The coal gas, free from tar, flows by the pipe A into a chamber B, heated by a steam-pipe. Thence the gas flows into a distilling apparatus C, in which it absorbs ammonia from ammoniacal liquor supplied from a tank D. The gas then flows into the oxidizing chamber E, and thence to the washer F. In F the ammonia is washed out of the gas by liquid flowing from a tank G; and this liquid then flows to a tank H, whence it is pumped to a tank I.

While the gas is being treated in this manner, air is flowing from the pipe J into the oxidizing chamber K, where it becomes laden with acid, and thence to the washer L, from which the residual nitrogen is discharged at M. The liquid flowing from the tank I, through the washer L, absorbs the acid, and then flows to the tank N, whence it is pumped to the tank G.

When the oxidizing agent in the chamber E has become more or less saturated with sulphur, the functions of the chambers K E are reversed by closing the respective cocks and opening others.

The proportion of acid to ammonia can be regulated. If the proportion of sulphuretted hydrogen is higher than required for furnishing the amount of acid capable of reacting with all the ammonia present, part of the acid-laden air may be separated and discharged into the atmosphere, or used for a separate purpose. If the quantity of acid is too small, additional acid from another source may be introduced into the washing liquid. Any kind of washing apparatus may be used, provided that the gas and air are brought into intimate contact with the liquid, either by causing the finely-divided liquid to act on the stream of gas or air, or by dividing into fine streams the gas or air, and causing it to pass through the liquid.

If the ammonia is taken from the ammoniacal liquor by the stream of air which is used for regenerating the oxidizing agent, the process of regeneration is accompanied by the formation of thio-ammonium salts, which are subsequently absorbed by the washing fluid. In this modification of the process, the whole of the ammonia may be separated by any suitable means from the crude gas, and then added to the regenerating air. In this case, the passage of the gas over the oxidizing agent is accompanied only by the combination of the sulphur with the iron. When the ammonia-laden air passes through the chamber, the sulphur is oxidized, and the sulphurous anhydride combines with the ammonia. The ammonia which remains free is absorbed by the washing liquid; and any residual acid in the oxidizing chamber is carried out by the stream of gas which follows the stream of air.

Treating Tar to Facilitate Subsequent Distillation.

GUTENSOHN, A., of Pigot Street, E.

No. 21,800; Oct. 15, 1908.

This invention relates to treating gas tar with a solution of chromic and sulphuric acids; the action of the acid solution when the tar is mixed into it creating a sufficient degree of heat by oxidation within the body of the tar to cause the light oils—such as benzol and benzoline—to distil off.

The proportions of the acids and tar employed in the process are as follows: One part by weight of chromic acid is dissolved in two parts by weight of water, so as to form a strong solution which is left to settle for twenty-four hours, and then there is gradually added to the solution 2 per cent. by weight of concentrated sulphuric acid. Then there is added gradually to 100 lbs. of the acids solution about two-thirds of its weight of gas tar and the whole stirred up. The result of this treatment of the tar before the usual heat distillation for the extraction of the heavy oils and the recovery of the pitch, is said to be that the light oils pass off in fumes and are in a very pure state when condensed. After the light oils cease to pass off, the solution is drawn off, which removes from the tar the cause of its bubbling over during distillation. The pitchy residue is then distilled by heat at a lower temperature—say, one-third less—than is usually employed in the distillation of gas tar, so as to recover the heavier oils. The pitch then obtained is "of a high quality and better suited for waterproofing textile material, being somewhat elastic."

A modification of the above process (to enable a weaker solution to be used) is as follows: Chromic acid is diluted with hot water to give a strength of about 10° Beaumé, and then sufficient sulphuric acid is added until the solution reaches 12°. Then the tar is gradually run into the solution, keeping the whole stirred up. The vessel holding the solution and tar is then closed and left without further disturbance for about twenty hours. Various constituents of the tar will have then become absorbed into the acid solution, and others will be suspended in it, all of which are carried off by the solution when it is withdrawn—the pitchy residue being pressed to recover any solution it may hold. The solution is then passed into a suitable still and subjected to distillation at low heat—varying up to 212° Fahr.—by which the highly inflammable oils (benzol and benzoline) held in the solution pass off as vapours and are conducted to a condenser.

If the treated tar is found not to have given up the whole of its light valuable constituents, it is only necessary to heat the pitchy mass to a sufficient degree of heat to drive them out and conduct them to a condenser. The pitchy mass is then heated up to 300° Fahr., which converts it into a "very high quality pitch."

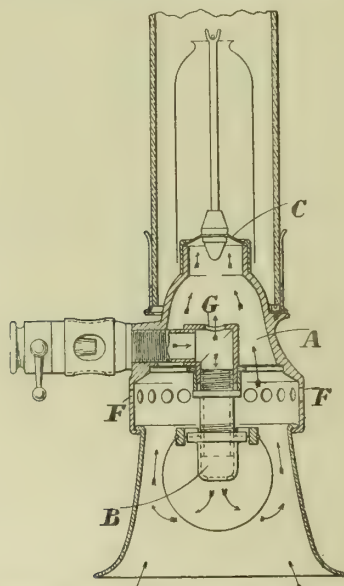
The solution, after the above treatment, may either be treated to recover the chromic acid in the usual way by heat or be boiled to dryness, and the residue calcined, which gives a "valuable green pigment free from arsenic."

Gas-Burners.

WARDLE, G., of Lever Street, E.C.

No. 21,961; Oct. 17, 1908.

The object of this invention is "to utilize the spent gases resulting from the combustion of gas in one incandescent burner, or sets of burners, by conveying the gases into a mixing, distributing or regulating, or diffusing chamber of another incandescent burner, or sets of burners, where they are revived or regenerated and rendered recom-bustible by the ultimate and intimate admixture with a small incoming supply of gas or any other inflammable vapour mixed with air."



Wardle's Combined Vertical and Inverted Gas-Burner.

The illustration shows the application of the invention to a double incandescent gas-burner.

A is the intermediate mixing-chamber and B and C ordinary inverted and vertical incandescent burners. Gas is led to the inverted burner from the mixing-injector E and burner-tube attached. The chamber A is dome-shaped, and is so arranged in relation to the inverted burner that the whole of the products of combustion pass up into the chamber, where they are again mixed with additional air from the inlet openings F and gas from the orifice G. The products of combustion are thus "recarburetted, regenerated, or revived in the mixing-chamber by the

addition of a small percentage of fresh gas and air; and they then pass upwards to be utilized and consumed afresh in the vertical burner."

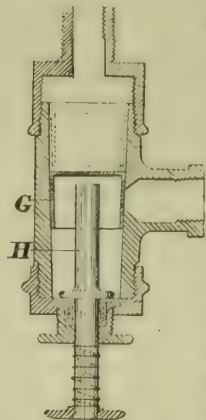
The advantages of the invention are said to be "manifest, inasmuch as two or more incandescent burners can be worked economically with only the gas consumption of one burner (necessary to produce the initial spent gases) plus a small jet of gas and air or gas supplied to each additional burner for the purpose of revivifying and regenerating and rendering combustible the spent gases to be consumed."

Automatic Closing Valve for Gas.

M'CARTHY, M., of Cardiff, and M'CARTHY, P., of Blaengwynfi.

No. 22,477; Oct. 23, 1908.

This automatic cut-off for gas consists of a valve which is opened by hand and shuts automatically when the gas pressure is decreased or withdrawn.



M'Carthy's Valve.

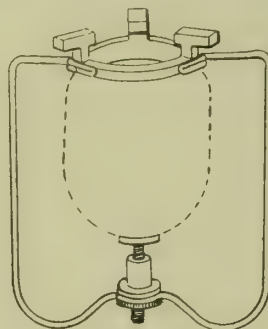
It consists of a conically bored cylinder or chamber attached to the gas-pipe or bracket by an ordinary branch about the centre. A thimble G (which operates as a valve and is conical shaped) completely blocks the passage of gas from the gas-pipe and closes the inlet port. To connect the gas, the jet is opened in the ordinary way and a rod H, which passes through the bottom cover and stuffing box, is pressed up so that the top end of it touches the head of the thimble on the inside sufficiently to raise it from its seating. Immediately the thimble is raised, the gas is allowed to pass between the cylinder and thimble through the inlet, and at the same time the pressure of gas underneath the head of the thimble keeps it in a floating position in the upper part of the chamber, as shown by the dotted lines. Gas meanwhile passes between the outside wall of the thimble and the inside of the cylinder—eventually flowing through the top outlet to the burner. When the gas is turned off, the thimble instantly drops into position in the chamber, shutting the inlet port, and thereby preventing the escape of gas from the fitting until pressure is again exerted on the head of the rod, causing it to fall back to its original position by the assistance of a spring around the rod.

Supporting Inverted Incandescent Mantles.

BEAL, W., of Birmingham.

No. 141; Jan. 4, 1909.

This mantle-support is formed of wire (as shown) so shaped as to clip on to the refractory ring at the top of the mantle and to extend down below it. The wire portion carries a central vertical adjusting screw with a dished head immediately underneath the central part of



Beal's Inverted Mantle Support.

the bottom of the mantle and touching, or almost touching, it. The mantle is thus supported in case of fracture, and the lower part of the mantle is prevented from falling away.

Vertical Retorts.

ROBERT DEMPSTER AND SONS, LIMITED, and TOOGOOD, H. J., of Elland.

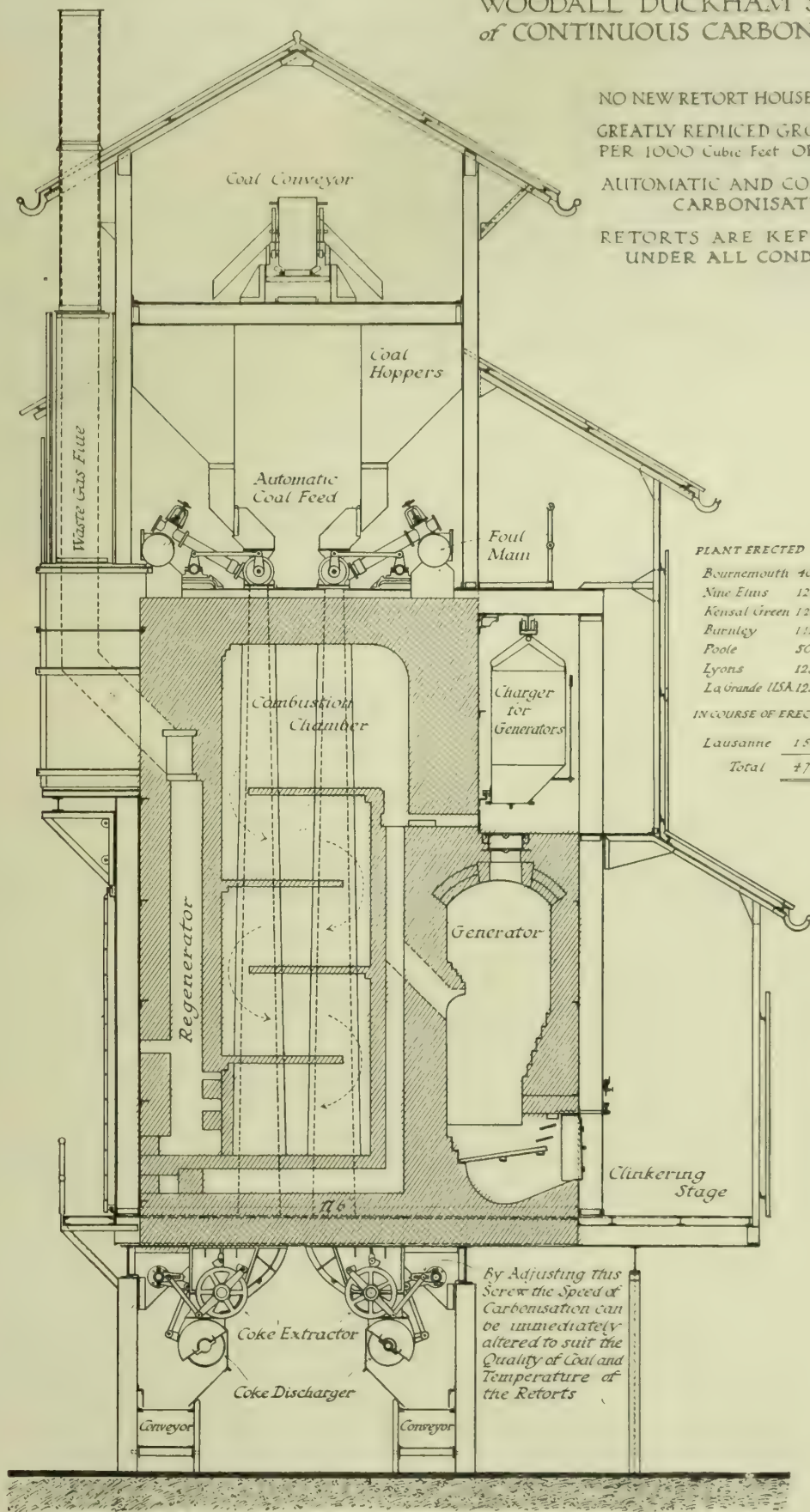
No. 28,201; Dec. 28, 1908.

This invention relates to intermittent vertical retorts, in which the charging is effected in a single operation; and concerning it, the patentees say: "It is well known that, in such a retort, during the process of carbonization, the charge of coal becomes less porous at certain stages of carbonization; so that the gas produced in the lower portion of the retort has a difficulty in reaching the outlet. For this reason, it has been proposed to provide the lower end of the retort with a separate auxiliary outlet; and it has also been proposed to make two retorts in one fire-clay block having a common outlet arranged between them—the retorts thus formed being charged and discharged simultaneously. We consider, however, such an auxiliary outlet would be very liable to become choked, and would then be difficult to clear."

They therefore propose to form a passage from the bottom mouthpiece of each retort to the bottom mouthpiece of the retort facing it in the next row; this passage being controlled by a valve or seal arrangement which is closed or sealed during the charging and discharging of either retort, but open at other times. Then, supposing the charge in the first retort to have been in for (say) four hours (or about half the time required for carbonization), and the charge in the second retort to be newly put in, the respective charges in different stages of carbonization will be also of different porosities, and the gas from either retort takes the path of least resistance to either outlet, whereby the yield of gas is increased and its quality improved or rendered more uniform.

WOODALL DUCKHAM SYSTEM
of CONTINUOUS CARBONISATION

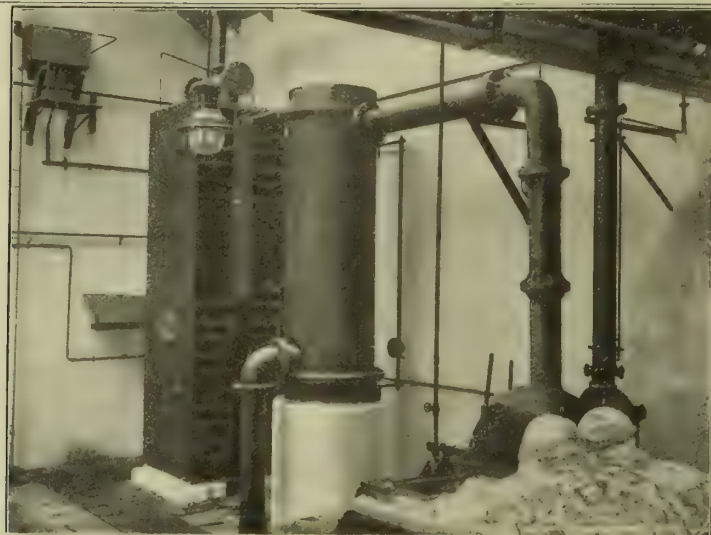
NO NEW RETORT HOUSES REQUIRED
GREATLY REDUCED GROUND SPACE
PER 1000 Cubic Feet OF GAS MADE
AUTOMATIC AND CONTINUOUS
CARBONISATION
RETORTS ARE KEPT CLOSED
UNDER ALL CONDITIONS



PLANT ERECTED	
Bournemouth	400,000 cubic feet per diem
Nine Elms	125,000
Kensal Green	125,000
Barnley	1125,000
Poole	50,000
Lyons	125,000
La Grande USA	125,000
IN COURSE OF ERECTION	
Lausanne	1,500,000
Total	4,700,000

— CROSS SECTION —

For Full Particulars apply to
WOODALL & DUCKHAM LTD.
168, PALACE CHAMBERS
WESTMINSTER, S.W.



W. C. HOLMES & Co.,

LONDON,
And Whitestone Iron Works,
HUDDERSFIELD.

SULPHATE OF AMMONIA PLANT
recently erected at
WALLASEY GAS-WORKS.

NOTICE.

Full Particulars regarding the MERRIFIELD-WESTCOTT-PEARSON
Water Gas Plants may be had on application to the Patentees at

19, ABINGDON STREET, WESTMINSTER, S.W.

The "FARRINGDON" Indoor Lamp.

ABSOLUTELY SATISFACTORY.

SIMPLICITY ITSELF.

No Inner Cylinders required.
White Enamel Steel Case,
Relieved with Gold Lines.

Fitted with Gas Adjusters and Air Regulators to Burners.

Lighting Power about
125 c.p. per Burner.

Consumption about
4 c. ft. per Burner per Hour.

Price complete.

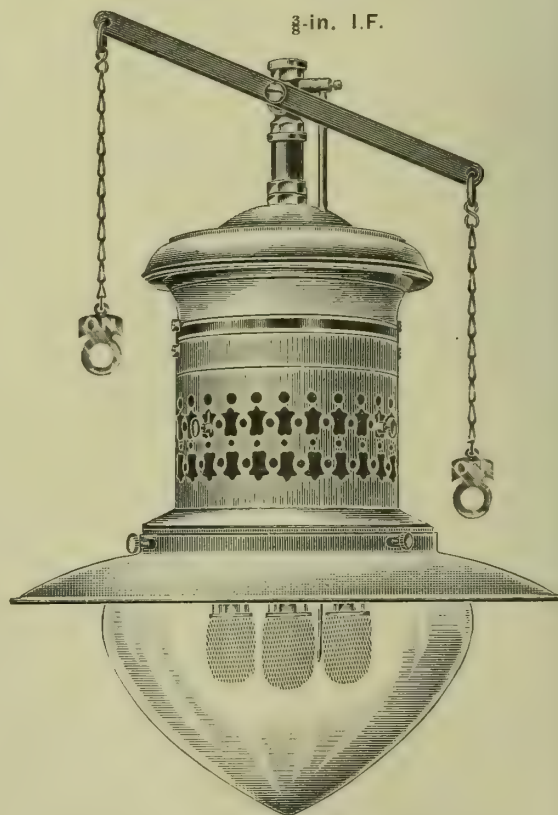
12425. With Bye-Pass Lever Cock and Chains,
Clear Monopel Globe and "Glasmir" XX Mantles.

2 Light **32**\$. each, *sub.* 3 Light **35**\$. each, *sub.*

12426. If with 15-in. White Enamelled Reflector
as shown.

2 Light **35**\$. each, *sub.* 3 Light **38**\$. each, *sub.*

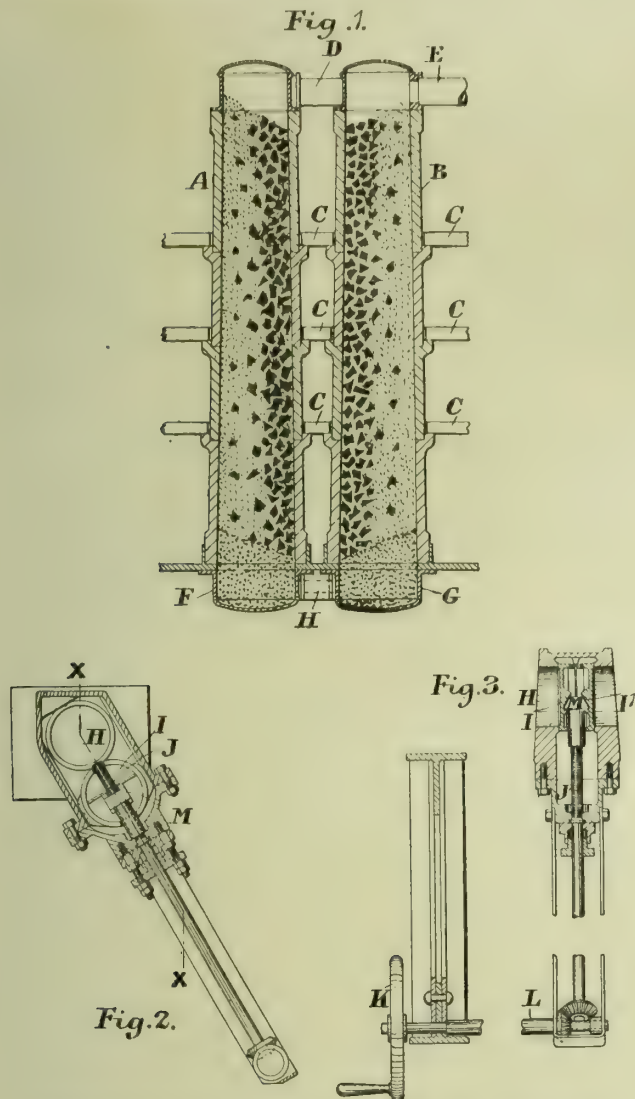
Subject to our usual Discount.



No. 12426. Length over all, 24 inches.

J. & W. B. SMITH, 17-23, Farringdon Road,
LONDON, E.C.

The arrangement is especially useful in conjunction with the method of feeding vertical retorts described in Patent No. 19,437 of 1908, in which the coal fed into the retorts is arranged in separate columns, concentric or side by side—the nuts predominating in one column and the slack in another column.



Dempster and Sons and Toogood's Vertical Retort Arrangement.

Fig. 1 shows, in vertical section, a pair of retorts A B, each of which may be built in four or other number of tubes united by spigot and socket joints; the floors or partitions C dividing the setting resting upon the sockets in such manner as to allow for independent expansion of each tube. The retort A has the usual outlet pipe D; and the retort B the usual outlet pipe E. The bottom mouthpiece F of the retort A is connected to the bottom mouthpiece G of the retort B by a passage H, capable of being closed at will by a valve or other seal—such mouthpieces being preferably filled with coke in the usual manner before the introduction of the charge of coal.

Figs. 2 and 3 illustrate, in section, a device for controlling the passage H. Fig. 2 shows the passage open, and fig. 3 the passage closed—the latter figure being a section taken on the line X of fig. 2. This device comprises a double disc valve I actuated by the stationary screw-threaded spindle J rotated by bevel-gearing from the hand-wheel K at the front of the bench. The spindle is inclined so as to allow the shaft L to be placed in such a position as to avoid interference with the discharging of the retorts. A tapered or conical head M may be employed to force the two discs I I' outwards when closing the valve, so as to secure a tight joint; the withdrawal of the head easing the discs during the operation of opening the valve.

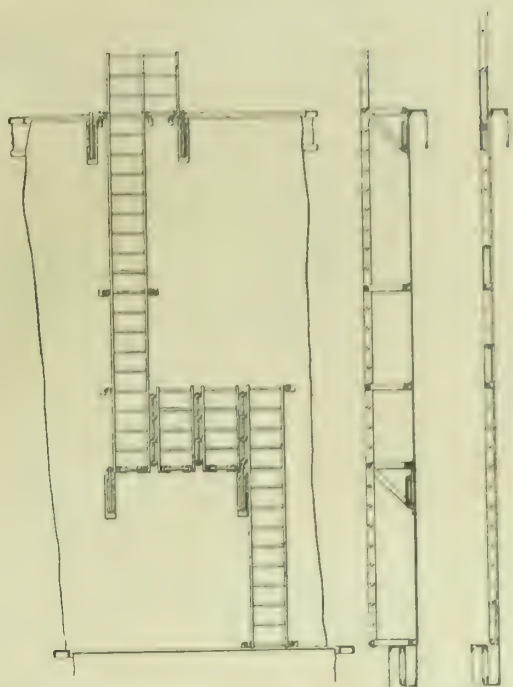
Ladders for Gasholders.

Downs, J. H., of Dipton, and Wright, H. F. (C. & W. Walker), of Donnington.

No. 9484; April 21, 1909.

The object of this invention is to provide gasholders with ladders, which will allow men to pass up and down them and between them and the sides of the lifts, and which can be folded up against the sides of the lifts when not in use. The ladder proper is connected to the lift of the holder by links, hinged respectively to the lift and to the risers of the ladder. Struts are also hinged to the risers; the other ends of the struts being capable of rising and falling in guides which constitute supports for the struts when the ladders are in position for use.

The ladder may be in one length, or it may be in lengths in different vertical planes and with short lengths affording means for passing from one length to the other as described in patent No. 9482 of 1909. The risers of the ladder have hinged links to them and to projections fixed to the lift of the holder. Hinged also to the risers are struts, the inner ends of which are provided with pins to engage slots in guide-



Downs and Wright's Collapsible Gasholder Ladders.

pieces secured to the lift of the holder. When the ladder is in position for use, these pins rest on the lower ends of the slots and act as diagonal supports for the ladder; the links acting as horizontal supports. When the ladder proper is folded up, the pins rise in the slots and the parts take up the folded position shown in the last illustration. The ladder may be operated to bring it to its position for use (and its folded position) by any suitable arrangement—such as a hand lever with cranks and rods, or wire ropes, or chains—after the way, for example, in which railway signals and points are operated. The parts of a ladder arranged as shown constitute practically one ladder as far as folding and extending for use are concerned, because all the parts, being connected as shown, will be folded and extended simultaneously.

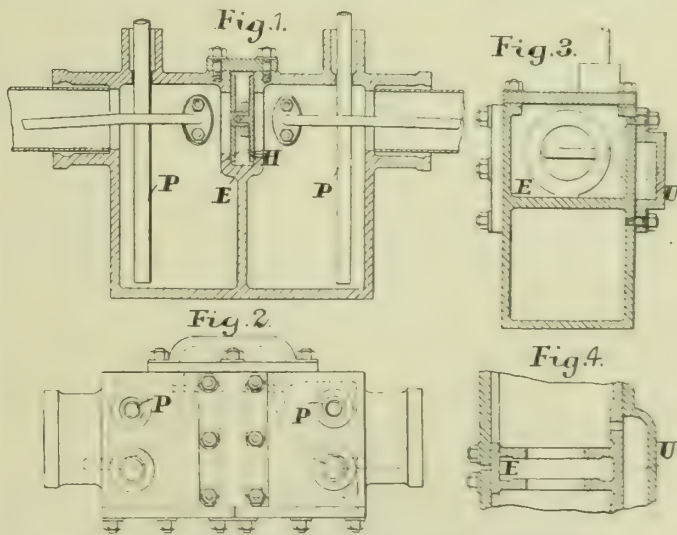
A modification has the treads formed by pieces hinged to projections fixed to the lift of the holder and formed next to their inner rounded ends with a flat part bearing on a projection fixed to the lift of the holder. The treads are connected by a wire-rope or chain, and can be folded and extended by any suitable means.

High-Pressure Gas-Mains.

WADDELL, A., of Dunfermline, and the BRYAN DONKIN COMPANY, LIMITED, of Victoria Street, S.W.

No. 10,941; May 8, 1909.

In the distribution of gas under high pressure, the patentees point out, it is desirable to provide means for enabling lengths of main to be tested, for trapping condensation liquid at intervals throughout the main for removal when necessary, and for governing the compressing pump so that it maintains the required minimum pressure at any portion of the main—preferably the least adequate, which is likely to be some distant portion of the main. Accordingly, at suitable intervals



Waddell and Donkin's High-Pressure System Junction Boxes.

throughout the main, they provide junction boxes connecting sections of the main, each having a partition formed with an opening which can be closed by the insertion of a valve or stopper when testing, a condensation liquid blow-off pipe from the bottom of the chamber on each side of the partition, and a passage from side to side of the partition forming a communication between lengths of small-bore tubing arranged in the mains and serving to transmit the gas pressure from a distant part of the main to the operating device of the throttle-valve or other controlling device of the compressing pump engine.

Fig. 1 shows, in vertical section, a junction box made according

to this invention—similar to fig. 4 of the illustration that was given in the "JOURNAL" for Aug. 3 (p. 325) in connection with Mr. Waddell's North British Association paper. Fig. 2 shows the junction box in plan. Figs. 3 and 4 are sections. The junction box consists of a casting, the end walls of which have cast on them outwardly projecting faucets adapted to receive the ends of the main pipe sections. Midway between the end walls, the box is formed with a transverse partition that extends from the top to the bottom of the box, and the upper portion of which is formed with double walls, which, with the side walls of the box, constitute a chamber E normally in free communication with the chambers of the box at each side of the partition through holes formed in the partition walls—the diameter of the holes corresponding to the bore of the mains, so as to avoid throttling of the gas. The upper end of the chamber E is closed by a removable cover; and in order to isolate a section of the main, for testing purposes or otherwise, the cover can be removed and a valve or stopper H inserted to close the holes of the partition.

In the construction shown, this stopper comprises two plates adapted to rest in a gas-tight manner on fixed beads surrounding the holes. A centrally arranged pin on one plate extends into a guide sleeve on the other plate; and for the purpose of forcing the plates against the faced beads, the sleeve is externally screw-threaded, and on it is fitted a nut that can be screwed against the back of the other plate.

The faucets are arranged near the top of the box, so that at each side of the partition a condensation liquid trap is formed from which the liquid can be blown out at intervals through vertical pipes P. The pipes R are of small bore, and contain gas under the pressure existing at a distant portion of the main—communicating with the governing device of the gas-compressing pump-engine. The pipes at each side of the partition are placed in free communication with each other through a bye-pass passage U constituted by a shallow box-like casting fixed in a gas-tight manner to the side of the main box. Each end portion of the pipe is connected to the inner wall of the box in line with a hole communicating with the passage U, by means of a flange and studs and nuts, or by a loose union. To enable these studs and nuts to be manipulated, the opposite side of the box is formed with openings that are closed by removable covers.

APPLICATIONS FOR LETTERS PATENT.

- 25,052.—CLEGG, D. T., "Gas-retorts." Nov. 1.
 25,063.—LOGAN, H. T., "Mantles." Nov. 1.
 25,081.—GAS-LATERNEN-FERNZÜNDUNG SYSTEM DR. ROSTIN, G. M. B. H., "Gas lighting apparatus." Nov. 1.
 25,101.—HARRIS, H. W., "Lighting and extinguishing gas." Nov. 1.
 25,104.—ROBIN, J. T., "Packing mantles." Nov. 1.
 25,123.—BREITKREUZ, R., "Valves for water-pipes." Nov. 1.
 25,142.—HUME, G. W., "Gas-controllers." Nov. 1.
 25,150.—MASCHINEN-UND ARMATURENFABRIK VORM. H. BREUER AND CO., "Three-way pipes." Nov. 1.
 25,162.—TRUEMAN, T., and RENOUF, P. L., "Two-way taps." Nov. 2.
 25,187.—NEWHOUSE, W. A., and FITMENTS, LTD., "Atmospheric burners." Nov. 2.
 25,197.—LEATHER, J. P., "Burners." Nov. 2.
 25,257.—MIEVILLE, H. C., "Carburetted air." Nov. 2.
 25,261.—MÜLLER, R., "Nozzles for burning gas." Nov. 2.
 25,287.—BEST, W., "Regulating the gas supply to burners." Nov. 3.
 25,298.—CHAMBERS, W. A., and BOOTH, W. H., "Production of gas from hydrocarbon oils." Nov. 3.
 25,299.—FRITCHARD, F., "Contacting of vapours and gases with liquids and the like." Nov. 3.
 25,302.—DEMPSTER, R., AND SONS, LTD., and TOOGOOD, H. J., "Coke trucks, barrows, or conveyors." Nov. 3.
 25,339.—CHAMBERLAIN, C. W., and MAYHEW, E., "Gas-burners." Nov. 3.
 25,360.—SIMONIN, H., "Utilization of materials employed for purifying illuminating gas." Nov. 3.
 25,392.—POOLEY, H., "Taps or switches for gas-lights." Nov. 4.
 25,393.—POOLEY, H., "Gas brackets or chandeliers." Nov. 4.
 25,460.—PETTIGREW, G., "Sulphate of ammonia saturator." Nov. 4.
 25,474.—GLASGOW, A. G., "Water-gas apparatus." Nov. 4.
 25,496.—GARDNER, F., and EMMONS, F. J., "Meter lock." Nov. 5.
 25,574.—DIER, F. F., and WHITCHER, W. C. W., "Electric gas-lighters." Nov. 5.
 25,584.—SMITH, S., AND SON, LTD., and CAHILL, D., "Liquid meters." Nov. 5.
 25,617.—WILLIAMS, J., "Fluid motor or pump." Nov. 6.
 25,618.—SÜSSMANN, H., and MAYER, M., "Inverted high-power incandescent gas-lamp worked by compressed gas or compressed air." Nov. 6.
 25,660.—HANSFORD, J., and WRIGHT, A. C., "Gas-governors." Nov. 6.
 25,661.—ALLEN, T. G., "Acetylene generators." Nov. 6.
 25,679.—DURANT, H. T., and METALS EXTRACTION CORPORATION, LTD., "Bringing a gas into contact with a liquid." Nov. 6.

Gas Shareholders on a Lighting Committee.—In the course of a discussion by the Bideford Town Council on the appointment of the Committees for the new municipal year, Mr. Heywood called attention to the fact that Mr. Clement, who was nominated for election on the Lighting Committee, was a shareholder in the Gas Company. He said he had himself been left off that Committee in previous years because he was an owner of shares in the Company. A resolution was then moved that both Mr. Clement and Mr. Heywood be appointed members of the Committee. Alderman Metherell, in supporting it, said he did not think the pecuniary interests of these gentlemen as shareholders in the Gas Company would clash with the interests of the town; and he was sure both would study the ratepayers. Both gentlemen were unanimously elected members of the Committee.

LEGAL INTELLIGENCE.

CONSTRUCTION OF UNAUTHORIZED WATER-WORKS.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Monday, Nov. 8.

(Before Lords Justices VAUGHAN WILLIAMS, BUCKLEY, and KENNEDY.)

Attorney-General v. Barnet District Gas and Water Company.

As briefly recorded in the "JOURNAL" last week, judgment in this appeal, which was argued before their Lordships on the 19th ult. (see ante, p. 264), was given on the above-named day.

Lord Justice VAUGHAN WILLIAMS said in this case he had the disadvantage of not agreeing with his brethren. It was an appeal by the defendants against the judgment of Mr. Justice Ridley, giving a decision for the plaintiff, the Attorney-General, on the relation of the Marquis of Salisbury, and granting an injunction restraining the defendants from constructing, on a piece of land at Colney Meath, a well or other works for the purpose of raising, collecting, or storing water, and carrying it away for the general purposes of their undertaking. The defendants asked that judgment should be entered for them, or, alternatively, that there should be a new trial. The case of the Attorney-General was that the defendants would be acting *ultra vires*, and beyond the powers of their Acts of Parliament, under which they were authorized to construct water-works, if they sank the well in question, and executed the works connected therewith. The case for the defendants was that, under their Special Act of 1904, authority was given to them to sink a well and execute the works in question. For the Attorney-General, it was urged that all the defendants were empowered to do was to take water from the authorized water-works shown on the deposited plans. If, in connection with these works, and ancillary to them, they wanted to sink a well, they might do so; but they were not entitled, because they had power to purchase land by agreement, to go and purchase land in any part of their area of supply and dig a well there. The defendants relied on section 10 of the Act of 1904. Having read the section, his Lordship said it would be seen that the power to purchase land by agreement (in addition to any land authorized to be purchased by the Acts of 1872, 1883, and 1887, and the land in the parish of Shenley) was limited to land not exceeding 15 acres within the limits of supply. The powers given in respect of such lands were these: "The Company, may, on all or any of such lands, execute, for the purpose of, or in connection with, the water-works, any works and exercise any powers mentioned in, or conferred by, section 12 of the Act of 1847." There was also a power to purchase easements, upon which he would not say anything just at present, because he did not think it affected the judgment he had to deliver, but would limit himself to the consideration of the question whether under this section they were authorized to proceed with the well in question. It was contended for the plaintiff that the words "subject to the provisions and restrictions in this Act and the Special Act incorporated therewith, the undertakers may execute any of the following works," and gave them no power whatever to sink a well at some distance from the authorized water-works, and in reference to which no parliamentary power had been given. The argument of Sir Alfred Cripps was apparently based on the preliminary words of section 12 of the Act of 1847: "The undertakers may execute any of the following works for constructing the water-works," and coupled with them the words of section 10 of the Act of 1904 "may on all or any of such lands, execute for the purpose of, or in connection with, the water-works;" and he urged that these words limited the powers given by reference in section 10 to the powers conferred by section 12 of the Act of 1847, to the execution of works for constructing the water-works authorized by the Act. Before Mr. Justice Ridley, it was argued, on behalf of the defendants, that section 10 left these words out of the question altogether; but he thought *prima facie* the meaning of section 10 of the present Act was to make it clear that, on any additional lands acquired by purchase under that section, the Company should have the powers given to them by section 12 of the Act of 1847, and not that they should have new or different powers unconnected with the construction of the works authorized by Parliament. He could not assent to the proposition put forward by Sir Alfred Cripps, that the proper construction of section 10 of the Special Act was decided by some of the previous cases. No case decided that Parliament could not, by any words, give general powers such as those contended for by the defendants; but it must be remembered that, for the protection of particular interests, these Acts generally only gave powers in respect of the lands specified by the deposited plans. It should be remembered, in construing clauses in Private Acts of Parliament, that it was one thing to infer the intention of the promoters who drafted the section and chose the words, and another thing to infer the intention of the Legislature when dealing with a Public Act introduced by those who presumably had no private interest to serve, and dealt with words chosen by the draftsman in a public drafting department. The Water-Works Clauses Act of 1847 was a Public Act, and whenever the words of a Private Act seemed to involve a departure from the provisions of a Public Act, such construction *prima facie* should be rejected. This observation applied with equal force to an argument on behalf of the defendants based on the negation in section 11 of the present Act of the right to sink wells in the additional land purchased by agreement in Middlesex, and contained no such negation in the case of Hertfordshire. The words of this section were chosen by the promoters and submitted to the Parliamentary Committee after the Committee had struck out of the Bill the clause giving express power to sink a specific well outside the district of the Company. He agreed with the proposition that the decision of the Frimley case was in no sense conclusive of the present; it was simply a decision on the Frimley Act, which differed from the Barnet Act, first because the Frimley Act only incorporated section 12 of the Act of 1847 by general words, while the words of section 10 of the Act of 1904 conferred specific powers which might be exercised by the Company on certain

additional lands which by that Act they were authorized by agreement to purchase and hold. Another difference between the Frimley Act and the present one was that the former, by the 23rd section, set out in detail the water-works which it gave the Frimley Company the power to make; whereas the Barnet Act contained no such section. Notwithstanding these differences, however, the Frimley case was a relevant authority to this extent, that Mr. Justice Swinfen Eady and the Lords Justices respectively all laid down general statements as to the practice of the Legislature in passing such Acts for the protection of the interests of individuals—a practice which included the deposit of plans and books of reference in cases in which public and private interests were likely to be affected injuriously. His Lordship then proceeded to read several passages from the judgments in the Frimley case, and repeated that he did not suggest for one moment that these judgments decided the present case—being judgments on a particular Act of Parliament; but he pointed out that both the learned Judge and the Lords Justices did lay down general principles on which it was said Parliament always acted in a matter of this sort. Apart from the observations he had quoted, he said there were one or two he should like to make as to the construction of Private Acts generally, and as to the construction of this one in particular. In his mind, there could be no doubt that, taking section 10 alone, it was capable of the construction put upon it by the Attorney-General; and this being so, it seemed to him that the language of such a section in a Private Act was to be treated as the language of the promoters, and that where any doubt arose as to the construction, the maxim ordinarily applicable to the interpretation of Statutes applied—viz., that words were to be understood most strongly against him who used them, and that the benefit was to be given to those who might be prejudiced by the exercise of the powers which the enactment granted, and against those who claimed to exercise them. It seemed to him, further, that sections 11 and 12, on which the defendants had so largely relied, ought to be treated as isolated, and foreign to the rest of the Act, and that their wording was not to be regarded as throwing any light on the construction. It was argued that section 10 intended that in the case of the purchase of land within the limits of supply not exceeding 15 acres wells should be sunk which were not referred to in the Special Act, and which might drain many wells in the surrounding district, though such wells were not included in the deposited plans or books of reference. If this were so, the interests of inhabitants of the district had no safeguard. The vendor of the particular piece of land purchased required no protection. But the inhabitants of the district generally might well require the protection which they would get if the sinking of the particular well were a power brought to the notice of Parliament and so to the notice of the public; and he did not think they ought, except by virtue of perfectly plain words, to construe the Act of 1904 so as to produce this result. One argument that was put forward on behalf of defendants was that by one or more of their prior Acts they not only obtained a clause very similar to the present one, which they presumed gave them power to construct their water-works, or part of them, on lands in respect of which there had been no plans deposited, and no mention made by the promoters of the Bill, but had also acted on the presumption, and dug wells to which no allusion was made in either the deposited plans or the book of reference. The answer to this argument was that it could not affect the mind of the Court in construing this particular section of the Act of 1904. It was probably true that some people thought such powers were conferred by these clauses. But the decision in the Frimley case had shown what the law was; and if there had been prior breaches founded on a mistaken construction put on a Special Act of a water company, it could not affect the construction of section 10 of the Barnet Company's Act. For these reasons, he thought the judgment of Mr. Justice Ridley was right, and should be affirmed.

Lord Justice BUCKLEY, in a long judgment, first reviewed the powers granted to the Company in the Acts obtained by them prior to 1904, under which they had, he said, in 1895, 1897, and 1905, sunk three wells, purporting to do so under the powers conferred. It had been contended by Sir Alfred Cripps that the sinking of all these wells had been *ultra vires*. In 1904, the Company obtained another Act giving them authority to execute further works, which were defined by section 4 to be the works authorized by the Acts of 1872, 1883, 1887, and that Act. It then proceeded by section 5 to empower the Company to acquire defined lands, and by section 6 to construct a further reservoir in a different part of the Company's area. This reservoir (the Arkley) had been built. The Act contained section 7—a section in some respects similar to, but in others differing from, section 8 of the Act of 1883 and section 7 of the Act of 1887. The relevant point of difference which he noted upon it was that whereas the last-mentioned sections had authorized the making of wells, this word was not to be found in section 7 of the Act of 1904. If the Act was to give power to sink wells for the purposes of the new reservoir, it must be found in some other section. Section 10 was one which might be described as combining the subject-matters which were dealt with in sections 14 and 16 of the Act of 1887. It empowered the Company to acquire additional lands and execute certain works. The particular words upon which the contest arose were those which empowered the Company, on all or any of such lands, to execute the works and exercise the powers mentioned in, or conferred by, section 12 of the Water-Works Clauses Act, 1847. The 10th section referred to lands taken by agreement under it, and to the lands authorized to be purchased by the previous Acts, as well as the land in Shenley mentioned in the present Act. The words "all or any of such lands" which followed applied, he thought, to both of these classes. Lands taken by agreement, whether under the present or the previous Acts, were thrown into one class with lands not taken by agreement, but under express authority; and to both the one and the other the powers contained in section 12 of the Act of 1847 were to be applicable. If this construction were not right, and the words "all or any of such lands" were confined to lands taken by agreement under the Act of 1904, then there was still more pointedly an express statutory enactment that the authority contained in section 12 of the General Act should apply to such lands. The Act of 1904 did not, except by this section, give anywhere, in so many words, power to sink wells or to collect water for the purposes of the new reservoir. Without express

words, the general enactment of section 12 of the Act of 1847 would, of course, apply; but it seemed to him that these words in section 10 must have been introduced (as must also have been section 16 of the Act of 1887) in order to add to, or enlarge, the general authority which, in the absence of express enactment, would exist by the incorporation of the Act of 1847. There was there, he thought, statutory authority to sink wells in lands purchased by agreement. The construction at which he thus arrived was fortified by the fact that section 11 contained a veto upon sinking wells in lands purchased by agreement in a particular place—viz., the county of Middlesex—an enactment which was without meaning unless the Act had somewhere contained a power to do that work on lands purchased by agreement. It had been strongly urged that the present case was covered by the previous decision of the Court in the Frimley case. But, in his opinion, that case differed from the present one in two essential particulars. The first was that there were not in the Act relating to the Frimley Company any such words as were found in section 16 of the Act of 1887 and section 10 of the Act of 1904 of the Barnet Company, giving specifically, by reference, the powers contained in section 12 of the Act of 1847; and, secondly, that the Act there had not, as had the previous Acts here, given such powers as were contained in section 8 of the Act of 1883, sections 7 and 16 of the Act of 1887, and, if his construction were right, section 10 of the Act of 1904. The statutory authority contained in section 23 of the Frimley Act was to make certain defined water-works, with all proper and necessary wells, and to enter upon, take, and use such of the lands delineated on the deposited plans, and described in the book of reference, as might be required for this purpose. The water-works and pumping-stations authorized were described in detail in that section. The decision of the Court was that, under the Act, the water-works, including the wells, were a defined thing, and that the general authority contained in section 30 to purchase land by agreement was an authority to purchase not so as to increase or alter the area over which the water-works, in the sense of works for the collection of water, might be carried, but to enable the Company to acquire land for ancillary purposes. There was in this case no section equivalent to section 23 of the Frimley Act; and there was in section 10 of the Barnet Company's Act of 1904 the provision which was not in the Frimley Act. That case and the present one were both cases of construction; and the construction which the Court placed upon the Frimley Act formed no ground for a decision upon the question of the true construction of the Barnet Act. In his judgment, the Acts of the appellant Company had conferred upon them the right to execute the works and exercise the powers mentioned in, or conferred by, section 12 of the Act of 1847 upon lands within the limits of supply; and as regarded wells, they might within those limits sink a well at any place at which a well was proper and necessary in connection with the reservoir and water-works authorized by the Act—including, of course, the Arkley reservoir. It was not disputed between the parties that the particular well in question was to be sunk for the purpose of supplying the reservoir authorized by section 6 of the Act of 1904. It was within the limits of supply, and was proper and necessary for the service of the reservoir. Under these circumstances, he thought that what the Company were doing was not *ultra vires*, that the injunction which had been granted was wrong, and that the order made in the Court below ought to be discharged, and judgment entered for the defendants, with costs, including the costs of the appeal.

Lord Justice KENNEDY said he had had an opportunity of perusing and considering the judgment which had just been read, and it so completely and exactly expressed the reasoning which appeared to him to be correct, that he desired simply to express his concurrence with that judgment.

Lord Justice VAUGHAN WILLIAMS said the judgment of the Court would be that the appeal be allowed, with costs.

Mr. EUSTACE HILLS said he believed it was the intention of the Attorney-General to take the opinion of the House of Lords on this matter. He did not know whether, under these circumstances, Sir Robert Finlay would agree to his suggestion, which he thought would be most convenient to all parties, that the works should be suspended pending the decision of the House of Lords.

Considerable discussion ensued on this point.

Lord Justice VAUGHAN WILLIAMS expressed the view that if the well were sunk and drained the whole district it would do irreparable injury which could never be put right again.

Lord Justice BUCKLEY, on the other hand, pointed out that it was not digging the well, but pumping the water, which would do the damage, if any.

Sir ROBERT FINLAY stated that the well was already 60 feet deep, and it was intended to go to a depth of 150 feet. It would take about five months to sink the remaining 90 feet.

It was ultimately decided that there should be no stay with regard to sinking the well, and that if any danger were apprehended from pumping hereafter, an application might be made to the Court.

DAMAGE TO GAS-MAINS BY TRAMWAYS.

The Bristol Gas and Tramways Companies' Arbitration.

In the Court of Appeal last Tuesday, Lords Justices Buckley and Kennedy and Mr. Justice Swinfen Eady had before them an appeal by the Bristol Tramways and Carriage Company, Limited, against the decision of Mr. Justice Phillimore dismissing an appeal by them from the award of Mr. Allen C. Edwards, the Arbitrator appointed by the Board of Trade to decide a difference which had arisen between the Company and the Bristol Gas Company, as to the liability of the former to pay the extra expense incurred by the latter in doing work on their mains and services, in consequence of the existence of the tramway. The proceedings in the Lower Court were reported in the "JOURNAL" for the 4th of May last (p. 399).

In support of the appeal, Mr. Balfour Browne, K.C., and Mr. Simon, K.C. (Mr. Murphy with them), argued at considerable length, as they did in the Court below, that the works done by the Gas Company had

not interrupted the traffic, and therefore were not "such works" as entitled them to claim compensation for the extra expenditure to which they might be put in consequence of the existence of the tramway.

Sir Alfred Cripps, K.C., who, with Mr. Weatherley, appeared for the Gas Company, having been heard very briefly in support of the judgment, and Mr. Balfour Browne in reply, the appeal was dismissed with costs, though their Lordships were all of opinion that the answer of the Arbitrator to the first question—viz., that the Tramways Company were liable to pay the extra expenditure incurred, even if there were no interruption of traffic, in which he had been supported by the learned Judge in the Court below—was incorrect. They therefore made a declaration to this effect, though the question did not really arise on the present appeal, as they all agreed with the Arbitrator that here there had been an interruption of the traffic within the meaning of section 32 of the Tramways Act, 1870.

LAINDON AND DISTRICT GAS COMPANY.

Application to Remove a Shareholder's Name from the Register.

In the Chancery Division of the High Court of Justice last Thursday, Mr. Justice Swinfen Eady had before him an application to rectify the register of the Laindon and District Gaslight, Coke, and Water Company, Limited, by striking out the name of Mrs. Totty, the holder of three preference shares of £5 each.

Mr. RYLAND, who made the application, said the matter came originally before Mr. Justice Eve on a motion made in June last; but the evidence was not then ready, and his Lordship directed the motion to be put in the non-witness list. At that time, Mr. M'Swinney appeared for the Company; but he (Counsel) understood that they had not instructed anyone on the present occasion. Whether or not this was explained by the fact that a Receiver on behalf of the debenture holders had been appointed, he could not say. The ground of the motion was that the applicant was induced to apply for the shares in question by misrepresentations that the dividends were guaranteed at the rate of 5 per cent., and that the applicant, who was already a holder of ordinary shares, was entitled to an allotment of these preference shares at par, and that they were likely to go to a premium. The so-called guarantee was only that of the vendors, the Water-Works, Lighting, and Power Investment Corporation; and it did not, in fact, apply to these particular shares. Counsel then proceeded to read the affidavits of the applicant and of Mr. H. P. Davis, the Secretary of the Company, and the letters exhibited thereto; the result of which appears in his Lordship's judgment.

Justice SWINFEN EADY said this was an application by Mrs. Maria Totty, of Bournemouth, that the register of the Laindon and District Gaslight, Coke, and Water Company, Limited, might be rectified by removing therefrom her name as the holder of three preference shares in the Company, on the ground of misrepresentation of material facts. The matter was a small one as regarded the amount of money; but on the evidence it appeared clear that the applicant had been misled into applying for these shares, and that she was now entitled to be relieved from the allotment by reason of the deception practised upon her. One ground was that she applied for shares in respect of which there was a representation that the dividends were guaranteed. But it seemed that at the date of the application and allotment to her of these shares there was no guarantee whatever; and this alone would entitle her to rescission. The Company did not appear that day, though he was informed that on a former occasion they did. They, however, had put in an affidavit, from which it seemed clear that there was no guarantee at the date of the application and allotment; and it was very doubtful indeed whether there was any subsisting guarantee now, because the so-called guarantee did not appear to have been given for any valuable consideration, and the agreement which was dated June 5, 1908, was only in respect of shares subscribed for in cash "on the issue you are about to make." So that, in terms, it would only apply to shares issued after that date. Again, it was made to appear to this lady that she was entitled to an allotment of shares as being an already existing shareholder; and this, as far as he could gather from the materials before him, appeared to be untrue. On these grounds, the applicant was entitled to have her name removed from the register in respect of the three shares in question, and to an order that the Company should pay the costs of the application.

The Bankruptcy of Mr. Charles Scott-Snell.

At the London Bankruptcy Court last Tuesday, Mr. Charles Scott-Snell, of No. 25, Victoria Street, S.W., applied for his discharge. The Official Receiver reported that the receiving order was made on the 19th of July, and at the first meeting of creditors he was appointed Trustee. The actual proofs of debt lodged amounted to £6155, and there were other probable claims amounting to £4295, which brought up the total liability to £10,450. The debtor carried out engineering works in Australia for three years, and came to England in 1883. In 1889, he perfected a self-intensifying gas-lamp, and sold the invention to a Syndicate for £750 in shares and an appointment as Engineer to the Syndicate at a salary of £300 per annum. Between 1899 and 1900 dividends of 40 per cent. were paid by the Syndicate; and in December, 1900, they sold the patent to the Scott-Snell Gas-Lamp Company—the consideration being £900,000 in shares and £7000 in cash. Debtor's shareholding in the parent Syndicate entitled him to four-tenths of the purchase-money; and this he duly received. He also became a Director of the new Company, which went to allotment; but, on subscription, only 50,000 shares were taken up. This capital was quite inadequate for carrying on the business; and in 1903 the Company went into liquidation, and the debtor's shares became valueless. In 1902, before the failure of the Company, there was an attempt to float a similar Company in America; and at that time the debtor considered himself worth £50,000 on the value of his shares. The only offence reported by the Official Receiver was that the assets were not equal to 20s. in the pound; and the discharge was suspended for 2½ years.

MISCELLANEOUS NEWS.

RAWCLIFFE AND DISTRICT GAS COMPANY, LIMITED.

The Report and Accounts Not Adopted.

Only some fourteen or fifteen persons in all attended the Ordinary General Meeting of the Company which was held last Tuesday afternoon at the Cannon Street Hotel, E.C.; but these proved amply sufficient to impart an exceedingly lively tone to the proceedings, which lasted about an hour and a half, and were presided over by Mr. JOHN MACLEAN, the Chairman of the Company.

The report stated that, in presenting the Company's accounts, covering the period of fifteen months from Oct. 1, 1907, to Dec. 31, 1908, the Directors desired to point out that a proportion of the administration expenses were incurred during the initial stage, and might rightly be charged to capital. The Directors had succeeded in effecting economy in the working expenses, which were now at a minimum; and they therefore believed that the next accounts of the Company would show a profit—especially if the new mains urgently required to meet the demand could be provided. The amount of capital at the Directors' disposal had been very limited; but, notwithstanding this, they had increased the number of consumers from 103 when the works were taken over to 208 at the end of 1908. For the December quarter of 1908 there was an increase in the revenue of 17 per cent. over the corresponding quarter. For the same reason—namely, want of capital—extensions at the works had not been fully dealt with; but it was now essential that part of the Company's mains be immediately enlarged. This work would be proceeded with when the Company were able to raise the necessary capital; and thereby the revenue of the Company could be materially increased, and the works made to produce a good profit. The Directors had approached the Vendor Company [this was the Water-Works, Lighting, and Power Investment Corporation], with a view to obtaining a reduction in the purchase consideration, and hoped to shortly be able to report an arrangement to this effect. A certain section of shareholders had recently thought fit to convene an extraordinary general meeting. The Directors felt that no purpose could be served by such meeting being held, except depreciating the shareholders' property, and that it was best to await the general meeting. Such view had been confirmed; and the Directors would be pleased to have with them on the Board any shareholder representative of the section of shareholders referred to. The names of the Directors appearing on the report were: Mr. John Maclean, Chairman, Mr. H. W. L. Way, J.P., and Mr. E. Eaton.

The accounts showed that at the end of 1908 there had been issued 219 ordinary and 309 preference shares. These were all of £5 each; and the total amount paid up on them was £2639 3s.—there being 17s. outstanding. This left £7360 of capital still to be issued out of the £10,000 which was the total amount authorized. On the other side the items were: Leasehold buildings and premises, gas-works, and mains at cost as per purchase agreement, £3500; and expenditure since, £471. This made £3971, and left a debit balance on capital account of £1332, which was carried to the balance-sheet, where it appeared along with the following items: Preliminary and formation expenses—Water-Works, Lighting, and Power Investment Corporation, Limited (as per agreement), £800; suspense account for payments made on account of promotion and issue expenses, £87; stocks on hand, £11 10s.; sundry debtors for gas, meter, and stove rental and residuals, £128; cash at bank and in hand, £4 13s.; and balance of loss on revenue account to date, £50 13s.—total, £2413. On the other side, the creditors were: Water-Works, Lighting, and Power Investment Corporation, Limited—balance of purchase money, £1683 18s., and of formation expenses account, £332, less general account balance, £12 10s.—£2003 8s.; tradesmen and others for stoves, meters, fittings, coal, and general stores, £365; and rent and salaries, £45. The expenditure on revenue account was £678 11s.; while on the receipts side the items were: Sale of gas, including meter and stove rentals, £620 17s.; and residuals, £7 1s.; the balance of £50 13s. being the revenue loss to date. The accounts were signed by Mr. Maclean and Mr. Eaton. The Auditors (Messrs. F. Rowland, Smith, and Co.) appended a certificate that "subject to the remarks contained in our report to the shareholders herewith, we certify that we have obtained all the information and explanations we have required, and that in our opinion such balance-sheet is properly drawn up so as to exhibit a true and correct view of the state of the Company's affairs according to the best of our information and the explanations given to us and as shown by the books of the Company."

The CHAIRMAN having asked whether the shareholders would take the report and accounts as read,

Mr. G. W. TOWNEND, Chartered Accountant of Goole (who intimated that he represented a number of shareholders), suggested that they should hear the report which the Auditors referred to as having been made by them.

The SECRETARY (Mr. H. P. Davies) thereupon read the document, which was of a lengthy character. In the course of it, the Auditors said that, though there had been a number of share transfers, all of which were shares allotted to the vendors as part of the purchase consideration, no transfer fees seemed to have been received. They had not seen vouchers of some items—principally petty cash—but they appeared to be in order. No depreciation had been provided for the lease (which was for 21 years), mains, or buildings; and they had seen no certificate that capital expenditure shown had been expended on capital account. The purchase agreement provided that all stores on hand at the date of completion of the purchase should be taken over at a valuation; but this did not seem to have been made, and therefore the liability (if any) did not appear in the accounts. They had seen no vouchers in support of the item of £800 for preliminary expenses; and they did not know whether or not this was actually spent by the vendors. The signatories to the Memorandum and Articles of Association did not

appear to have paid for their shares; and they did not appear as shareholders on the register. They had been unable to verify the gross revenue, as for some portion of the period the receipts were entered as a lump sum. Since April 1, 1908, the vendors had held less than £50 of capital in the Company. One of the Directors—Mr. E. Eaton—did not take up his qualification until after the date of the present balance-sheet. The Secretary (dealing with the report) said the statements made called for some little explanation. The first thing pointed out was that no transfer fees had been received by the Company; but this was an optional matter. Secondly, a certificate with reference to capital expenditure could be obtained from the Works Manager at any time. Vouchers in support of the item of £800 for preliminary expenses were produced to the Auditor at the time of the statutory accounts; but they had now been mislaid. Though it was stated in the Auditors' report that less than £500 capital of the Company was held by the vendors since April, 1908, to the closing of the accounts, this was rather misleading, because the vendors agreed in April, 1908, to take shares in settlement of a sum due to them, which would bring their holding considerably over £500. As a matter of fact, however, the actual allotment did not take place until January of this year. They really had more than £700 worth of shares. Mr. Eaton was certainly appointed a Director in June, 1908, and accepted the appointment; but a fortnight or three weeks afterwards he resigned, so the qualification was not taken up. He was, however, re-appointed in July; and he then took up the necessary qualification. With reference to the shares of the signatories not being allotted, he would point out that they were still liable for the shares, and they had now been placed upon the register.

The CHAIRMAN then, without comment, moved that the report and accounts be adopted.

Mr. EATON seconded.

Mr. TOWNEND said he intended to move an amendment, and would give good reasons for doing so. In the first place, he considered the accounts most unsatisfactory; and, in the second, he would tell them what the position of the Company was to-day. He was asked, when the Company was floated, to accept the Auditorship; and he agreed, on condition that a copy of the prospectus was sent to him for approval. This was not done; but nevertheless his name was published as Auditor, and sent out broadcast to people who might wish to apply for shares. Since then, many shareholders had written to him in respect to the matter. Goole, where he resided, was 3 miles from these works; and at the time the Company was formed, he was collecting the gas-rentals for the Water Company. As soon as the prospectus was sent out, he decided to have nothing to do with the Company, and said he should not act as Auditor. At that time, he believed there were something like 60,000 prospectuses sent out all over the United Kingdom to likely applicants, offering these shares. He understood that £1500 of capital was applied for, and it cost about £800 in postage and expenses to raise this amount. First of all, it was necessary to get a list of likely applicants; and he gathered that one of Mr. Eaton's Companies supplied such a list, consisting of about 60,000 names, and charged for it at the rate of 50s. per 1000—in other words, £150. Then the postage on the prospectuses, at 1d. each, came to another £250. This year, the Directors sent out another prospectus, offering a bigger guaranteed dividend—5 per cent., instead of the 4 per cent. in the first prospectus. He understood this issue cost the Company something like £700; and applications were made for shares amounting to £1100. The money that had been spent on this concern was to his mind disgraceful. Mr. Eaton had seen the undertaking; but he did not think the other Directors had been to Rawcliffe. [The CHAIRMAN: I have been there.] Anyway, though the purchase price was £3500, there was nothing to sell except a lease for 21 years, at £50 a year. The Directors undertook to do certain things, and to make certain alterations; but this had not been done. The object of the Directors—and the only object—seemed to have been to get the purchase price—£2800 in cash, and 140 shares of £5 each fully paid. Since the Company was first formed, the sheriff had been in possession for execution in respect of claims no less than half-a-dozen times. About two months ago, he was in possession for an account of about £20; and a receiver was appointed. The execution sheriff, of course, had to withdraw; and the receiver was withdrawn also within a month. In June last year, the Directors took powers to issue £2000 of debentures in the Company; and they then proceeded to place some debentures, for the purpose, he understood, of giving the vendors a further payment on account of their purchase money. Since then more debentures had been issued—he believed, amounting to £300. Another creditor sued the Company; and immediately an execution was levied, another receiver was appointed, who happened to be Mr. Eaton's clerk, Mr. Williams.

Mr. EATON: He is not my clerk. All I wish you to do is to stick to the truth.

Mr. TOWNEND: I say he is nominally your clerk—that he has to do as you tell him.

Mr. EATON: I have never paid him any salary in my life.

Mr. TOWNEND: I say he is bound to do as you tell him. He is under your thumb and finger just as much as Mr. Davies is. Continuing, he remarked that two receivers had been appointed in two months in respect of debentures issued by the Company. The works were in a most unsatisfactory condition. The lease provided that the Company should repair; but the Company had done nothing whatever, and the retorts would not last another fortnight. The Parish Council of Rawcliffe had not been supplied with gas for nearly three weeks; the consumers were complaining; and the town had been altogether in darkness on several occasions. The Company had applied for a supply of coals to every colliery in Yorkshire without avail. He thought from one colliery they did get something like two trucks, though they had had fourteen or fifteen refusals. If they could not get coal from somewhere, the works would be closed, as they had none left. All this had irritated the consumers; and, in fact, he considered that the Directors had in every way mismanaged the Company most disgracefully. He therefore begged to move that the report and accounts be not adopted.

Mr. J. A. PAINE, in seconding the amendment, remarked that evidently a great deal of mismanagement had been going on.

Mr. EATON, in reply, said Mr. Townend (who held one single share in the Company) had given them his reason for not acting as Auditor. Happily, there was a record of what the main reason really was; and it was contained in correspondence. Mr. Townend asked for an increase in the commission of 5 per cent. which he was receiving for the collection of the rentals. He wrote to the Company and to him (Mr. Eaton) saying that the 5 per cent. for merely collecting the money from the few slot meters and the ordinary rentals did not remunerate him for the time he was devoting to the work; and therefore he asked for a further sum. He (Mr. Eaton) personally pointed out to him that the 5 per cent. amounted to something like £25 or £30 a year; and said that, while he recognized this might not cover his time, yet, in the circumstances in which the Company were then placed, he did not think the Directors would feel inclined to pay him another 1 or 2 per cent. for simply collecting the rentals, as they intended to get the administration work done in London. Thus the real reason for his declining to act as Auditor for the Company, was not as Mr. Townend had stated, but because he asked for an increase in his commission which the Directors could ill-afford. As to the complaints about the promotion expenses, he was under the impression that they had paid the "Goole Times," a journal with which Mr. Townend was largely connected, a sum that might perhaps exceed the charge of a London paper. Mr. Townend had not told them anything either about this or about his commission.

Mr. TOWNEND said he was only a shareholder in the "Goole Times," and received no commission.

Mr. EATON (continuing) remarked that Mr. Townend had gone on to state that nothing had been done to the works in pursuance of the covenants in the lease. When the works were taken over by the vendors, there was not a single retort capable of making gas. The meters were not registering, the mains were leaky, and the works were in a condition which would, he thought, have shocked Mr. Townend had he taken the trouble to visit them, which he did not believe he did all the time he was Manager. The vendors had undertaken to spend a certain amount of money on improving the works; and the first step in this direction was to lay a main down to Rawcliffe Bridge, which increased the number of consumers by 100 per cent. Consequently, it was unfair for Mr. Townend to say that nothing had been done to the works. Reference had likewise been made to the issue of debentures, the primary object of which issue was stated to be the payment to the vendors of an amount due to them. This statement was, however, incorrect. There was a minute of the resolution to issue debentures; and the Chairman made it a great point that, if they were to be issued, the proceeds should be carefully preserved for enlarging the mains, whereby the revenue could be still further increased. Mr. Townend had next referred to Mr. Williams being his (Mr. Eaton's) clerk. He had sent for Mr. Williams, and he was there; and he would ask him to state whether he was his clerk, or whether he had any control over his actions. Mr. Townend had also referred to the appointment of a receiver. They all knew that a receiver was a friend who sometimes did a great service to shareholders. The Directors found themselves short of capital, and unable to pay some of their creditors; and in order to protect the interests of the shareholders, a receiver was appointed, and thus the interests of the shareholders were protected. Mr. Townend would make them believe that, with the executions, the receivers, and so on, the Directors had been doing their best to damage the interests of shareholders when they were themselves shareholders. He failed to understand why Mr. Townend attacked the Company as he had done. He did not think, even if the statements were correct, that it would be Mr. Townend's duty to depreciate the property as he had done in that room and by means of circulars. If the Directors were guilty of all that had been alleged, he could not understand the desire to throw mud at the concern. There must be something behind it. As to the reference to the works being closed, Mr. Townend appeared to know more about the matter than the Directors did. He (Mr. Eaton) did not think it was the intention of the Board to close the works. During the whole of the time that the works were managed by Mr. Townend, who was taking £30 a year, not a single new consumer was put on. The Directors had spent £400 or £500, and had personally lent money to the Company; and they had increased the revenue by 100 per cent.

Mr. TOWNEND: My firm were not appointed Managers of this Gas Company. We simply collected the gas-rentals.

Mr. EATON: I am talking of the time before the Company came on the scene.

Mr. TOWNEND: That has nothing to do with the Company. A bigger fraud never existed than this prospectus.

Mrs. R. E. J. SCOTT: Why did Mr. Townend's name appear in print, if he was not Auditor? I have a paper with his name on. It is false representation.

Mr. EATON: He declined to act.

Mrs. SCOTT: Then you had no right to publish his name. It is an illegal thing to have done.

The SECRETARY: He was Auditor at that time.

Mr. TOWNEND denied that he had ever audited a single account. Continuing, he read a letter dated Nov. 8 from Mr. Wright, Steward to Mr. Creyke, the ground landlord, in the course of which the writer said: "Things appear to be in a hopeless state; and, so far as I can see, the only plan is for the shareholders to go into liquidation. I am afraid the Company have got such a bad reputation already, that they cannot obtain a supply of coal. The contract with the Parish Council has been broken time after time; and we are already looking for a fresh source of supply. The works are very much depreciated; and I, as agent of the owner of this property—for after all the property is only a lease—shall have something to say about the continuance of the lease before very long." He could read other letters.

Mrs. SCOTT: It is a dreadful state of things when we do not get any return on our money, and hear such a report as Mr. Townend gives.

Mr. EATON: I have no doubt the next balance-sheet will show a profit.

Mrs. SCOTT: It will not, if the town is in darkness.

Mr. EATON: It is not so.

Mr. PAINE: Where are the Water-Works, Lighting, and Power Investment Corporation, who guaranteed the interest?

In reply to further remarks,
The CHAIRMAN said: The Directors' fees are ten guineas for the whole of the fifteen months covered by the accounts. Since then there have been no Directors' fees or travelling expenses. We have done the best we could with the capital. We have put in a lot of ordinary and slot meters.
Mrs. SCOTT: What is the good of having meters if you have no gas?
The CHAIRMAN: We have laid out the money to the best of our ability; and we have no money to go on with. We shall have to re-arrange matters or go into liquidation. I believe the works could be made a paying concern. I know the consumers are anxious to get gas; and if we could obtain a little capital for new mains, we should secure additional street lighting to the extent of eighteen or twenty lamps, which would bring in about £40 a year more.
Mr. PAINE: It is a game of shuttlecock between the two Companies.
The CHAIRMAN: If you will come on the Board, I shall be pleased.
Mr. PAINE: I should be sorry to join such a disgraceful Board.
The CHAIRMAN (to Mr. Townend): What do you propose as an alternative?
Mr. TOWNEND: I have nothing to propose.
A vote was then taken, when five voted for the amendment, and seven in favour of the adoption of the report.
Mr. TOWNEND: The meeting has been packed. I warn any shareholder against voting, if he has not held his shares three months. I demand a poll, and also to know how many shares are held by those present, and who are the shareholders. The Secretary has been offering shares up and down to dummy shareholders to beat this amendment. You have been transferring shares for this meeting. The Act says: "Any shareholder holding shares for less than three months prior to the meeting cannot vote." I hold proxies, properly filled in and lodged 72 hours before the meeting, for 194 shares. The Board's proxies say 24 hours, and they are bad. There is no such thing as proxy voting at 24 hours. If, however, the Chairman will ascertain who is eligible to vote, I shall be satisfied, and will place my proxies against the Board's.
Mr. EATON: You cannot demand a poll under £3000.
Mr. TOWNEND: I ask the Chairman to allow a poll to be taken. You can use your discretion; but if you say "No," it is against the interests of the Company.
A fresh vote was then taken, after ruling out those present who had not held their shares for three months; and five then voted for the amendment, and five against it. It was suggested that the Chairman had a casting-vote; but he did not record it. Instead, he expressed his willingness that a poll should be taken. This was at once done, and resulted in 265 votes for the amendment, and 121 against.
The report and accounts were therefore not adopted.
The CHAIRMAN next proposed the re-election of the retiring Director, Mr. H. W. L. Way, J.P.
Mr. TOWNEND moved as an amendment that he be not re-elected. Again the voting was five for the amendment, and five against.
The CHAIRMAN said the proposal would be withdrawn, as it was not the unanimous wish of the shareholders that Mr. Way should be re-appointed.

Mr. EATON: May I ask you to make a note that Mr. Townend has voted—he not having paid his calls?
The CHAIRMAN: It was stated that none of the signatories had paid for their shares; but that was passed. It was understood that they were liable to be called on, and so were counted as shareholders.
The Auditors were re-appointed on the motion of Mr. TOWNEND.
Mr. TOWNEND: The business, I take it, of the ordinary meeting is now ended; but I may say that my instructions from the shareholders I represent are that, unless the Directors are prepared to resign in a body, immediate steps will be taken to put the Company into compulsory liquidation. There are two ways of winding-up the Company. My idea would be for a fresh Board of Directors to be appointed, and then to approach the Parish Council, or some other persons, and see if they would buy the assets. If you go into liquidation, you immediately destroy the assets and break the lease. I am not for breaking the lease, if anything can be saved for the shareholders out of the wreck. I believe the Parish Council are prepared to take over the works at a price. In the alternative, the shareholders I represent intend to apply for an order for compulsory liquidation, and to have the matter thoroughly threshed out in the Courts.
The CHAIRMAN: We will take your proposal into consideration and negotiate with you with a view to the resignation of the Directors or some other arrangement being made. Failing some satisfactory arrangement, the Directors would probably be prepared to resign.
Mr. J. BAXTER CORRIE said nearly twelve months had elapsed since the date to which the present accounts were made up; and it would be interesting to know how the Company had got on since then.
The SECRETARY said the revenue figures were as follows: For the quarter to December, 1907, £111; and to December, 1908, £129. For the quarter to March, 1908, £180; and to March, 1909, £190. For the quarter to June, 1908, £75; and to June, 1909, £71. The total increase in revenue since the last balance-sheet was made out was between 5 and 6 per cent.
Mr. EATON said that if the mains were increased, they would earn another £50 or £60 a year, which would bring the Company probably on to a small dividend footing. That would be the immediate gain, without reckoning anything for the future.
Mr. CORRIE asked what was being done as to the proposal that the vendors should make a reduction in the purchase consideration.
The SECRETARY said the matter had been put before the Receiver of that Company, and also before the largest debenture holders; and the Receiver had indicated that he would certainly be prepared to reduce the £1500 or £1600 now outstanding.
Mr. EATON, in reply to a question, stated that the cost of increasing the mains as suggested would be about £250.
The CHAIRMAN (to Mr. Townend): If you will put your proposal in writing, we shall be glad to meet you.
Mr. TOWNEND: You have wrecked the concern; and you should now let the shareholders see if they can make anything out of it.
After this parting shot, Mr. Townend gathered up his papers, the Directors and other shareholders seized their hats, and a somewhat dejected little party walked down the stairs from the third-floor room of the hotel in which the meeting had been held.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 455.

Issue	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Oct. 14	10	Alliance & Dublin 10 p.c.	17-18	..	5 11 1	195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
298,955	10	"	7	Do. 7 p.c.	124-13	..	5 7 8	561,000	Stk.	"	10	Liverpool United A	223-225	..	4 8 11
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	98-100	..	4 8 0	718,100	"	"	7	Do. B	166-168	..	4 3 4
200,000	5	Oct. 28	6½	Bombay, Ltd.	53-6	..	5 8 4	306,083	"	June 25	4	Do. Deb. Stk.	104-106	..	3 15 6
40,000	5	"	6½	Do. New, £4 paid.	43-43	..	5 9 1	75,000	5	Oct. 11	6	Malta & Mediterranean.	48-53	..	5 17 1
50,000	13	Aug. 26	15	Bourne- 10 p.c.	28-28½	..	5 5 3	560,000	100	"	5	Met. of 5 p.c. Deb.	59-102	..	4 18 0
311,810	13	"	7	mouth Gas B 7 p.c.	162-163	..	4 3 7	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
75,000	10	"	6	and Water Pref. 6 p.c.	152-154	..	3 16 2	541,920	20	"	3½	Monte Video, Ltd.	124-13*	..	5 7 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	254-257	..	4 17 3	1,775,892	Stk.	July 29	43	Newcastle & G'tesh'd Con.	106-108	..	4 3 4
300,000	"	"	9½	Do. New	190-192	..	4 19 0	518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	93-94	..	3 14 6
50,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13-13½	..	5 3 8
206,250	"	June 11	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	300,000	Stk.	Apr. 29	8	Oriental, Ltd.	140-142	+1	5 12 8
220,000	Stk.	Sep. 10	11	Brighton & Hove Orig.	203-213	..	5 3 3	60,000	5	Sep. 10	8	Ottoman, Ltd.	68-68½	..	6 5 6
246,320	"	"	8	Do. A Ord. Stk.	150-152	..	5 5 3	31,800	53	Aug. 26	13	Portsea Island A.	137-139	..	4 19 0
460,000	23	Oct. 14	10	British	42-43	..	4 13 0	60,000	50	"	13	Do. B.	129-131	..	4 19 3
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c.	118-120	..	5 0 0	100,000	50	"	12	Do. C.	120-123	..	4 17 7
165,700	"	"	4½	Do. B 3½ p.c.	83-90	..	5 0 0	114,800	50	"	10	Do. D and E.	101-103	..	4 27 1
82,278	"	"	5½	Do. C 5 p.c.	106-108	..	5 1 10	398,490	5	Oct. 28	7	Primitive Ord.	7-7½	+½	4 16 7
5,000	"	June 25	3½	Do. 3½ p.c. Deb.	88-90	..	3 17 9	796,983	5	July 29	5	Do. 5 p.c. Pref.	52-54	..	4 10 11
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	132-14	..	5 0 0	488,903	100	June 1	4	Do. 4 p.c. Deb.	95-97	..	4 2 6
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	96-98	..	4 1 8	1,000,000	10	Oct. 14	8	River Plate Ord.	161-162	..	4 15 7
103,000	13	"	—	Cape Town & Dis., Ltd.	4-5	..	—	312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	96-98	..	4 1 8
100,000	13	"	—	Do. 4½ p.c. Pref.	52-52½	..	—	250,000	10	Sep. 29	8	San Paulo, Ltd.	142-143	..	5 8 6
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	473-484	..	6 3 9	62,500	10	"	6	Do. 6 p.c. Pref.	112-124	..	4 18 0
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82-84	..	5 7 2	125,000	50	July 1	5	Do. 5 p.c. Deb.	51-52	..	4 16 2
157,152	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	1083-1102	+½	4 10 6	135,000	Stk.	Sep. 10	10	Sheffield A	230-232	..	4 6 2
1,493,280	Stk.	Aug. 26	5½	Commercial 4 p.c. Stk.	109-111	..	4 13 8	269,984	"	"	10	Do. B	230-232	..	4 6 2
50,000	"	"	5	Do. 3½ p.c. do.	104-106	..	4 14 4	523,500	"	"	10	Do. C	230-232	..	4 6 2
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	70,000	10	Oct. 14	10	South African	122-123	..	7 16 11
800,000	Stk.	"	5	Continental Union, Ltd.	97-99	..	5 1 0	6,429,895	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	120-122	..	4 7 4
200,000	"	"	7	Do. 7 p.c. Pref.	138-140	..	5 0 0	1,895,445	Stk.	July 14	3	Do. 3 p.c. Deb.	82-84	-1	3 11 5
493,270	Stk.	"	5	Derby Con. Stk.	121-123	..	4 1 4	209,823	Stk.	Aug. 26	8	South Shields Con. Stk.	154-156	..	5 2 7
55,000	"	Oct. 2	4	Do. Deb. Stk.	103-105	..	3 16 2	605,000	Stk.	Aug. 12	5½	S'th Suburb'n Ord. 5 p.c.	119-121	..	4 10 11
144,995	"	July 14	12	East Hull 5 p.c. Ord.	97-99	..	5 1 0	60,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
486,092	10	"	12	European, Ltd.	242-25	..	4 16 0	117,058	Stk.	July 14	5	Do. 5 p.c. Deb. Stk.	122-124	..	4 0 8
354,060	"	"	12	Do. £7 ros. paid.	184-19	..	4 14 0	502,370	Stk.	Nov. 11	5	Southampton Ord.	109-111	+½	4 10 1
15,141,545	Stk.	Aug. 12	4½	Gas 4 p.c. Ord.	102-104	..	4 8 8	120,000	Stk.	Aug. 12	6½	Tottenham A 5 p.c.	133-135	..	5 1 9
2,600,000	"	"	3½	light 3½ p.c. max.	87-89	-1	3 18 8	453,940	"	"	58	and B 3½ p.c.	111-113	..	4 15 3
3,793,735	"	"	4	and 4 p.c. Con. Pref.	103-105	-½	3 16 2	149,470	"	June 25	4	Edmonton 4 p.c. Deb.	100-102	..	3 18 5
4,193,975	"	June 11	3	Coke 3 p.c. Con. Deb.	82-84	..	3 11 5	182,380	10	June 11	8	Tuscan, Ltd.	9-9½	..	8 8 6
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	92-94	..	5 6 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	101-102	+1	4 18 0
82,500	"	"	6½	Do. do. 5 p.c.	117-119	..	5 9 3	236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	110-112	..	4 9 3
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	174-172	..	6 4 0	255,636	Stk.	Aug. 26	6½	Wands- B 3½ p.c.	139-141	..	4 14 0
131,000	Stk.	Sep. 10	6½	Ilford A and C	144-146	+6	4 9 0	79,416	"	June 25	3	worth 3 p.c. Deb. Stk.	73-75	..	4 0 0
65,781	"	"	5	Do. B	108-110	+3	4 10 11	835,872	"	Aug. 12	5½	West Ham 5 p.c. Ord.	123-125	..	4 6 0
65,590	"	June 25	4	Do. 4 p.c. Deb.	102-104	..	3 16 11	210,000	"	"	5	Do. 5 p.c. Pref.	126-128	-1	3 18 2
4,942,000	Stk.	Nov. 11	8	Imperial Continental	176-173*	..	4 9 11	253,300	"	June 25	4	Do. 4 p.c. Deb. Stk.	108-110	-4	3 12 9
1,235,030	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	95-97	..	3 12 2								

Prices marked * are "Ex div."

PUBLIC LIGHTING OF COBHAM.

The Oil v. Gas Controversy.

At the close of the reference to this subject in the last number of the "JOURNAL" (p. 423), it was mentioned that the Gas Company had hired the Village Hall for a meeting at which their side of the public lighting question could be put forward. It was held on Monday last week, and was attended by a large number of parishioners.

At the outset, the Secretary of the Company (Mr. E. Saphin) stated that he had written to every member of the Parish Council, and one was with them. He then went on to say that the Company had never had a full opportunity of bargaining with the Council. He attended two meetings in October and November, 1908, and at these they got on very well indeed. Afterwards a draft agreement was submitted to the Council which specified that the Company were to light the lamps on stipulated conditions for certain hours, and if they did not light them, they were to be subjected to a penalty of 6d. per night for each lamp that failed, after due notice had been given at the works. With this draft in his hands, the Chairman of the Parish Council wrote asking what the Company would supply gas for "at per week per standard." He (Mr. Saphin) replied that the charge would be 2s. 2d. per lamp per week; and in view of this fact, he maintained that the Company were not fairly represented when it was said that the Parish Council could get no terms for future years. On the 23rd of August last, the agreement was returned to him with so many alterations that, if signed in that form, litigation would have resulted over every clause. He took it to the Company's Solicitor to be put into shape. It was sent to the Epsom Rural District Council, and the next thing he heard was that Cobham was to be lighted with oil-lamps. In all the correspondence, he challenged anyone connected with the Parish Council or the Rural District Council to produce one letter that had asked him to reduce one penny. As to the period of the agreement, the Council wanted two, three, or five years; and then the Company's Solicitor said if they wanted a long agreement ask them to have seven years. It was only a draft agreement, and the Council could have altered the term; and as to the price, they could have asked for a rebate in the event of a reduction being made to the public. Mr. Saphin then turned his attention to some of the criticisms passed on the Gas Company at the previous meeting, and said it was most unfair and cowardly to attack them when they could not answer for themselves.

Mr. Harvey Lee moved a resolution expressing satisfaction with the Company's explanation, and requesting the Epsom Rural District Council not to approve the scheme of making use of oil-lamps for lighting the parish. He said as an old parishioner he wanted fair play; and they were going to have it. If they were only going to have oil-lamps for six months, let them go without light until they could get gas. Mr. S. A. Child, a member of the Parish Council, said he was not going to move any amendment, as he thought the matter had been pretty well

thrashed out before. He had read all the correspondence, and it was utterly inconsistent with the statement made by the Secretary of the Gas Company that evening. Mr. T. Hale spoke in praise of the Company. The Chairman (Mr. C. A. Smith) pointed out that the Parish Council had £100 in hand for the purpose of lighting the parish. He said it did not matter if gas cost £10 more than oil; what the parish wanted was the best form of illuminant for public lighting—gas.

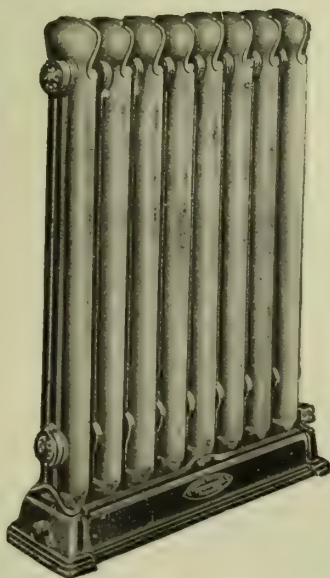
The resolution was then put to the meeting. Many abstained from voting; but there were only two hands held up against the resolution, which the Chairman declared carried practically unanimously.

ORIENTAL GAS COMPANY, LIMITED.

The Public Lighting Contract.

In the report for the year ended the 30th of June last, which the Directors of the Company will submit to the proprietors to-morrow, they say the prices of coal which ruled during the twelve months were somewhat easier, but the markets for coke and other residuals were unfavourable; so that the net result is not so good as it has hitherto been. At the last two meetings, allusion was made to the Corporation's request for tenders for the future lighting of the city of Calcutta. More than one tender was submitted by the Company to meet the varying views of the Corporation; and ultimately, in the spring of this year, negotiations were carried on by the Board in London with Mr. Alfred Mansfield, the accredited technical adviser of the Corporation. After several protracted interviews, terms for a new contract for the supply of gas to the public lamps from May 1, 1911, were agreed upon, and were finally accepted by the Corporation on the 8th of September, subject to the sanction of the local (Bengal) Government. Under the new contract (which is to be for a period of twenty years), an improved supply of gas will be furnished to the city at increased pressures. This will necessitate a very large outlay by the Company for new mains and plant and for alterations, and also an augmentation of the staff. These matters have already been taken in hand. Several new mains have been laid since the 30th of June, and a Chief Distributing Engineer and an Assistant—both thoroughly qualified and experienced—have been dispatched to Calcutta. The question of lighting and extinguishing, cleaning, and maintaining the lamps and their accessories, and the supply of new lamps and mantles, is left open for further consideration and negotiations prior to the commencement of the new contract. The Directors propose, when the new public lighting contract has obtained the sanction of the local (Bengal) Government, and has been legally executed, to reduce the price of gas to private consumers; and it is anticipated that with a lower price and increased pressures a considerable advance in the use of gas will follow. The Directors recommend the payment of the usual dividend of 4½ per cent., free of income-tax, making a total of 8 per cent. for the year.

The Steamless Radiator.



THE unique construction of Davis's Patent Steamless Radiator (Patent No. 21,453) affords UNIFORM HEAT DISTRIBUTION without Steam and Water—and their attendant drawbacks.

There is NO FLAME CONTACT under any circumstances, and CONDENSATION AND DEPOSIT CANNOT TAKE PLACE.

Davis's "Steamless" represents the acme of SIMPLICITY in Radiator construction; no Water Receptacles to fill; no Gauge Glasses to break; no Valves; no array of Cleaning Brushes; no voluminous Instruction Charts.

The Davis Gas Stove Co., Ltd., Luton.

EFFECTS OF THE MINES (EIGHT HOURS) ACT.

In the House of Lords, last Tuesday, Lord Newton asked the Government whether they could state what decrease in the output of coal had occurred since the Mines (Eight Hours) Act came into operation, and whether the Government still contemplated introducing an Amending Bill this session. He said, so far as his own information went, he believed there was no great difference in the Yorkshire collieries; but as regarded Lancashire, part of the Midlands, and South Wales, there was a reduction in the output of 10 per cent. He was further informed that the miners earned 9s. or 10s. a day less than before the Bill was passed. The Act, which was intended to be so beneficial, had, as a matter of fact, proved so unpopular that when a member of the Government (Mr. Herbert Samuel) had to seek re-election in Cleveland he had, in order to retain possession of his seat, to promise an Amending Bill. Earl Beauchamp replied that returns would not be made up till the end of the year, and there would be nothing to show the distinction between the output of coal in the six months before and the six months after the passing of the Act. The Inspectors of Mines were consulted, and there appeared to have been a small decrease in the output of coal since July 1. They pointed out that, in addition to the reduction of hours, there were other causes tending to decreasing the output. In particular, the general depression in trade had influenced many industries, and there had also been strikes and difficulties with the men. The Amending Bill was only intended to deal with a very small question—viz., whether the men should go to work early on Saturday morning, so as to obtain full advantage of the Saturday half holiday. The Government did not propose to introduce an Amending Bill other than the one already brought in.

The Engineering Supplement to "The Times" on Wednesday last contained the following remarks: "A correspondent informs us that, in consequence of the efforts that are being made by colliery managers to maintain their output in face of the restrictive influence exercised by the Mines (Eight Hours) Act, there is a tendency to hurry and carelessness in the filling of the trams; the result being deterioration in the quality of the coal raised. He suggests that colliery managers would be wise if they took steps to check this carelessness before it has led to loss of business, and that possibly it may be found less troublesome to erect additional cleaning and washing plant at the pit-head than to reduce the output of the mine and, as a direct consequence, the earnings of the individual miner."

According to the "Daily Mail," the Linby Colliery Company have posted notices to the effect that their pits will close down in a fortnight's time. The announcement has occasioned something like consternation, as some 300 miners will be thrown out of work at a time when their services should be fully occupied in coping with the increased demand for coal for the winter. The pits are situated near Nottingham; and the proprietors contend that the step, which has been taken most reluctantly, is entirely due to the operation of the Mines (Eight Hours) Act, which makes it impossible to work the colliery except at a loss.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The meeting of the Eastern District of the Scottish Junior Gas Association in Dunfermline this afternoon was, in point of numbers, one of the best they have ever had. It was a novel meeting, in respect that the larger part of the information conveyed by Mr. R. B. Chalmers, of Alva, was contained in sketches upon the blackboard, made on the spot, and immediately rubbed out to make room for others. But by this means the subjects dealt with were made much more clear than they could have been by word description. Mr. Chalmers' methods of working are very ingenious; and whether anyone may adopt them or not, there was conveyed by the discourse a sense of the value of self-reliance and resource which should not fail to be of great service to the hearers. The intimation that a circulating library is about to be opened should be of much assistance to the Association in attracting members. I should not omit to mention that the visit to the Dunfermline Gas-Works, before the meeting, was worth more than the trouble. Mr. A. Waddell, the Engineer, being an adept at thinking out for himself the kind of apparatus which will suit him, the works contain many novelties, all of which are fully answering the purposes for which they have been devised and constructed.

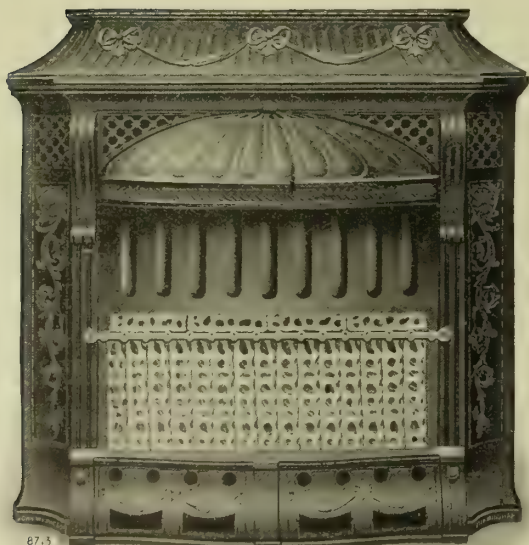
The accounts of the gas undertaking of the Corporation of Kilmarnock for the year ending May 15 last have been approved by the Town Council and issued. They show a total make of gas of 164,317,200 cubic feet, which was a decrease of 5½ million cubic feet upon the preceding year. Gas accounted for amounted to 152,393,500 cubic feet—a decrease of 5,208,200 cubic feet. Unaccounted-for gas amounted to 11,923,691 cubic feet, which was a less quantity than in the previous year by 256,609 cubic feet. The yield of gas per ton of coal was 9566 cubic feet—a decrease of 34 cubic feet. The total revenue for the year was £25,268, of which £17,913 (a decrease of £1894) was derived from the sale of gas, £1922 from the sale of char, and £2773 from tar and sulphate of ammonia; the revenue from residuals being £4695—a decrease of £782. The rental of gas stoves and fires hired amounted to £221. The total expenditure was £22,391, which left a balance to the net revenue account of £2877. Coal cost £9447, lime £394, retorts £363, maintenance of works £1272, and salaries and wages in the manufacturing department £5611. The total charge for the manufacture of gas was £17,127, which was at the rate of 19s. 11½d. per ton of coal, and 2s. 10½d. per 1000 cubic feet of gas. Distribution of gas cost £2097, which was at the rate of 2s. 5½d. per ton of coal, and 3½d. per 1000 cubic feet of gas. Rents, rates, taxes, and insurances amounted to £1414, which was at the rate of 1s. 7½d. per ton of coal, and of 2½d. per 1000 cubic feet of gas. There was a capital expenditure during the year of £5683—raising the capital account to £100,645. The capital expenditure consisted of £3300 upon buildings, machinery, &c., £615 upon main and service pipes, £1198 upon meters, and £570 upon cooking and heating appliances. Interest on loans amounted to £2168; and there is at the credit of the sinking fund £2084.

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The "SALON."

Fire width - 21 ins.



It affords a maximum width from which Radiation takes place.

No attempt to concentrate radiation within a narrow limit can replace this.

The Gas-Fires of the Future will all radiate from as wide an area as Coal-Fires.

THIS WIDE-FIRE SPACE PRINCIPLE
of OURS is what the Gas Industry was waiting for.

HAVE YOU SEEN THE "SALON"?

Its Fire-Space is 21-inches wide.

JOHN WRIGHT & CO.,
Essex Works,
BIRMINGHAM.

In the Hamilton Town Council on Tuesday, the Gas Committee reported that the Gas Manager, having experienced considerable difficulty in moving waggons from the railway siding to the tipping apparatus, had suggested that plant should be provided for the haulage of the waggons. Estimates for such plant had been received from three firms, the lowest of which was by Messrs. Mackenzie and Torrance, of Edinburgh, who offered to fit up, for the sum of £95, one of Liddle's patent concentric electric capstans, of 18 H.P., capable of drawing two 25-ton waggons on a gradient of 1 in 40, at about 90 feet per minute. This offer was accepted. Bailie Cassells said a great grievance seemed to exist among users of prepayment meters; and he asked if the Gas Committee had considered the advisability of lessening the present charge. Ex-Provost Keith thought the matter might be remitted to the Committee, with a recommendation from the Council to reconsider the present charge, with a view to a reduction. Bailie Anderson, the new Convener of the Gas Committee, said it was his intention, independently of the matter being raised in the Council, to bring it before the Committee.

In the Police Court at Kirkintilloch on Tuesday, William Bain, a butcher, of Cowgate, was summoned on a charge of having caused annoyance to a neighbour by using a mincing-machine driven by a gas-engine. He denied the charge. The complainer stated that the engine and mincer were placed in a shed which stood against the gable of her house, and that the vibration caused by them affected her house so much that the gas-mantle was broken, and pieces of cement and plaster fell off, while the dropping of soot down the chimney prevented her using her kitchen range. For the defence, it was stated that the mincer was a patent "silent" one, similar to many in use in Glasgow, and that no gas-engine could be got which did not make a noise to some extent. It was argued, on behalf of the respondent, that a noise or vibration, before it could be held to be a nuisance, must be unnatural, unusual, or extraordinary, and must cause material injury to another. To put a stop to the working of this engine would be a serious interference with the accused's business, and would place him at a disadvantage compared with others in the trade. The case was adjourned to give the accused an opportunity of conferring with his landlord as to the removal of the machine to another part of the premises, and also that the Magistrate might hear and see it working.

The Dunfermline Town Council on Monday engaged in the work of adjusting Committees. In the course of the proceedings, Mr. T. Stewart, the Convener of the Gas Committee, said it was proposed by the Magistrates to appoint Mr. Bowie to the Gas Committee; and he asked the reason for this. Provost Husband said that the Magistrates noticed that Mr. Bowie had been criticizing the Committee; and he remembered the saying of a former Magistrate, to the effect that when a man found fault with a Committee they should put him on it. Mr. Stewart thought it was a mistake to put a man on a Committee who had prejudged anything to the extent Mr. Bowie had done. The officials, particularly the Manager and himself, insisted that the charges which Mr. Bowie had made should be investigated. The inference was that things were going on at the gas-works which should not go on, and

there must be an inquiry. Bailie Norval, as one who had the utmost faith in the Manager, thought that Mr. Bowie should go on the Committee. The gas-works would stand the closest inspection that could be made; and after a little experience, Mr. Bowie might modify his views as to the Manager. The appointment was agreed to.

The Gas Committee of the Arbroath Town Council reported on Friday that, in consequence of an application from Messrs. Douglas Fraser and Sons, Limited, engineers, for a special rate for gas for case-hardening and other heating purposes, the Manager had submitted a statement of the larger customers, consuming over 250,000 cubic feet of gas per annum. Six of these took over 500,000 cubic feet, and four of the six consumed over a million cubic feet per annum—one consumer having used 1,475,000 cubic feet during the past year. The Manager submitted a table showing the effect of making a special rebate to consumers of 250,000 cubic feet per annum and upwards, graduated from 250,000 up to 1,500,000 cubic feet, from which it could be inferred that it might prove profitable for the gas-works if these large consumers were given a special rebate in proportion to the consumption of each. The Gas Committee remitted it to a Sub-Committee for consideration and report. The Manager suggested to the Committee the desirability of developing the sale of gas further by pushing the use of it for domestic heating. He pointed out that cooking by gas was almost universal in Arbroath; there being now 4150 cookers, grinders, and boiling-rings fixed. Gas-fires were at present supplied, as well as water-heaters for baths and other domestic purposes, and all apparatus manufactured for the purpose of utilizing coal gas for heating, at the net cost price to the Corporation—this being at a considerable reduction from list prices. The Corporation were also fixing the necessary piping for gas-fires for heating sitting-rooms and bedrooms free of charge; and the Manager suggested for consideration whether gas-fires should not also be hired or provided free. It appeared to the Committee that it would not be profitable to supply gas-fires free of charge, unless on condition of being guaranteed the consumption of a certain quantity of gas; but in the end they remitted the whole matter to a Sub-Committee to consider and report. The Town Council approved of the action of the Committee.

Sheffield and the Handsworth Water Supply.—At a recent special meeting of the Handsworth Urban District Council, a resolution was passed to dispose of their water-works to the Sheffield Corporation, and hand over to them the entire responsibility for the supply of the district.

Successful Water Divining.—Owing to the shortage of water on the property of Sir W. Clayton, Bart., at Widmere Farm, near Marlow, a water-finding expert was engaged to prospect. He stated that a good spring would be found at a depth of 90 feet; and on an artesian well being sunk at the spot indicated a spring was tapped at 96 feet which yields 8000 gallons of water per day. Several other borings to the depth of from 300 to 400 feet have been made in the neighbourhood, but with no result.

The Growth of the Demand!

A . . .
Picture
Study!

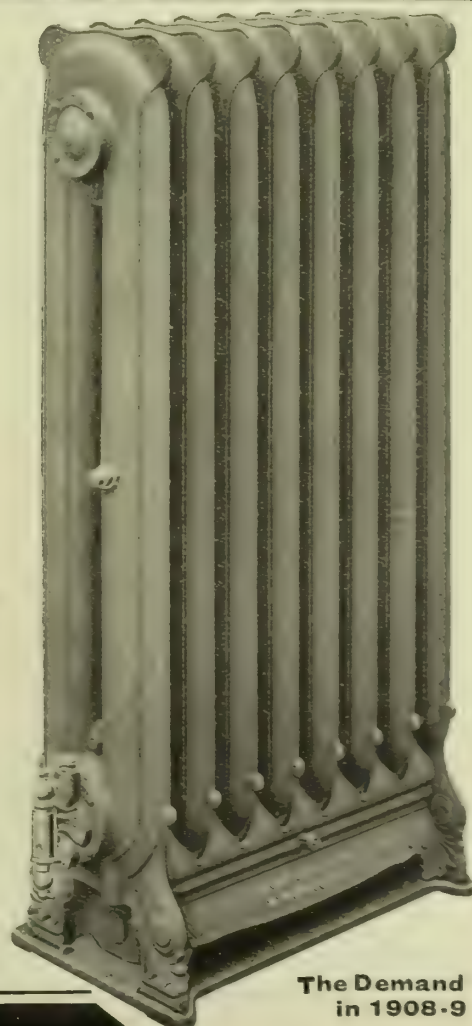
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The Demand
in 1903-4

JOHN WRIGHT & CO.,
The Radiator Experts,
Essex Works, BIRMINGHAM



The Demand
in 1908-9

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, Nov. 13.

There is practically no change to report in the market this week, either as regards tone or value. Buying has again been just about enough to take up the present output as it becomes ready, and it has mainly been for covering sales made some time ago. The quotations remain £11 2s. 6d. per ton f.o.b. Hull, £11 3s. 9d. per ton f.o.b. Liverpool, and £11 5s. per ton f.o.b. Leith. For forward delivery, the position also continues unaltered; and although little new business has transpired, it is understood that offers are still being made by dealers for January-June, 1910, shipment at to-day's price.

Nitrate of Soda.

This article remains a dull market; but quotations are still given as 9s. 3d. per cwt. for ordinary and 9s. 6d. for refined qualities respectively.

Tar Products.

LONDON, Nov. 15.

The markets for tar products have not been very brisk during the past week. Pitch has been steady, but dealers are inclined to take lower prices for forward delivery. Creosote is quiet, and no transactions of note are reported. In 90 per cent. benzol, there has been little business done for this year's delivery; but the transactions are not affecting the prices.

The average values during the week were: Tar, 13s. to 17s., *ex* works. Pitch, London, 26s. to 26s. 3d.; east coast, 25s. 6d. to 26s.; west coast, 24s. 6d. to 25s. 6d. f.a.s. Mersey ports, 25s. f.o.b. other ports. Benzol, 90 per cent., casks included, London, 6½d. to 6¾d.; North, 5¾d. to 6d.; 50-90 per cent., casks included, London, 7¾d.; North, 6¾d. to 7d. Toluol, casks included, London, 9d. to 9½d.; North, 9d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3¾d. to 3½d.; solvent naphtha, casks included, London, 1s. to 1s. 0½d.; North, 11¼d. to 11½d.; heavy naphtha, casks included, London, 10½d. to 11½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. Carbolic acid, 60 per cent., casks included, east coast, 10½d. to 10¾d.; west coast, 10½d. to 11d. Refined naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article is still very quiet, and buyers who come into the market expect to get on at even under the prices which are being quoted. Beckton to-day quote £11 5s. and £11 8s. 9d. for forward. In Hull, the figure is £10 18s. 9d.; and in Liverpool, £11 to £11 1s. 3d. In Leith, £11 5s. is quoted; and for forward, £11 7s. 6d.

. We regret that a mistake was made in quoting the maximum price of tar and heavy naphtha in the North last week. The former should have been 17s., and the latter 10d. to 10½d.

COAL TRADE REPORTS.

Northern Coal Trade.

There has been a rather better request for coals; and, with a fuller supply of steamers, the shipments have been heavier, more especially of gas coals. In the steam coal trade, the demand is still rather limited, and the prices fell off, with a partial recovery—about 10s. 3d. to 10s. 6d. per ton f.o.b. being now quoted for best Northumbrians. For second-class steams, from 8s. 9d. to 9s. is quoted; and for steam smalls from 5s. to 6s.—the latter class being rather more scarce. In the gas coal trade, the demand is very near its fullest; and the deliveries on the long contracts are now very heavy both for home use and for export. Durham gas coals are from 10s. to 10s. 10½d. per ton f.o.b., according to quality, for the usual classes; while for best "Wear specials," up to 11s. 6d. per ton f.o.b. is quoted. There are sales being made forward of best gas coals at about 17s. 7d. per ton at Genoa, and second-class gas coals at about 10d. per ton or so less. Some of the collieries, however, refrain from further forward sales at present. There is still a little uncertainty as to the methods of coming into operation of the Eight Hours Act at the end of the year; and the negotiations between coalowners and miners proceed very slowly. Coke is firm. Gas coke is plentiful, and is quoted at about 12s. 6d. to 12s. 9d. per ton f.o.b.

Scott Coal Trade.

Trade is sluggish, and with no appearance of improvement. The shipping demand is again slack. For home consumption, steam coal is in poor request, and small sorts are very plentiful. The prices now quoted are: Ell 9s. 3d. to 10s. 6d. per ton f.o.b. Glasgow, splint 10s. to 10s. 3d., and steam 9s. to 9s. 3d. The shipments for the week amounted to 322,018 tons—an increase of 26,163 tons upon the previous week, and of 3177 tons upon the corresponding week of last year. For the year to date, the total shipments have been 13,109,925 tons—an increase of 597,418 tons upon the corresponding period.

Reduced Price of Gas at Seaford.—At the meeting of the Seaford Urban District Council on Monday last week, the General Purposes Committee reported that a letter had been received from the Seaford Gas Company with reference to the price of gas, suggesting that if the standard price were reduced the net charge should be 3s. 8½d. per 1000 cubic feet. It was recommended that the offer be accepted, and that seven of the lamps on the Parade be not lighted during the ensuing winter months, as suggested at the interview between the Directors and the Sub-Committee. On the motion for the adoption of the report, Mr. Hooper said Mr. Kent and he met two Directors of the Gas Company with regard to the suggested reduction in the price of gas to the Council *pro rata* with the concession made to the general consumers, and they proposed a reduction to the Council from 3s. 10d. to 3s. 8½d. The reduction to outside consumers would be very satisfactory. He thought the Company deserved the best thanks of the town. The report was adopted.

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CARRON, STIRLINGSHIRE.



GRAND PRIX,
Franco-British Exhibition.

Conviction for Illegally Tapping a Gas-Main.

A man named Peter Taylor was charged at the Salford Police Court last Friday with stealing gas from the Corporation. It was stated by the Deputy Town Clerk (Mr. J. W. Jackson) that the defendant in 1903, being in arrears, had his gas supply cut off. Recently a Corporation official found, on examining Taylor's house in Griswell Street, that a service-pipe had been fixed to the main, and connected with that supplying the house. The opinion was expressed that for at least twelve months Taylor had been obtaining gas in this way without payment. The defending solicitor admitted the guilt of his client, but said the gas had only been occasionally used since the illegal connection was made. Taylor, who expressed sorrow for what he had done, said he was a widower with two ailing children, and only earned 25s. a week. He was fined 40s. and costs.

Damage Done by Smoke.

The new Chairman of the Manchester Section of the Society of Chemical Industry (Mr. R. H. Clayton) chose for his Inaugural Address last Friday night the subject of "The Conservation of Finished Products;" and the greater part of it was devoted to the consideration of the great enemy of finished textile products—smoke. He showed in a striking way how vast is the damage done by smoke, and suggested means for combating its ill-effect. As an illustration of the losses sustained by traders in consequence of smoke, he said that a foggy week in December, 1904, cost a firm of drapers in Manchester £600 in depreciation of goods alone, to say nothing of the extra cost of lighting, cleaning, and so forth. Furnishing firms had sent him details regarding the deterioration of wood and metal work due to Manchester's atmospheric impurities; while builders and architects had suffered losses. An estimate of the loss to the nation due to coal smoke was between £30,000,000 to £40,000,000. As a solution of the domestic smoke problem, Mr. Clayton advocated the prohibition of open grates burning soft coal and the extension of heating by gas and coke. But he thought it was necessary for the community to set to work in a serious manner to clear away the difficulty, and not to imagine that simply by legislating against the factory chimney they were going to attain the necessary end.

Additional Capital for the Mitcham and Wimbledon Gas Company.—From an announcement which appears in another part of the "JOURNAL," it will be seen that the Directors of the Mitcham and Wimbledon Gas Company are inviting tenders for an issue of £12,000 of consolidated ordinary stock at a minimum price of £108 per £100. The development of the Company's business has for many years been continuous and rapid; the sales of gas having more than doubled since 1902. The dividend for the half year to June last was at the rate of 5½ per cent. per annum; and at the minimum price offered, the stock would yield £4 17s. 2d. per cent. to the purchaser.

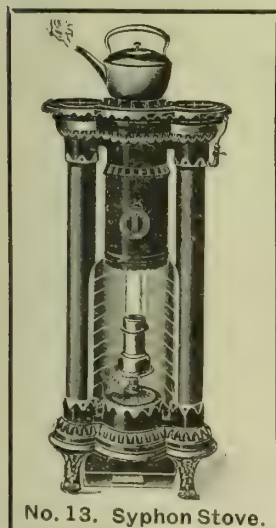
Salford Corporation Finances.

On his election as Mayor of Salford for the current year, Alderman Snape, referring to the rates of the borough, said they were almost too heavy for the ratepayers to bear. The outlook was not promising; and all he dared to hope for was that they would not be compelled to raise the rates next year. The profits of their trading departments were decreasing monthly, and were likely to be much less than the estimates; and if they were to end the year without a debit balance, it would be absolutely necessary for each Committee to exercise most rigid economy, and be determined to keep within the estimates. He also thought it his duty to warn the Council that if the members insisted on reducing the price of gas and electricity, and continued to make concessions on tramway fares, they must have increased rates. They could not have it both in "meal and in malt." The price of gas had been reduced from 3s. 1d. in 1881 to 2s. 3d. to-day. As to the relations between the Corporation and some neighbouring authorities who were supplied with gas and electricity, the newly-elected Mayor expressed the hope that any difficulties would be removed through the exercise of mutual forbearance and friendliness.

Crewkerne Lighting Dispute Settled.

After the streets had been in darkness for several weeks, the dispute between the Crewkerne District Council and the Gas Company in regard to the amount to be paid for public lighting, to which reference was made in the "JOURNAL" for the 26th ult. (p. 272), has been settled. When the Council met last Wednesday, a letter was read from Mr. A. H. Hussey, a local Magistrate and member of the Somerset County Council, complaining of the inactivity of the Council in the matter, and threatening to place it before a higher authority unless they took immediate steps to light the town. Dr. T. B. Macdermot, a member of the Council, asked what was the actual sum in dispute; and the Chairman (Mr. H. Gould) replied that it was between £10 and £11. Dr. Macdermot asked if the Council would allow him or some other private individual to pay the amount, so as to have the town lighted at once. If the Council would accept it, he would be pleased to pay the amount that night, so that the question might be settled for this winter. Such a condition of things as that then existing was, he said, a disgrace to the town. The Chairman thought this was a very handsome offer, and said he did not see how the Council could refuse it. Other members, however, considered it undesirable that a private gentleman should pay the expenses of public lighting; and, after some discussion, it was decided that the Council should pay the sum in dispute, the exact amount of which was £10 15s. 8d., and have the town lighted at once.

The annual report of the Bacup Borough Accountant shows that the total outlay on the water scheme is £251,799, and that the loans raised amount to £245,158.



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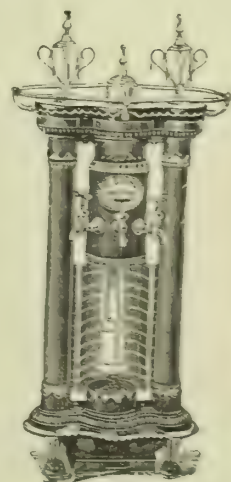
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No. 11. Bar Stove.

Wages Question at the Rochdale Gas-Works.—The application of the meter inspectors, stokers, and labourers employed at the Rochdale Gas-Works for an advance of wages was before the Gas Committee last Wednesday. The Works Sub-Committee's report on the matter was considered and referred back. Information obtained from some forty towns similar to Rochdale, as to the wages paid in the gas-works, was submitted; and it showed that in only eight places is the pay for the labourers more than at Rochdale, that a large number pay the same rate, and that a few pay less.

Management of the Colwyn Bay Gas-Works.—The Lighting Committee reported at the last meeting of the Colwyn Bay Urban District Council that they had considered carefully the report on the gas undertaking by Messrs. Thomas Newbigging and Son, portions of which were given in the "JOURNAL" for the 2nd inst. (p. 340), and the reply thereto of the Gas Manager (Mr. J. W. C. Pennington), a summary of which was published at the same time. They said they felt that the Manager had not given "that attention to his duties so necessary to the good working of the concern;" and they recommended "that his salary be reduced at the rate of £50 per annum for the next six months—the matter to be then reconsidered." Mr. Bevan said the conclusion of the Committee was unjust. They had not had any direct evidence of neglect on the part of the Manager. In the course of further discussion, it was pointed out by Mr. Dicken that the Committee, in stating that they would consider the matter again in six months, did not necessarily mean that the salary would be restored to its former figure. That was far from the intention. By that time, it was assumed that the Committee who were considering the duties and salaries of the officials would probably have presented their report. The resolution to confirm the Committee's action was unanimously approved.

Exmouth Water Supply.—The opponents of the much-discussed scheme for augmenting the water supply of Exmouth are displaying the same activity as they did last year, when they succeeded in defeating, on a poll of the ratepayers, the decision of the District Council to apply for parliamentary powers. At the last meeting of the Council, a further discussion of the subject was raised on a motion by the Rev. O. J. Reichel for rescinding the resolution passed in September, instructing the Clerk to take the necessary steps to promote a Bill in the ensuing session. Mr. Reichel asserted that two-thirds of the ratepayers were opposed to the Dottor scheme, which Mr. Randell, who seconded the motion, characterized as the maddest and wildest scheme they had seen. The proposal to rescind the previous resolution was defeated. Mr. Randell then called attention to certain sections in previous Exmouth Water Acts, giving power to take water; and he proposed that a Committee should be appointed to look into the conditions of the intakes and report on the subject. The Clerk expressed the opinion that the various Water Acts had been repealed by the last Act, which was passed in 1900; but it was pointed out that this measure reserved to the Council the right to utilize any water not taken under the former Acts. The resolution was carried, and a Committee appointed to give effect to it.

Cost of Lighting in Ireland.—At the close of an article on "Long Nights and Bright Lights" in last Wednesday's "Irish Independent," the author (Mr. A. T. Oliver) said: "Since the seventies, the competition evoked by the introduction of electric lighting has been of real service to gas producers and consumers. With equal experience of electric light and gas, as a domestic illuminant, the writer awards the palm for brilliancy and economy to the inverted incandescent gas-mantle, which yields an ideal light at a cost of 1d. for five hours. Three-quarters of a million sterling is about the annual expenditure upon gas in Ireland at the present time; but a portion of the outlay is incurred for power, heating, and cooking purposes. On candles imported into the country, we pay £100,000 per annum. Our paraffin oil bill runs into nearly £400,000 yearly. Approximately the inclusive cost of lighting our streets, roads, and buildings of every class is not less than £1,500,000 sterling per annum."

Torpoint Water Supply.—The Admiralty have once more entered into negotiations with the Torpoint District Council with a view to securing a supply of water for works which the Government contemplate carrying out in the Torpoint district. In a letter addressed to the Council by the Superintending Civil Engineer at the Devonport Dockyard, it is stated that at least 1½ million gallons of water per annum will be required by the new works, and that the Admiralty would reserve to themselves the right to take a larger quantity. The Council, whose previous negotiations with the Admiralty led to disappointment through a sudden change of policy by the Government, decided to refer the subject to the Water Committee for consideration. In the meantime, further details as to the Admiralty's plans and the probable revenue have been asked for; and it has been pointed out that such an augmentation of the water supply as seems to be contemplated would involve the Council in a heavy capital outlay and the cost of promoting a Bill in Parliament.

Unprofitable Electric Lighting at Sleaford.—Mr. J. A. Cole, the District Auditor, has made his report on the electricity accounts of the Sleaford Urban District Council for the year ended the 31st of March last. Its nature may be gathered from the fact that the Local Government Board expressed a wish to be furnished with the observations of the Council thereon when they had considered it; and this has been done. In the course of his report, Mr. Cole says: "Every effort should be used to reduce the working expenses, as the deficiency has to be met by means of the general district rate, which amounted during the year under audit to £290 14s. 10d. I find that the cash produced from sale of current amounted to £840 9s. 11d., which is less than the previous year. I gathered from the Engineer that at the price charged for current used in motors there was not a large margin of profit; and it is perhaps desirable that further investigation into this matter should be carried out. The cost of public lighting should not, of course, be included in the wages charged to cost of generation." At the meeting of the Council at which this matter came up, it was stated that the Electric Lighting Committee were doing their utmost to keep down the expenses.

PREPAYMENT METERS



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MILES PLATTING,
MANCHESTER.

RADFORD ROAD,
NOTTINGHAM.

Scotch Agent: JNO. D. GIBSON, 2, Causeyside Street, Paisley.

New Joint-Stock Companies.—The Pressure-Clock Lamplighter, Limited, has been registered with a capital of £8250, in 5000 £1 shares and 65,000 rs. shares, to take over the invention of Mr. George Robson, for automatically turning on and off the lights of gas-burners, and the apparatus therefor, and to enter into an agreement with him and the Automaton Gas Lamplighter Proprietary, Limited. The Mercury Safety Air-Gas Company, Limited, has been registered as a private Company with a capital of £5000, in £1 shares, to acquire patent rights for improvements in plant for the generation and storage of carburetted petrol and like gas, and to carry on the business of manufacturers of gas plant and machinery.

Lord Avebury on Municipal and National Trading.—At the *convenzione* of the London and Suburban Ironmongers' Association, held at the Holborn Restaurant on Monday last week, Lord Avebury delivered an address, in the course of which he gave the following as his reasons for opposing municipal trading: Municipalities and the Government had quite enough to do without going into matters of trade; if they did engage in commercial ventures, national indebtedness would be increased, which was an evil; this policy would bring them into conflict with labour, and the services would be more expensively carried on; it was a check to progress and discovery; and it afforded an opening for corruption, such as had been witnessed at San Francisco and New York. His Lordship elaborated these points separately.

Tiverton Public Lighting.—At a meeting of the Tiverton Town Council last Tuesday, the Streets Committee presented a report from the Borough Surveyor (Mr. J. Siddalls) and Gas Manager (Mr. Clark Jeffery) on the incandescent system of gas lighting, and recommended that about 40 of the full-service lamps and about 50 of the short-service lamps be extinguished at eleven o'clock each night, and that all the lamps (except those in courts) should be lighted every night throughout the year. The resultant saving on the gas used for lighting would be about £124 per annum; but the cost of extra labour in extinguishing the lamps at eleven o'clock, which the Gas Manager stated would be £50 a year, would have to be paid to the Gas Committee until the Lighting Committee saw their way to the general adoption of automatic lighting controllers. This would leave the net reduction in the cost of public lighting at £74 a year. The Committee further recommended that the conversion of the ordinary lamps into incandescent burners should be gradually extended in the town. The report was adopted.

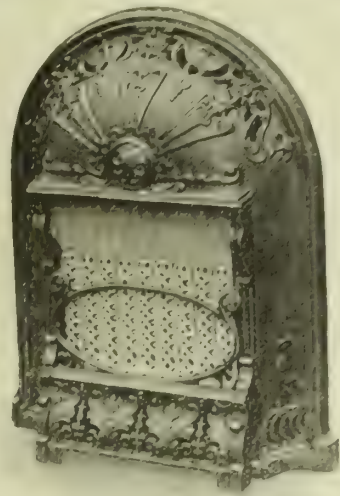
Gas Poisoning at Cambridge.—An inquest was held last Wednesday at Cambridge on the body of Elizabeth Gathercole, aged 83, who died from the effects of gas poisoning. Deceased was found in her bedroom on the previous morning in a state of collapse, there being a strong odour of gas in a cupboard about 4 feet from her bed. Medical aid was summoned, and under treatment she partially recovered; but she died early next morning. Dr. W. Nicolls, who was called in, said the collapse was due to gas poisoning, and there was enough gas in the room to overcome any ordinary person. Deceased had been about three hours under the influence of the gas, and her age was against her recovery. Mr. J. W. Auchterlonie, the Engineer and Manager of the Cambridge Gas Company, stated that the report of the escape was received at the office about ten o'clock in the morning, and they immediately sent a man to investigate the matter. They did not find any pipes in the house, and the road was opened and the main found to be cracked. This was due to some heavy weight having passed over it. The ground around the defective spot did not smell as if there was an escape of gas. Witness thought the only way by which the gas could have found its way into the deceased's bedroom was through the foundations and floor. The jury found a verdict of "Accidental death from gas poisoning."

Assessment of the Woking Water Company.—At the last meeting of the Guildford Board of Guardians, the Clerk (Mr. W. S. V. Cullerne) replied to a series of questions put some time ago in regard to certain assessments at Woking. The most important was whether a reduction of £580 had been allowed by the Assessment Committee to the Woking Water Company in respect of Woking parish, and whether any reduction had been made in other parishes. He explained that the Company, upon the new valuation, appealed against their assessment in eleven or twelve parishes, with the result that the Committee confirmed the assessment in certain cases, increased it in others, and decreased it in some. The net increase was £410 gross and £262 rateable, and the net decrease £247 ros. gross and £962 rateable. The result of the objection to the valuation list by the Company was that the Committee saw fit to reduce the assessment in the rateable value made by Mr. Eve by £700 ros. for Woking. The Company were not satisfied, and appealed to the Quarter Sessions against the assessment in the parishes where the Committee had made reductions. There was a meeting of the Engineers on both sides, and a compromise was arrived at. Under this the Company, instead of having a reduction in their total rateable value, consented to an increase of £62. While there had been a reduction in the assessment in Woking parish of £700, there had been an increase in West Clandon of no less than £225, which the Company had agreed to, and of £37 in West Horsley. From a union, and not a parish, point of view, there was an increase of £62 in the rateable value.

After church service last Sunday week, there was a brief failure of the electric light at Brighton. So far as the streets were concerned, it was little more than momentary.

About thirty members of the moulding class at the Halifax Technical School, accompanied by their teacher (Mr. J. Robinson), had an instructive time last Saturday afternoon. Through the kindness of the firm, a visit was paid to the works of the Campbell Gas-Engine Company; and the party were conducted round the extensive premises—the students finding much to interest them.

When some of the Committees of the Manchester Corporation met to elect their Chairman and Vice-Chairman for the ensuing year, a remarkable record of continuous service, says the local "Courier," was chronicled in the case of the Gas Committee, when Alderman Gibson was elected Chairman for the seventeenth year in succession, and Alderman Briggs Deputy-Chairman for the fourteenth year.



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13-inch Fire Opening.

NOTE

The Wide Fire Opening,
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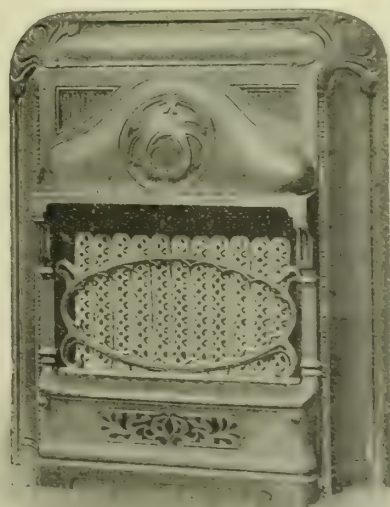
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UNEXCELLED FOR EFFICIENCY
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ALL SINGLE ROW FUEL FIRES
ARE SUPPLIED WHEN REQUIRED
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We learn that Mr. Arthur C. Frost, who has for the past nine years been engaged with the Sutherland Meter Company, of Witton, Birmingham, first as traveller and later as commercial manager, has now been appointed General Manager, and will have his headquarters at the works.

After negotiations extending over two years, the Abertillery and Abercarn Urban District Councils have decided to go to Parliament next session with a Bill for the formation of a Water Board. The proposal is to take water from the Grwyne Vawr Valley in Breconsire, and to convey it to the Western Valleys of Monmouthshire. The Bill to be promoted will provide for the Risca or any other local authority joining the Board if they so desire. Messrs. Baldwin Latham and Rofe and Son, of Westminster, are the Engineers; and Mr. T. S. Edwards, of Newport, will act as Solicitor. The scheme is estimated to cost about £225,000.

We understand that the arrangement made last year with Metropolitan Gas Meters, Limited, with regard to the "Rapid" light controller has now terminated, and that the Rapid Light Controlling Syndicate, Limited, of No. 11, St. Helen's Place, E.C., have resumed the sale and supply of their apparatus direct.

We have received from Mr. William Edgar, of Hammersmith, a new illustrated catalogue—compact, smart, and up-to-date. Everything is well described, illustrated, and indexed in a thoroughly clear manner. Gas-lamps and lanterns with upright and inverted burners, gas-fittings and accessories, and other things appertaining to the gas industry, are included in it. Some of the most recent items are an automatic flashing device for advertising purposes, a "Luminary" stove for heating halls, &c., the "Cutmore" greenhouse heater, and so on. The well-known "Blenheim" gas-fire is also illustrated. Much care must have been taken in compiling the catalogue.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

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AIR PIPES. Sheffield Water Department.

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ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.
Nov. 23.
BOGNOR WATER COMPANY. Nov. 23.
BRENTFORD GAS COMPANY. Dec. 15.

Stocks and Shares—continued.

HARROW AND STANMORE GAS COMPANY. Dec. 7.
MITCHAM AND WIMBLEDON GAS COMPANY. Dec. 6.
SOUTHEAD WATER COMPANY. Dec. 7.
WORTHING GAS COMPANY. Nov. 23.

TENDERS FOR

Sulphur (Recovered). No. 5154.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Sulphate of Ammonia.

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Nov. 11, 1909.

BRENTFORD GAS COMPANY.

SALE BY TENDER OF £30,000 NEW STOCK, 1881.
IN pursuance of the Brentford Gas

Order, 1881, Notice is Hereby Given, that it is the
intention of the Directors of this Company to SELL
BY TENDER £30,000 of NEW STOCK, 1881, of the
Company, to be paid up in full on or before the 15th day
of January, 1910; such Stock being a portion of Addi-
tional Capital Authorized to be raised by Resolutions
passed at an Ordinary Meeting of the Proprietors held
on the 11th day of February, 1898, under the powers of
the above-mentioned Order.

Particulars and Conditions of Tender may be ob-
tained on Application at this Office; and Sealed Tenders
must be sent in not later than Ten o'clock on the
Morning of Wednesday, the 15th day of December next.

By order,
WILLIAM MANX,
Secretary.

Office: Brentford Gas Company,
Brentford, Nov. 1, 1909.

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AMMONIA Makers by
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MESSRS. A. & W. RICHARDS beg to
notify that their SALES BY AUCTION of NEW
CAPITAL ISSUED UNDER PARLIAMENTARY
POWERS, and of STOCKS and SHARES belonging to
EXECUTORS and other PRIVATE OWNERS in LON-
DON, SUBURBAN, and PROVINCIAL GAS and
WATER COMPANIES, take place PERIODICALLY
at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing New Capital, and also for including
other Gas and Water Stocks and Shares in these Periodi-
cal Sales, will be forwarded on Application to Messrs.
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By order of the Directors of the
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NEW ISSUE OF £4085 CONSOLIDATED
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MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
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Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
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NEW ISSUE OF 250 £10 ORDINARY SHARES.

MESSRS. A. & W. RICHARDS will
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Lots.
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CIRCUS, E.C.

By order of the Directors of the
ALLIANCE AND DUBLIN CONSUMERS' GAS
COMPANY.

NEW ISSUE OF £32,000 FOUR PER CENT.
PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will
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By order of the Directors of the
SOUTHEAST WATER-WORKS COMPANY.

NEW ISSUE OF 500 NEW ORDINARY FIVE PER
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AND
£5000 FOUR PER CENT. PERPETUAL
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Lots.
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By order of the Directors of the
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CIRCUS, E.C.

Issued under the powers and subject to the provisions
of "The Mitcham and Wimbledon Gas Act, 1907."

MITCHAM AND WIMBLEDON DISTRICT
GASLIGHT COMPANY.

NOTICE OF SALE BY TENDER OF £12,000
CONSOLIDATED ORDINARY STOCK.

MINIMUM PRICE OF ISSUE £108 PER £100 OF STOCK.

THE Directors of the Mitcham and
Wimbledon District Gaslight Company Hereby
Give Notice that they will be prepared to receive, not
later than Five o'clock p.m. on Monday, the 6th day of
December, 1909, Sealed Tenders for £12,000 CON-
SOLIDATED ORDINARY STOCK of the Company,
in lots of the nominal amount of £50, or Multiples
thereof.

No Tender for any less nominal amount than £50, or
at a less price than £108 per £100 of Stock, will be
entertained.

The Balance of the Purchase Money is to be paid on
or before Monday, the 3rd day of January, 1910. Divi-
dend will accrue from the 1st day of January, 1910.

Tenders must be made on Forms provided by the
Company, which, with Particulars and Conditions of
Sale, can be obtained on Application to the under-
signed.

BENJAMIN GREEN,
Secretary.

Offices and Works, Western Road,
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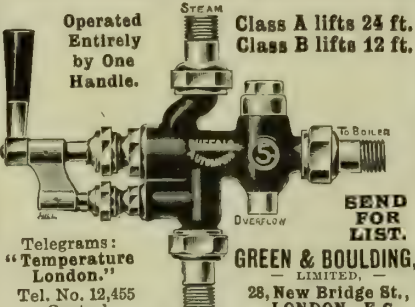
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NOTICE IS HEREBY GIVEN, that Proceedings for Infringement of this Patent will at once be taken against any person using in Gas-Purifiers Inclined Supports and Bars or Laths supported thereby so as to make the Laths break joint.

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JAMES CLARKSON,

Solicitor for Walter Spencer, of Elland, Yorkshire.
the Patentee.

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VOL. CVII.

OF THE

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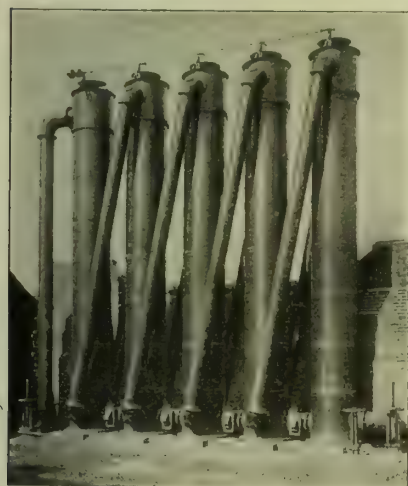
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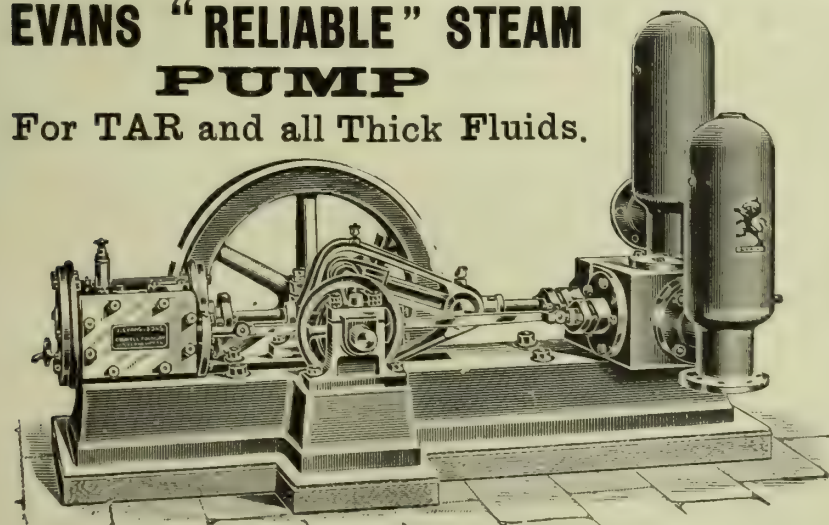
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RETORTS

MAIN LAYING.

Paper by PERCY GRIFFITH, M.Inst C.E., and BRUCE MCGREGOR GRAY, Assoc.M Inst.C.E., before the Association of Water Engineers.

A. The Authors used *Flanged Pipes* for the Rising Main up the Steep side of the Barff, and their experience proved that this was not an advantage, as the *rigidity of the Joints* involved considerable difficulty in regard to the depth of the Trench, and a good deal of Cutting to make the final Connections at each end of the Pipe-Line.

B. In the case of the Delivery Main, the Joints were *Ordinary Socket Joints*, but made with Lead only. The only difficulty met with here was the necessity for pouring the Lead in at a suitable temperature to prevent it melting the Solid Lead Fillet, and running through into the Pipe.

C. In some of the Smaller Branch Connections, Lead Wool was used, and proved highly successful.

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500 CANDLE POWER

OUTSIDE

LAMPS

Fig. I.586.

4 BURNERS.

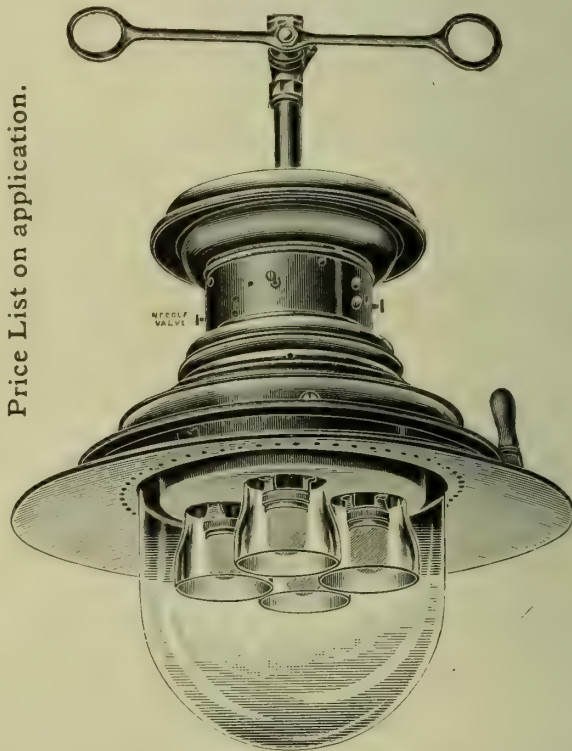
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Olive Green Vitrified
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47/-

USUAL DISCOUNT.



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Lamp with Hinged Bowl, 17in. Enamelled Reflector, Bye-Pass Lever Cock and Pilots, Inverted Incandescent Gas Burners, Improved Adjustable Gas Regulators, Jena Glass Cylinders, and Mantles. Length over all 27in.

Number of Burners 2 3 4

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Important Improvements.



BURNERS.

1. **20-Candle Power** more light without increase in the consumption of gas.
2. **Patent Gas Adjuster**; cannot get out of order.
3. **Automatic Gas Regulator**, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. **Accurate Regulation of the Air Supply.**
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

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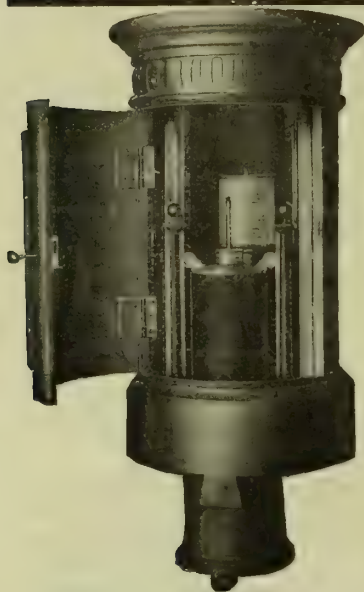
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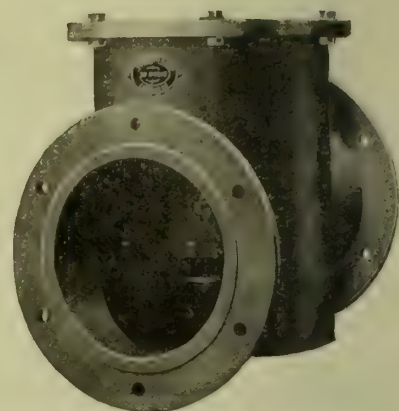
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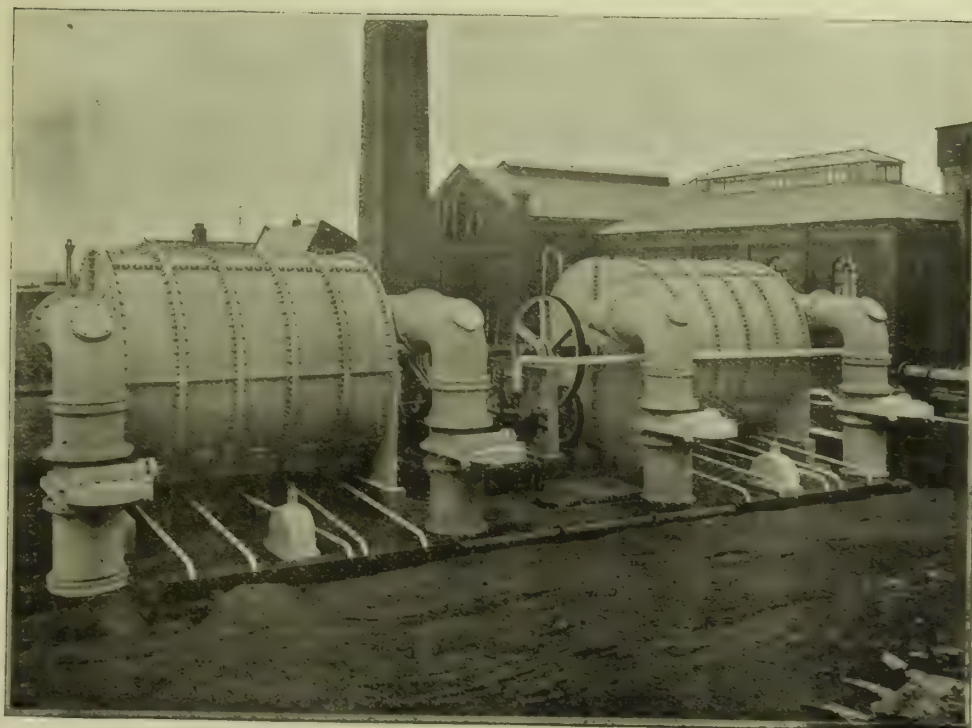
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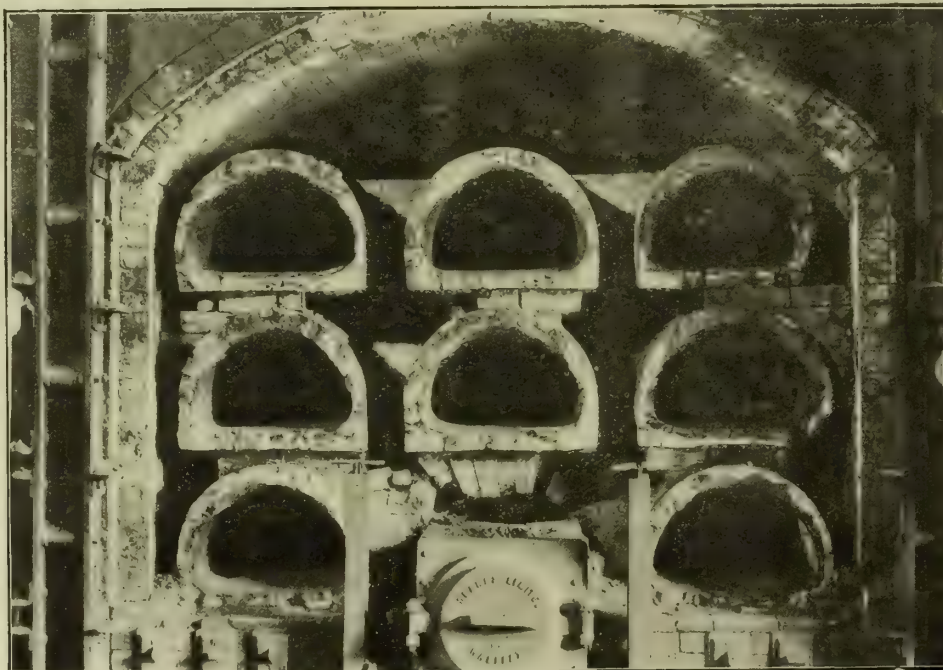
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Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

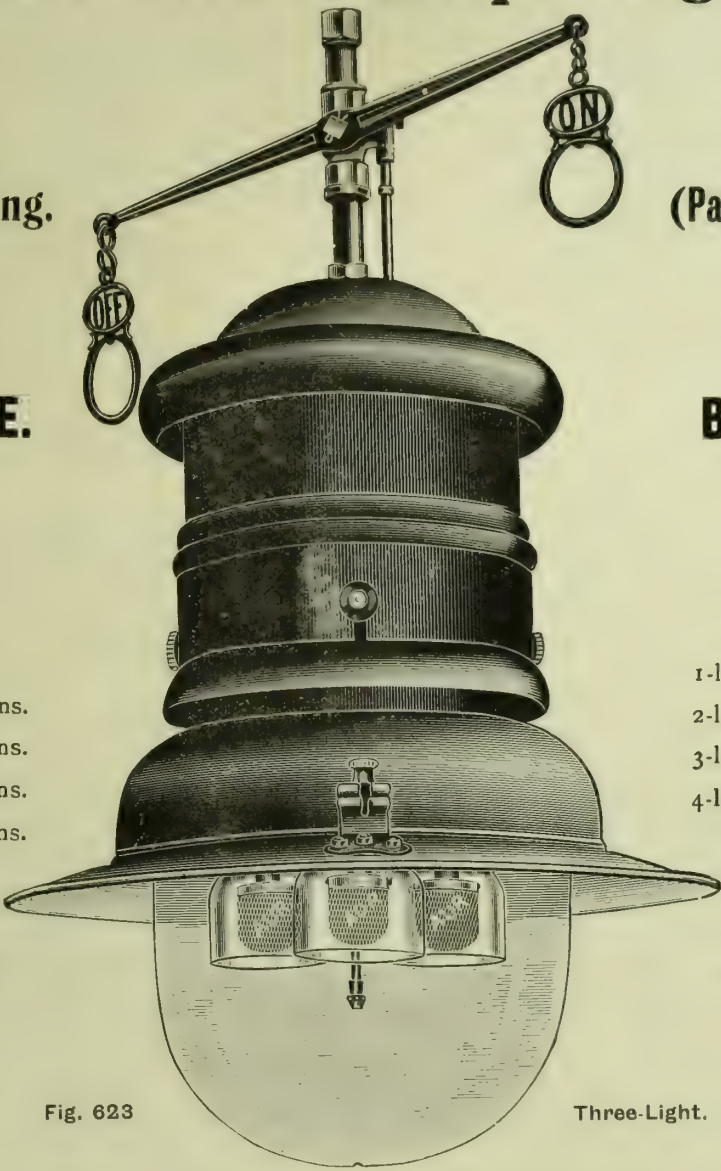


Fig. 623

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52 6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72 6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	29 36
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	36 6/-	7 6	Not made
Case contains . . .	80	18	18	12	Welsbach Mantles, each	6d. subject as usual.			

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

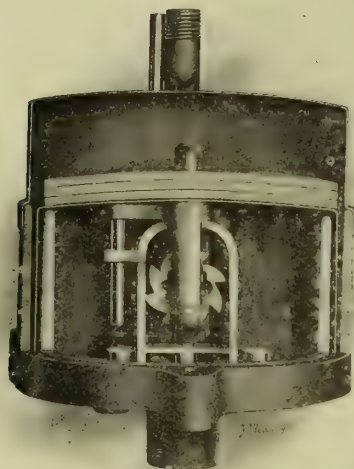
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Efficient.
Cheap.

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Saves Labour, Gas, Mantles, and Glasses.

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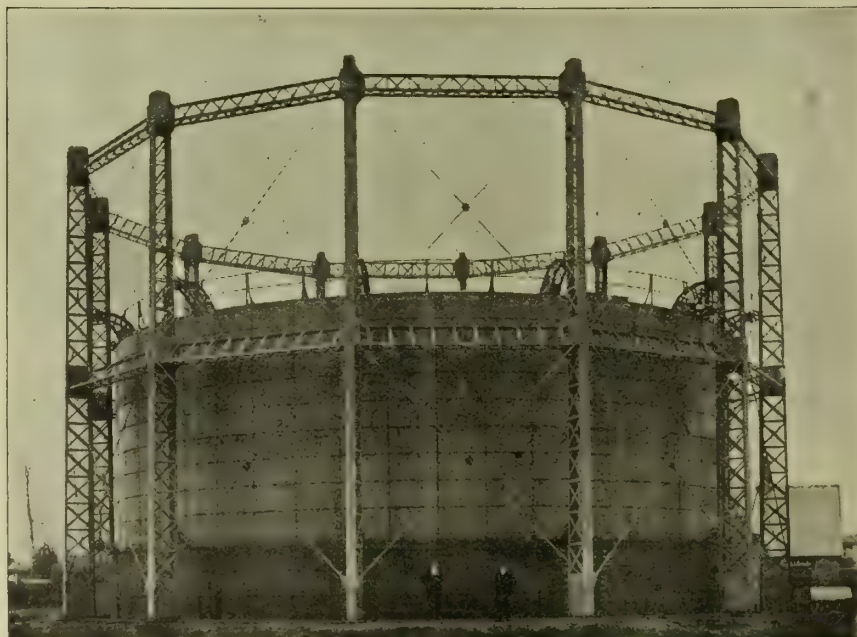
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Can either be applied with a Brush, allowed to
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Half-an-Hour, when Liners and Reflectors can be
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In cases where a **steam pipe** is connected to
bottom of tank, stoves or liners can be **perfectly**
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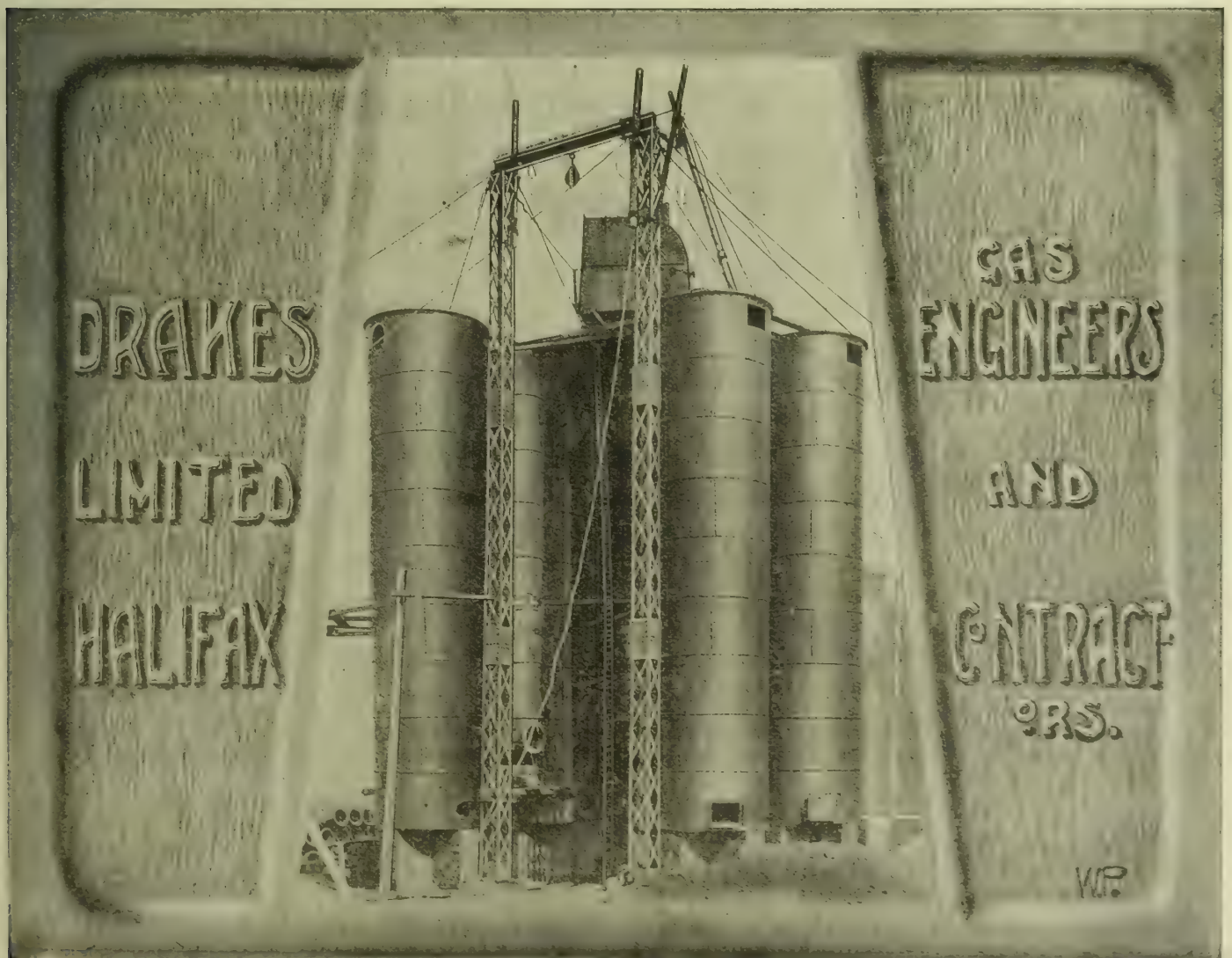
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Gas made per Ton	13,102 cubic feet.
Fuel Consumption	12.3 lbs. per cent.
Illuminating Power	15.56 No. 2 Met. Burner.
Calorific Value	573.6 B.Th.U. (Gross).

YORKSHIRE (SILKSTONE), BARROW COLLIERY.

Gas made per Ton	12,435 cubic feet.
Fuel Consumption	13.4 lbs. per cent.
Illuminating Power	16.19 No. 2 Met. Burner.
Calorific Value	584.9 B.Th.U. (Gross).

LANCASHIRE, WIGAN (ARLEY MINE).

Gas made per Ton	12,145 cubic feet.
Fuel Consumption	12.2 lbs. per cent.
Illuminating Power	15.22 No. 2 Met. Burner.
Calorific Value	576.2 B.Th.U. (Gross).

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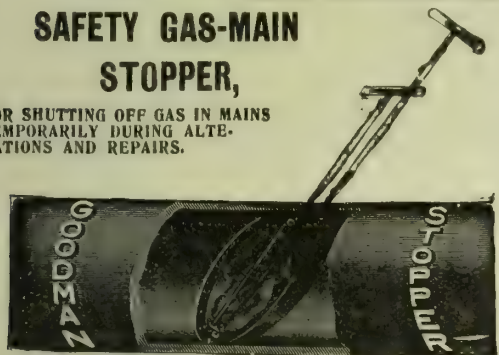
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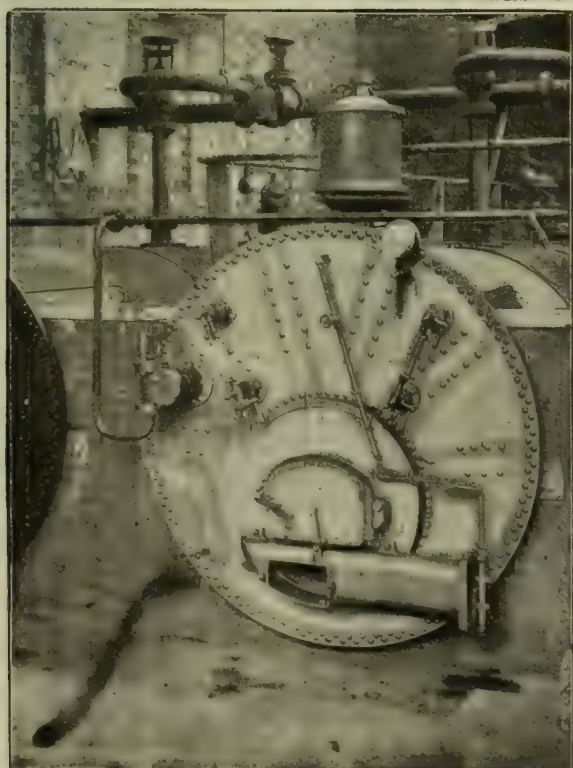
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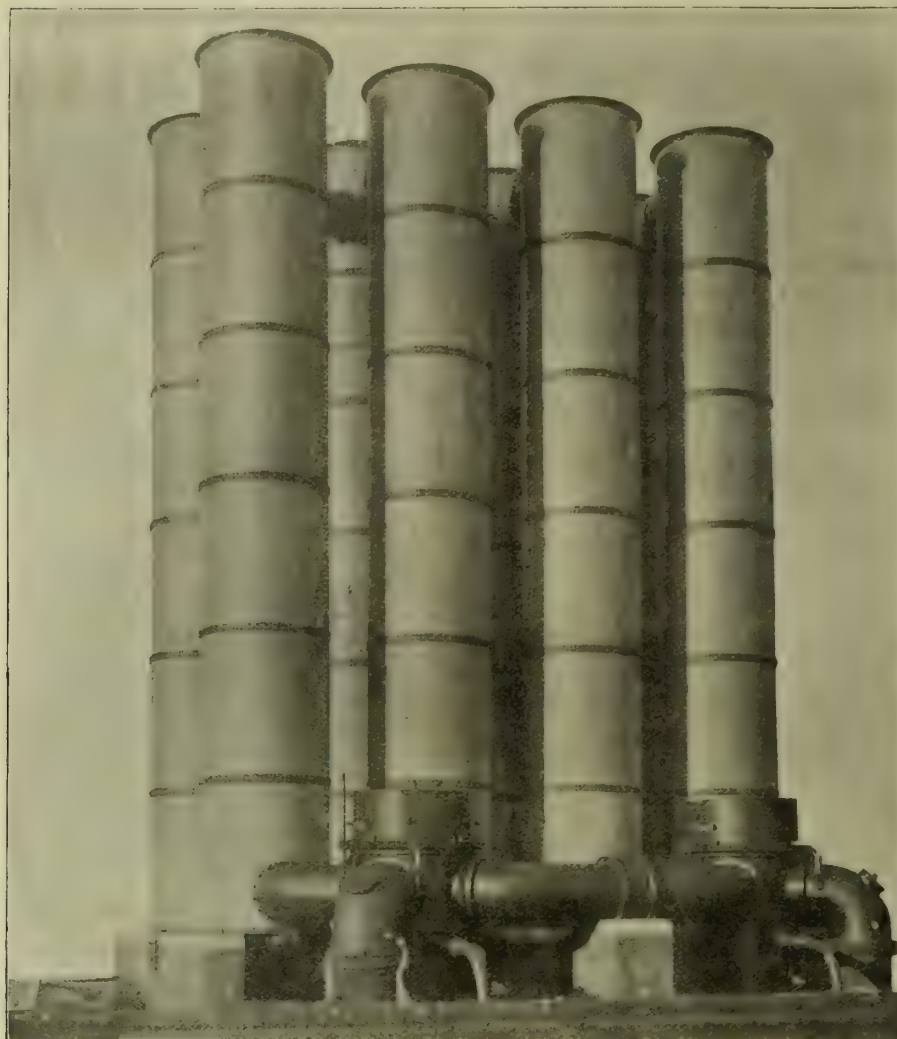
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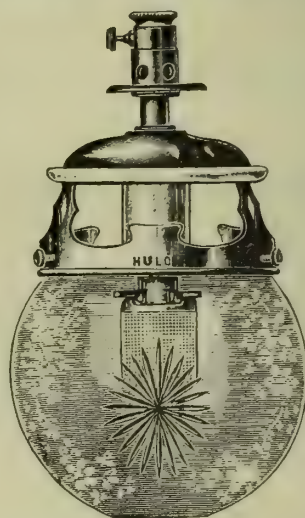
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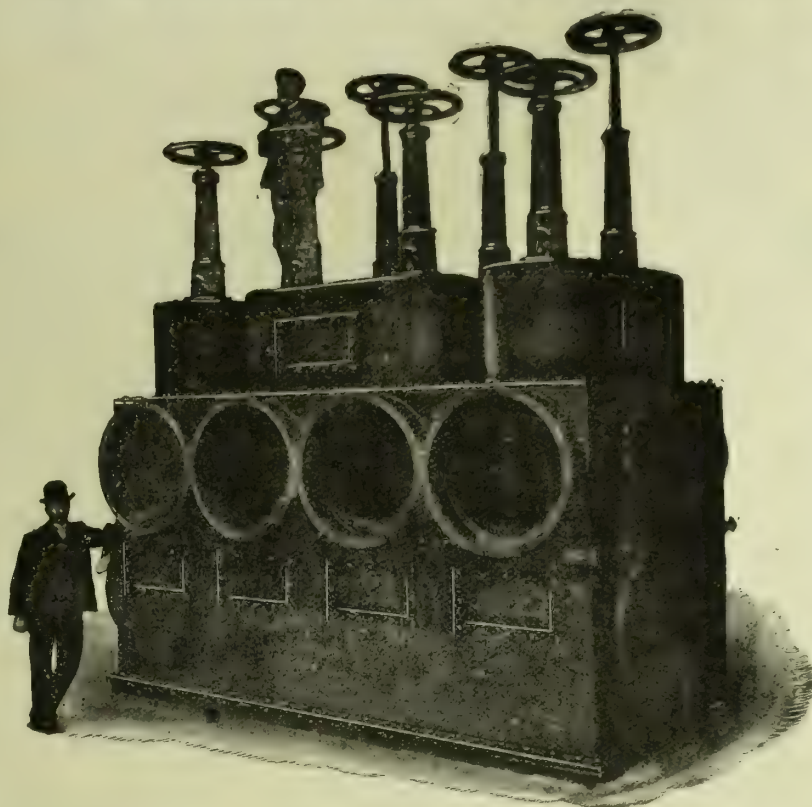
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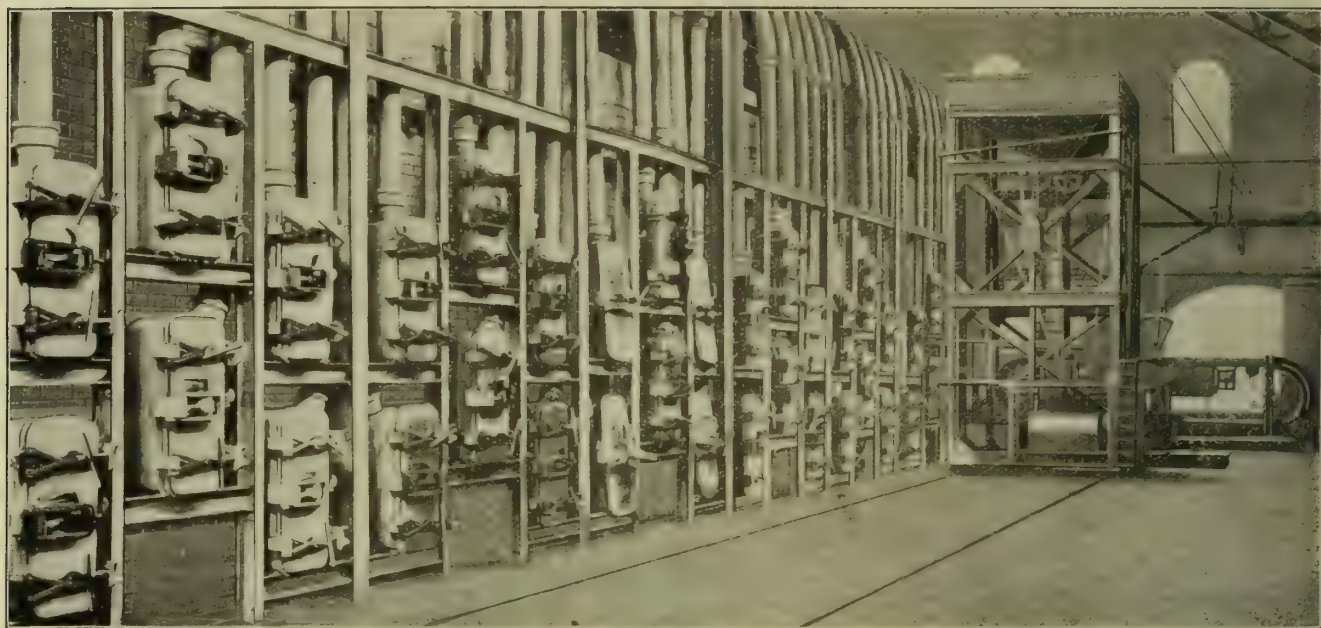
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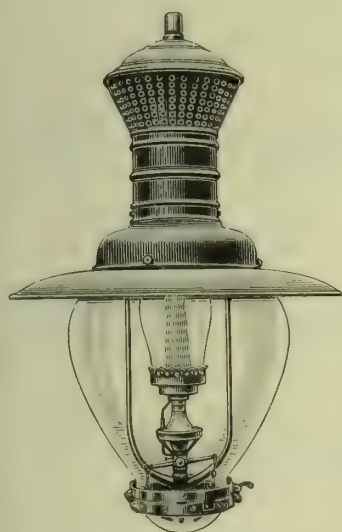
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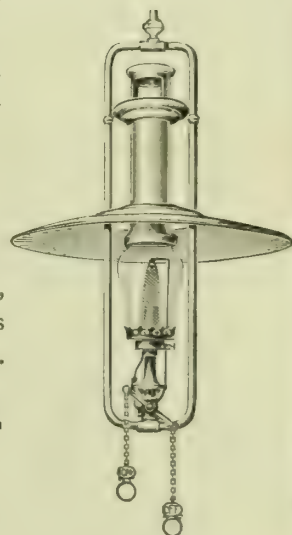
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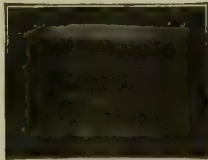


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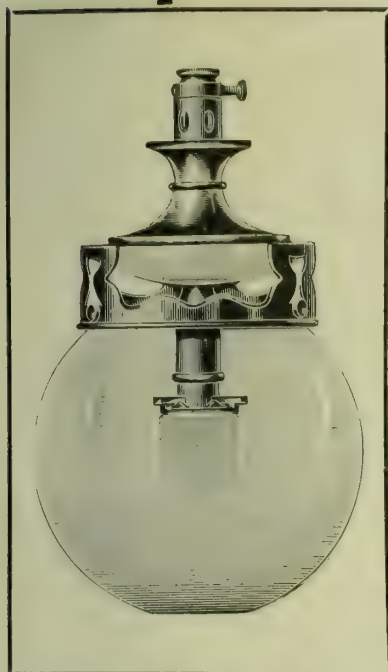
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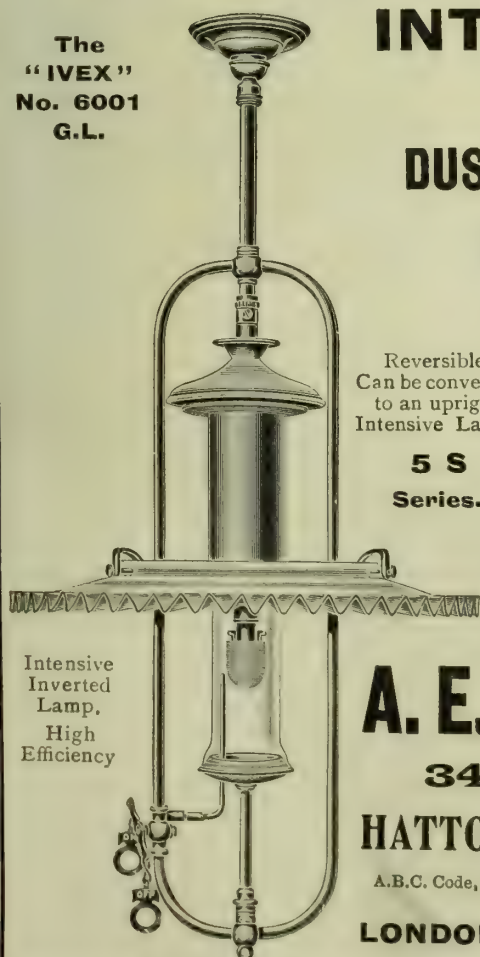
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Carlisle	600,000	Longton	600,000	Sydney-Mortlake (2nd)	500,000
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Crefeld, Germany	500,000	McKeesport, Pa.	500,000	Utrecht, Holland	1,000,000
Croydon	1,250,000	Merthyr Tydfil	300,000	Utrecht (2nd)	1,000,000
Croydon (2nd)	625,000	Middlesbrough	1,250,000	Verviers, Belgium	1,000,000
Croydon (3rd)	625,000	Namur, Belgium	175,000	Vienna	3,500,000
Croydon (4th)	550,000	Nelson	400,000	Vienna (2nd)	2,500,000
Debreczin, Hungary	100,000	Newburgh, N.Y.	600,000	Waltham	400,000
Deventer, Holland	150,000	New York	5,200,000	Wandsworth & Putney	1,800,000
Deventer (2nd)	200,000	Nichteroy, Brazil	250,000	Watford	300,000
Dorking	150,000	North Middlesex	150,000	Watford (2nd)	350,000
Dublin	2,000,000	North Middlesex (2nd)	200,000	Wellington, N.Z.	350,000
Dublin (2nd)	2,000,000	North Middlesex (3rd)	75,000	West Bromwich	550,000
Dublin (3rd)	650,000	Norwich	1,000,000	West Ham	1,500,000
Dundee	1,500,000	Norwich (2nd)	300,000	West Ham (2nd)	800,000
Dunedin, N.Z.	150,000	Norwich (3rd)	500,000	Weston-super-Mare	350,000
Dunedin, N.Z. (2nd)	275,000	Nottingham	1,000,000	Weston (2nd)	350,000
Durham	200,000	Nottingham (2nd)	1,000,000	Wexford, Ireland	100,000
Düsseldorf, Germany	1,000,000	Nuneaton	125,000	Wiesbaden, Germany	850,000
Eastbourne	1,250,000	Oberhausen, Germany	175,000	Winchester	225,000
Edinburgh	2,000,000	Oldenburg, Germany	200,000	Winchester (2nd)	125,000
Epsom	225,000	Ostend, Belgium	100,000	Wolverhampton	1,500,000
Epsom (2nd)	300,000	Ostend (2nd)	200,000	Zwolle, Holland	200,000
Falmouth	150,000	Perth, W.A.	125,000	Zwolle (2nd)	200,000

ALSO CONSTRUCTION OF AMERICAN COLLEAGUES, 581,800,000 Cu. Ft. Daily.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

Depreciation Allowance for Income-Tax.

AN important letter which throws light upon the peculiar position taken up by the Somerset House authorities in relation to the allowance of depreciation upon gas plant and appliances in assessing for income-tax appears in our "Correspondence" columns. The letter was addressed to the Gas Companies' Protection Association by Mr. William Cash, F.C.A.; and it has been forwarded to us for publication. It sets out the results of communications and interviews that Mr. Cash has had with the authorities at Somerset House, and then gives his own views, as an authority on gas finance, on the points at issue. The investigation has brought to knowledge three points, any one of which would alone be sufficient to question the fairness of the instructions of the Board of Inland Revenue to the Surveyors of Taxes. In the first place, before the issue of the circular to which the gas industry takes strong exception, it appears that the authorities had conferences with representatives of certain statutory undertakings—tramways and electric light undertakings, but not of gas undertakings. In the second place, it is submitted by the department that their aim has been throughout to obtain uniformity in the assessment of these kindred undertakings. In the third place, Mr. Cash has ascertained the principles upon which the department is proceeding in this matter. The investigation places the gas industry in possession of knowledge in connection with this piece of official injustice which they had not previously; and it will, together with the advice tendered by Mr. Cash, strengthen the resistance to the arbitrary instructions to the Surveyors of Taxes.

As to the first point, that the gas industry were unrepresented at the conferences that preceded the issue of the instructions, the industry has here just cause for complaint at being ignored in this fashion. It is not a sufficient excuse for the authorities to say they were unaware of the existence of the Gas Companies' Protection Association, and, presumably, of the Institution of Gas Engineers. It is evident that, notwithstanding the huge interests involved in the gas industry, and the large taxation claims made upon it, the authorities did not condescend to inquire whether there was a representative organization with which they could confer in the same way that they did with the tramway and electrical interests. The regret now expressed does not exonerate them, nor does it rectify the omission, nor compensate for the fact that there has been no proper consideration of the arguments that the gas industry would have been prepared to advance against the instructions laid down for the guidance of the surveyors. Regarding the second point, that it has been the aim of the department throughout to obtain uniformity in the assessment of these kindred undertakings, there is sufficient dissimilarity between the material and trading affairs of gas, electricity, and tramway undertakings for the kindredship to be questioned. However that may be, the inquiry can be put as to whether or not it is a fact that an allowance has been agreed upon in respect of depreciation in connection with electrical undertakings. According to a report presented at the annual meeting of the Incorporated Municipal Electrical Association, there has been such an agreement (see "JOURNAL" for Aug. 10, last paragraph on p. 373). If this report is correct, then the aim of the department has ended in disuniformity, and not uniformity.

Concerning the third point, as to the principles the authorities have arbitrarily laid down as a justification for their procedure in this matter, it is contended that, by allowing for renewals as they take place, gas undertakings receive all the consideration that they are entitled to. This is a principle that is neither reasonable nor sound; and certainly it is one to which the industry will not willingly subscribe. Current charges to revenue for repairs and renewals do not

in such a business as gas manufacture and distribution cover the constant depreciation and obsolescence that are going on all around. Why statutory industries should be treated differently from ordinary traders in this matter of depreciation allowance has not been explained; and Mr. Cash sees "no reason why a company should be asked, for income-tax purposes, to defer the charge against revenue for renewals, until these actually take place, and to depart from what is a well-established principle of making an annual allowance for depreciation as recognized by the Income-Tax Acts, and allowed to all traders." We particularly quote this expression of opinion, as, though there is no definite suggestion to this effect, we seem to detect in Mr. Cash's letter a hint at an attempted compromise (which has already been rejected by the Somerset House officials) by drawing a distinction between fixed plant—such as buildings, retorts, gas-holders, &c.—and short-life plant, such as meters, stoves, and internal house fittings. We see no reason why, in the case of fixed plant of the nature mentioned—the renewal of which means heavy expenditure, and the depreciation of which commences from its advent in service—"a company should be asked, for income-tax purposes, to defer the charge against revenue for renewals, until these actually take place," and so "depart from a well-established principle." That Mr. Cash moreover considers it good policy to take Time by the forelock in regard to depreciation is amply clear in other parts of his communication—for example: "Apart from the subject of income-tax, there can be no question whatever as to the desirability, and, in fact, necessity, of a gas company making provision, out of current profits, for depreciation which is going on continually, and which will have to be met when the plant in question has to be renewed." Then, again, Mr. Cash does not see why a gas company should not claim, and be allowed, like any other trader, for depreciation on such assets as labour-saving machinery, much of which he describes as of "a quick running type." If on this machinery, why not on retorts, which, under the high-temperature carbonization of the times, is also of a somewhat "quick running type" in another sense. It comes to this, that there must be no compromise, nor any willing acceptance of a principle that is authoritatively pronounced unsound. Any compromise would be the first endorsement of the new principle laid down by the Inland Revenue authorities; and there is no knowing to what it would ultimately lead.

We have only written the foregoing on the assumption that we are correct in thinking that Mr. Cash set out with the view that this is a matter in which some compromise might be effected by drawing a distinction between fixed plant and short-life appliances on the broad question of depreciation allowance and disallowance. Whether or not we are correct in this, on the general question as to the injustice of the instructions of the Inland Revenue authorities, he is absolutely at one with the gas industry, with whose interests, as is well known, he is so closely identified professionally and administratively. But turning to the question of short-life plant—such as stoves, meters, and internal house fittings, the authorities stated that they would be prepared, in assessing renewals, to deal with the question on generous lines, and estimate the renewals on average prices. This, we fear, would tend to a great deal of dispute and variation in practice. The officials would not admit that depreciation could be allowed on this short-life plant, as there was considerable doubt as to whether, so far as stoves and house fittings were concerned, they constituted machinery and plant within the meaning of the Income-Tax Acts. From which it would appear that the Inland Revenue authorities have arrived at a decision on this particular point, despite the existence of "considerable doubt." A rigid resistance to their proposed arrangement is the advice of Mr. Cash. Upon this point and several others, the views expressed in the letter are instructive, and in perfect accord with the general view in, and interests of, the industry. The principles enunciated by the Somerset House authorities must not be allowed to

become established by consent to be inferred by inaction. The contest must be carried to the end, by, where proper allowance is not made, appeal to the Commissioners, and then, if unsuccessful, steps should be taken (as Mr. Cash advises) to have the question determined on a stated case by the High Court. It is clear the Inland Revenue authorities have opened the door widely for contention on a matter involving an important principle; and the position should be met without delay by some concerted action. Of course, it cannot be expected that the Gas Companies' Protection Association can bear the costs of a test case; though (as a letter received late yesterday from the Chairman, Mr. H. E. Jones, on p. 520 shows), they are prepared to do all in their power to advance in various ways a legal pronouncement on the point.

The Sliding-Scale through American Glasses.

It passes strange in this country that America should only now be discussing the *pros* and *cons* of the sliding-scale principle as applied to the sale of gas under company administration, and be dealing with it as something that should be regarded as purely of an experimental nature. Mr. Alfred E. Forstall, in a paper on "The Sliding-Scale Regulation of Prices and Rates of Dividend for Gas Companies," of which we reproduce the chief portions elsewhere, bestows on American gas administrators a bit of his mind over their perpetual treatment of the gas-supply business as though it were virgin ground upon which it was necessary to be constantly making experiment, rather than accept the large experience of others. The whole history of the rule and regulation applying to American gas supply, has been one of re-exploration of territory already traversed by British gas enterprise. The penalty of independence has been paid; and, as is commonly the case, dearly paid for has been the experience, the conclusions of which have come out very much the same as those of the foregone British experience. Though it was as far back as 1875 that the sliding-scale was first introduced in the Commercial Gas Company's Act, and has since spread its salutary influence throughout the length and breadth of gas supply by statutory companies in the British Isles, it is only within the last five years that America has seriously given it thought. In 1906 particularly was consideration being accorded to it by the Massachusetts Board of Gas and Electric Light Commissioners and the Boston Gas Companies; and then it was Messrs. Stevenson and Burstal made their favourable report to the latter upon its working in this country. But America has not advanced far in the application of a system that imparts a mutual pecuniary interest to consumers and stock or share holders in the economies of working, which economies are greatly assisted by the extent of the consumers' patronage. Mr. Forstall's paper may, however, do something to revive interest in America in what has been found in this country to be one of the most far-reaching regulations—if not the most far-reaching—in beneficial effect that has ever been applied to gas supply.

The author states the case of the sliding-scale fairly and clearly, and shows the mode by which its application could be arranged under American conditions. But he makes one criticism. "The fixing of the extent to which the rate of dividend on stocks under the sliding-scale shall change for the unit change in price of gas would seem," he says, "to deserve more careful consideration than has been given to it in Great Britain." His reason for thinking this is that, under the provision that the rate shall always change one-quarter of 1 per cent. for each change of 1d. in price, the proportion borne by the total amount of extra dividend allowed the stockholders to the saving accruing to the consumers has grown steadily smaller until in some cases it is as low as 1 : 6 and 1 : 7. The result of this, he adds, has been to decrease the incentive to achieve further reductions in price. It is admitted that the proportion going to the proprietors of the total sum divided between them and the consumers has, by the expansion of business—a large part of which represents a sort of "unearned increment" through a natural development of district, industries, and uses of gas—dwindled; but any interference with the fixed ratio of one-quarter of 1 per cent. for each change of 1d. in price would alter one of the basic principles of the sliding-scale.

Mr. Forstall follows up his criticism by a suggestion, whereby he believes that equality might be established, and which would he seems to think be preferable to the present plan. "There is no good reason," he remarks, "why the

"savings effected by management better than the average" should not be divided equally between the consumers and "the company." That would not do. Mr. Forstall appears to consider the position as though there would be nothing but a continuous record of saving. That is not the case; and when through commercial adversity, it is necessary to raise the price of gas, and lower the dividend, the proprietor's loss only represents the 1 in the ratio, while the consumer's represents the 5, 6, or 7 as the case may be. That is to say, to take an extreme case, if a reduction of 1d. in the price of gas represents £80,000, and the proprietors only receive something a little above £13,000, when the price goes up by 1d., then the boot would be on the other leg, and the consumers would give up £80,000 and the proprietors (say) only £13,000 odd. With equality in the division of savings, there must be equality in losses; and we can well conceive bad times in which, under such a system, the market values of gas stocks would be terribly mauled about, and the credit of the concerns would severely suffer. Such oscillations would do an undertaking no good. Moreover, equality in the sharing of savings would widen the periods between reductions so considerably, and cause them to be fewer, that we are of opinion that, on balance, taking also bad seasons into consideration when the price would have to be raised, the proprietors' condition under Mr. Forstall's plan would be worse than that under the existing circumstances. The retarding of reductions in these times also means, in some degree, the repression of business development, and that would not be good in these competitive days. That is the only point upon which we disagree with Mr. Forstall.

Tramways and Gas-Pipe Work.

THE owners of pipes in the subsoil of our roads, which pipes have been placed there under parliamentary powers, have a just cause of complaint that the newer users of the road surfaces have, while adding to the damage-inflicting conditions of the subterranean tenancy, made more complex than ever the circumstances under which work can be done to pipe distribution systems, and so have concurrently added to the costliness of the work. The motor and the tramway traffic of the times subject underground pipes to a continuity of tremors that in the olden days was not experienced; and this has ill-effect on pipe-joints, and, in loose and made-soil, in affecting the bed support of the pipes. Furthermore, electric tramways are spreading their tracks in all directions—outwards, inwards, and by intercommunication; and these tramways throw a solid concrete bed right over the gas and water systems reposing in the roadways. This causes increased expense in obtaining ready and complete access to the gas and water pipes, and in carrying on the ordinary work of connection making, repair, enlargement, replacement, and so forth. Of course, it cannot be expected that there should be any stoppage of the progress of public convenience by any preferential consideration for the older inhabitants of a roadway; but with the extension of these road-sealing tramways, the question of accessibility becomes of increasing importance to all gas and water pipe owners. The additional expenditure to which they may thus be put through the presence of the tramway in individual cases may not be large, but in the aggregate the cost, of course, mounts up to a respectable total.

The Tramways Act of 1870, section 32, provides for the reimbursement of the extra expense to which gas and water and other pipe owners are put through the presence of the tramways, by providing that the construction of a tramway shall not interfere with the rights of local and road authorities, or gas, water, or electric light companies to deal with roads for the purpose of repairing, laying down, or removing mains, pipes, &c.—due notice being given of their intention to do so when the contemplated work will interfere in any way with the traffic or affect the tramway; and sub-section 5 provides that any extra expense in doing such work caused by the existence of the tramway shall be borne by the tramway company. There is a clear opening here for a considerable amount of friction; but it points to the good sense of gas and water companies and tramway authorities that so little is publicly heard of any dispute, which indicates a very general harmonious settlement of the many questions which work of the kind referred to raises. The Bristol Tramway and Carriage Company, however, some time ago failed to see the righteousness of certain claims made by the Bristol Gas Company in respect of the extra

expense to which they had been put in connection with their distribution system through the existence of the tramways. But the legitimacy of the claims have been sustained from Arbitrator to the Court of Appeal, as was seen by a brief reference to the judgment of the latter in our "Legal Intelligence" last week. The length of that reference is not any criterion of the general importance of the matter before the Court.

There is no particular point to be made regarding the circumstances of the Bristol case *per se*, save one which was discussed at length, and that is as to the test that is applied, under the Act, to ascertain whether the claimants to excess expenditure are justified in their claim. The test applied is as to whether the work done causes an interruption of the tramway traffic. That is, to say the least, a singular and a fallacious test. A gas or water company might exercise the fullest prevision and the greatest care in executing the work, and they might go to some expense in their endeavour to avert interruption of the tramway traffic; but all this would be counted to their detriment if, through it, there was no interruption of tramcar-running. There is certainly little encouragement in the test to pipe-owners. In the case of Bristol, the Tramway Company contended that there was really no interruption of their traffic. That was putting a feather in the cap of the Gas Company; but the Tramway Company further submitted that what they wished to enter to the credit of the Gas Company disentitled them to the extra expense which they claimed. There is an interesting conflict of virtue, acts, and title here. The Appeal Lords, however, held that there was interruption of the tramcars. It is a critical point to have to determine after the event; but their Lordships clearly drew practical conclusions from the information before them.

The Standard Burner Bills.

THE notices have been published of the joint promotion which will be known as the Gas Companies (Standard Burner) Bill, or rather we should say Bills, as it is learned (upon inquiry of Mr. F. E. Cooper, the Secretary of the Gas Companies' Protection Association) that the parliamentary authorities require, having regard to the number of companies concerned, that there should be three Bills. One of them is to be promoted by not more than ten companies, representative of the whole—that is to say, the group of ten is to have in its composition companies supplying a high illuminating power and a low illuminating power, companies subject to the sliding-scale and maximum dividend companies, as well as companies situated in different parts of the country. It is, however, a matter of understanding with the parliamentary authorities that the three Bills may, if circumstances permit, be amalgamated into one during their passage through Parliament. But, whatever happens, the Committee of the Association having charge of the Bill have very properly decided that, for the purpose of the division of the costs, the three Bills shall be deemed to be one. The notices of the Bills are identical; and a copy, with the groupings of Companies for the three Bills, is published in this issue (p. 548). It will be remarked that there are (if we take the British Gaslight Company, who have joined in respect of three of their stations, as representing three concerns) 49 undertakings interested in the joint promotion. These Bills will, so far as can be seen at the moment, constitute the feature of most general interest in gas legislation in the coming session. At present, the prospects are not brilliant for a busy time, so far as gas matters are concerned.

The Art of Illumination.

THE Illuminating Engineering Society has had an excellent send-off at the hands of the first President (Professor Silvanus Thompson, D.Sc., F.R.S.), a master in the scientific world who is admired for his perfectly independent and honest view. His address limned the useful work that is before the Society, if carried out by avoiding those many gaping loopholes through which bias may penetrate, and unjustifiable injury be dealt. The predominant claim for the Society is that it will present to the art of illumination an impartial platform. So long as it does this, so long as it avoids questions of commercial contention, and devotes itself exclusively to matters of common concern—and there are many in which the whole of the illuminating agents are interested, together with physiologists, ophthalmic surgeons, architects, builders, road surveyors, and, in fact, the whole

body politic—all will be well. The President placed before the considerable audience that he had last Thursday a fitting scheme of work; and his case justifying the existence of such a Society—always presuming impartiality—was complete. We are only standing at the threshold, as he shows us, of knowledge of the art of illumination. What knowledge there is requires accumulating, and there are many blanks in the knowledge that need to be filled in. The newest of the means of lighting are but as the things of yesterday; and it is their coming, as well as the rivalry of the illuminants, that have accentuated the need for the collection and coordination of present knowledge, and the penetration of that which is at present indifferently known or absolutely unknown. The Society has started well. That is agreed. It has before it a big expanse for useful exploration work. That too is agreed. It is the keen commercial rivalry that we fear will undermine the platform of impartiality. There are at present few gas men in the Society. But let the work proceed; and if, as time passes, the impartiality continues, the organization will undoubtedly attract greater numbers from the ranks of the gas industry. It must not be forgotten that the origin of the Society was essentially electrical; and if its inception had been with the gas interests, the electrical would have held back. There is one thing the Society must guard against, and that is any attempt to accomplish too much in a short space of time. Ambitions are great; but there must be care in their pursuit. Most professional men—particularly those in official position—have their hands pretty full; and the claims on time of present organized effort are already great. It cannot therefore be expected that a considerable amount of time can be devoted by them to this one line of work—fascinating as it always will be. Those who go slowly sometimes go farthest.

Gas Managers and Fees.

The Corporation of Greenock were much in evidence last week, in connection with the trial, lasting four days, which began before Lord Mackenzie in the Court of Session, in the action by Mr. W. Ewing, formerly Gas Manager at Greenock, against the Corporation. The evidence is reported at considerable length in another column. A decision in the case need not be looked for till January, as the speeches of Counsel will not be taken till the 21st of December. It is to be noted that the Corporation, in their defence, made no attack upon Mr. Ewing's ability, but rather appreciated him; and also that among the witnesses who testified against Mr. Ewing, there was not a single gas manager. The case turns upon the terms of engagement, and will probably be very largely affected by custom in the matter of employing gas managers to do engineering work.

The Last City and Guilds Examinations.

In another part of the "JOURNAL" will be found some extracts from the report just issued on the general work of the Department of Technology of the City and Guilds of London Institute which bear upon the examinations in the two subjects in which our readers—at all events the junior ones—are interested. It is gratifying to find that both "Gas Engineering" and "Gas Supply" were taught in twenty-two centres last year, compared with nineteen in 1907-8; and that the number of students in attendance was nearly double—652 against 351. There were 20 more candidates for examination in the first-named subject; but in the second there were 122 more—315 compared with 193. Out of the 311 students in "Gas Engineering" who went up, 173 passed; but all the "Gas Supply" students presented themselves, and 191 passed—the failures in the two subjects being respectively 44.3 and 39.3 per cent. Our readers will see, from the particulars given elsewhere, how these young men succeeded in dealing with the papers submitted to them by Mr. W. Doig Gibb and Mr. J. H. Brearley. As to the quality of their work, Mr. Gibb says that the papers in both grades in his subject varied from very excellent ones down to exceedingly poor ones; but he adds that all the prize winners certainly merited their awards. Mr. Brearley has more to say about his examinees, whose papers showed "enormous disparity" in their qualifications. While many of those which secured a first-class pass could not be too highly spoken of, he expresses regret that so many candidates presented themselves who were "obviously unprepared" for an

examination of the character of that which he was conducting. He says the figures of passes and failures clearly indicate a need for more systematic training. He thinks most of the candidates must have been "denied the means of obtaining tuition by approved educational institutions;" and he urges upon the education authorities of all large towns the importance of making extended provision for such candidates. Meanwhile, all intending students of "Gas Supply" will do well to read carefully the answers to the questions set at the last examinations, to be found in the early numbers of the last volume of the "JOURNAL." They will then be in a position to gauge the amount of knowledge required to satisfy the Examiner as to their proficiency.

The Output of Coal in 1908.

Ploughing through the figures of an average Blue-Book is not a popular form of recreation; but such a process often provides the only available means of arriving at valuable information. And in the case of Blue-Books, as with other things—there are degrees. Some are more interesting than others; and in the former category must be placed the annual Home Office report which furnishes statistics compiled by the Chief Inspector of Mines with regard to the output and value of the minerals raised in the United Kingdom, the amount and value of the metals produced, and the exports and imports of minerals. No one is independent altogether of coal (the consumption of which in this country runs round about 4 tons per head of the population); and no one certainly can afford to ignore statistics regarding it, which are perhaps the surest existing index to the national prosperity. But though all are concerned, it does not follow that everyone is prepared to sit down and read through the Blue-Book. Many will desire to get the main facts in a more condensed form; and for their benefit the recently issued report, dealing with the year 1908, is noticed in another column to-day—so far as it relates to coal and other matters of importance to "JOURNAL" readers in particular. What the country gains by its mineral resources is shown by the statement that the total value of the minerals raised last year was £130,003,670. This is an enormous figure—even though it be a decrease of £5,275,418 as compared with 1907. It need not be stated that coal is the principal of these minerals; the output in the year 1908 having been 261½ million tons, the value of which was £116,598,848. This was over 6½ million tons less than in the preceding twelve months, which constituted a record period; and the falling off in value was somewhat greater in proportion—the average price of the coal having come down from 9s. to 8s. 11d. per ton. Singularly enough, the reduction in the total output very fairly corresponds with the smaller "quantity remaining for home consumption for all purposes;" so that United Kingdom coal, and coal equivalents, must have been in somewhat greater request proportionately (when comparison is made with the preceding twelve months) in some other places than has been the case in the United Kingdom. This, however, is merely mentioned here as an obvious deduction from the report, and is not in any way intended as a suggestion for politicians. As a matter of fact, there was a decrease of just over a million tons in the exports proper; but this was counterbalanced by the greater quantity of coal shipped for the use of steamers engaged in foreign trade. Anyhow, the total quantity of coal, including coke, briquettes, and shipping, which was taken from the country was 85¼ million tons—leaving 176¼ million tons for home consumption. The value of the coal, coke, and briquettes exported was £41,600,000. The worth of the coal raised in this country during the past thirty-six years is no less than £2,361,701,000. This means that 6592½ million tons have been raised; and of this amount 1490 million tons, or nearly 23 per cent. of the total production, have been shipped abroad as exports in the form of coal, coke, and manufactured fuel, and as coal used for steamers engaged in foreign trade. In the five years from 1873 to 1877, the amount so shipped was 13·8 per cent.; and in 1908 the proportion had risen to 32·6 per cent. In 1908, 18½ million tons of coke were made, of which more than 7¼ million tons came from 1452 gas undertakings, and the remainder from 26,214 coke-ovens. The average price of coal in the London market, it may be pointed out, was 17s. 6d. per ton in 1908, compared with 19s. 9d. per ton in 1907, and 15s. 9d. in 1906.

And Present Prospects.

The major portion of the above remarks refers to 1908—and the remainder to earlier years. But since the period dealt with in the Home Office report, almost another year has elapsed; and

it is only natural that the thought should arise, What about 1909? A definite answer will not be forthcoming yet awhile; but, as has already been pointed out in the pages of the "JOURNAL," in the meantime the signs are not promising of record figures. As was stated in our columns last week, a question in the House of Lords some days ago as to the effect of the Mines Eight Hours Act led Earl Beauchamp to state that the Inspectors of Mines had reported that since July 1 there appeared to have been more or less generally in England and Wales some decrease in output. Though this decrease in very exceptional cases seemed to amount to 10 per cent. or more, the average, he said, was a great deal smaller, while in Scotland there had been little or no decrease. Then other causes tending to restriction of output were also cited—depression of trade, and strikes and difficulties with the men, "which were naturally to be expected before they were able to adjust themselves to the new conditions." Of the difficulties with the men which were thus "naturally to be expected," there has been no lack; and so far from "adjusting themselves to the new conditions," things seem just as unsettled now as ever they were. One colliery was cited as having cut the knot of all the troubles occasioned by the Act, by giving notice of their intention to close down; while there has recently been quite a ferment over the negotiations for bringing the Act into operation in Northumberland. As the time approaches when the present wages agreement in South Wales may expire, the feeling of uncertainty as to what will happen tends to seriously handicap forward business. At the end of next month, three months' notice to terminate the arrangement may be given by either side; and the general idea is that a new agreement will be insisted upon. But in any event the agreement holds over this year, and the feeling of apprehension is in regard to entering into contracts over 1910; so that this particular question need not be taken into consideration when reviewing the effect of the Eight Hours Act on the current year's output. There are enough points for the observer to take into account without including this; and when these points are carefully considered, it is impossible to avoid the conclusion that the coal statistics for 1909, when the time comes for their publication, will be found to have been unfavourably influenced by the limiting Act which will have been in operation for six months out of the twelve.

Depreciation Allowance for Income-Tax.

We received yesterday afternoon—unfortunately too late to be inserted after the letter by Mr. Cash on the above subject which appears in our "Correspondence" columns—the following letter from Mr. H. E. Jones, the Chairman of the Gas Companies' Protection Association: "In reference to the very valuable notes by Mr. Cash (who has taken a great deal of trouble in a most unselfish and loyal spirit), the question has been primarily discussed by the Committee of the Gas Companies' Protection Association, who have also had the advantage of several conferences with Mr. Cash. I desire to point out that while the constitution of the Association and the nature of the subscriptions to its fund do not admit of its independently fighting out a test-case, it is prepared to lend any assistance in bringing together those companies who are threatened with unreasonable demands, and to further in every legitimate way the co-operative joint action of such parties by way of evidence expenses, &c., if it be so desired, and upon a specific and approved case being submitted. It was with this object that I called early attention to the matter in your columns, that the Committee referred to it in their report, and that a discussion was raised at the general meeting. The Committee will be glad to hear from all companies who have already received claims to which they are contemplating an effective resistance."

An interesting gathering of the officials and workmen of the outdoor departments of the Sunderland Gas Company took place last Thursday night to do honour, in a practical way, to their esteemed Outdoor Manager, Mr. JOHN GRANT, who has this year attained his jubilee in the Company's service. Mr. Norman S. Cox, who presided, spoke very highly indeed of Mr. Grant, and Mr. C. Dru Drury (the Engineer), and others also referred to Mr. Grant in eulogistic terms. Mr. Joseph G. Kitts, the Chief Clerk, on behalf of the officials and workmen, asked Mr. Grant to accept as mementoes of the happy occasion, and as slight tokens of their high esteem for him, a solid silver cake basket, suitably inscribed, three silver flower-vases, a cheese and biscuit tray, and an oak dining-table. Mr. Grant, who was very cordially received, feelingly thanked the gathering for the many kind things that had been said about him, and told them how he had risen from a shop-boy to be successively a meter inspector, meter repairer, superintendent of Ayre's Quay Gas-Works, and finally to reach his present position; and he attributed his success to the fact of always being ready for the next step.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 562.)

BUSINESS on the Stock Exchange last week was quiet and dull as a general rule. The gilt-edged division had a better time—thanks to the subsidence of apprehension in regard to a further tightening of the screw in the Money Market. And the Foreign Market was calm, and in some lines quite cheerful. But Home Rails persistently drooped, and seemed to be quite unable to summon up the most temporary smile. The weakest point, however, was in the South African Market, where some marked uneasiness was evident. The opening on Monday showed no change; but business was so quiet and inanimate that prices shrank for want of support. Consols, however, rose $\frac{1}{8}$. Business was not very much brisker on Tuesday, and the tendency was dull for the most part, relieved here and there by some recovery. Wednesday was uneasy, disquieted by the prospect of a political struggle; and everything was more or less flat. The general tone on Thursday was unchanged; and things remained heavy and spiritless. Consols were a little lower, and there was hardly a rise anywhere. Friday cheered up a bit and showed a rather stronger front. There was some slight recovery in prices, but business was not active. Saturday was much the same, with steadiness in the gilt-edged and in the Foreign Markets; but the American and South African were flat. In the Money Market, there was a steady movement in favour of lower rates; and terms for discount and for short loans eased down to the close. Business in the Gas Market was moderate and almost wholly devoid of any salient feature. Prices continued so level that in the London Market only three quotations made any change at all; and there was only one in all the Provincial markets put together. In Gaslight and Coke issues, the ordinary provided a good average number of transactions at figures ranging from $102\frac{1}{2}$ to $103\frac{1}{2}$, with one special deal at $102\frac{1}{2}$ free. Little was done in the secured issues; the maximum marking $88\frac{1}{2}$, the preference $103\frac{1}{2}$ and $104\frac{1}{2}$, and the debenture from 82 special to $83\frac{1}{2}$. South Metropolitan was quiet and unchanged, transactions ranging from $120\frac{1}{2}$ to 121 . The debenture made $82\frac{1}{2}$ and 82 special. In Commercials, there was rather more doing. The 4 per cent. realized $109\frac{1}{2}$ and 110 , the $3\frac{1}{2}$ per cent. from $104\frac{1}{2}$ to $105\frac{1}{2}$, and the debenture 81. In the Suburban and Provincial group, Bournemouth "B" changed hands at $16\frac{1}{2}$ and $16\frac{3}{4}$, Brentford old at 254 (a fall of 1), Brighton original at 211 and 212, ditto new at $151\frac{1}{2}$, Hastings and St. Leonards $3\frac{1}{2}$ per cent. at $93\frac{1}{2}$, South Suburban at $119\frac{1}{2}$ and $119\frac{3}{4}$, and West Ham at 124 and $124\frac{1}{2}$. In the Continental companies, Imperial was rather active at from $176\frac{1}{2}$ to 178, ditto debenture marked $96\frac{1}{2}$, European fully-paid $24\frac{1}{2}$ and $24\frac{3}{4}$, and Tuscan 98. Among the undertakings of the remoter world, Cape Town ordinary was done at 3 (a fall of $1\frac{1}{2}$), ditto preference at $5\frac{1}{2}$ and $5\frac{3}{4}$, Monte Video at $12\frac{5}{8}$ and $12\frac{1}{16}$, Primitiva at $71\frac{1}{8}$, ditto preference at $5\frac{1}{2}$ and $5\frac{3}{8}$, River Plate at $16\frac{3}{8}$ and $16\frac{1}{2}$, and San Paulo at $14\frac{1}{16}$.

ELECTRICITY SUPPLY MEMORANDA.

Finances of Municipal Electricity Undertakings—Investigation at Taunton—Unprovided for Depreciation—Compliance with Regulation Insufficient—Failures—Drastic and Aggressive Operations—Tradesmen Pay for Special Street Lighting—"Meteor" Turns Tail.

If proper investigation were made as to the conditions of municipal electrical undertakings in this country, it would be found that many are in a parlous financial state in relation to the depreciation of their assets. This is known, though not openly admitted, by numerous councillors throughout the country, whose fragile defences of the present position are easily penetrated and destroyed. How hearty the handshaking, how great the glorious prediction as to the future, when these municipal undertakings were started or purchased! But the satisfaction expressed by the handshake has turned to dissatisfaction; and the glorious prediction has been, in numerous cases, falsified by time. There are admittedly municipal electrical undertakings in excellent position; but they are undertakings with exceptionally good districts for a diversity of business. They are, however, of the minority; and it is the majority that have turned out bad investments, if consideration is given to the whole of the aspects of their position. In their cases, there is to-day screwing in every direction in order to make the revenue account look better; and at every conceivable point, the authorities are trying to provide, through the public purse, business for the undertakings, taking no thought for the morrow, and building up a heritage for their successors for which they will not be thanked. Few of these towns have any competent body who can review the position with the intelligence that is being devoted to the subject at the present time by the Taunton Chamber of Commerce; and the Taunton undertaking is representative of many others. It was in 1893 the Taunton concern was taken over by the Council; and the inflated satisfaction of the municipal body of that year has gradually declined until it has a very wan appearance. Better far for the ratepayers would it have been if the undertaking had continued a matter of private enterprise. Taunton, as well as many other similarly situated towns, cannot hold dear in memory the local bodies who, being

in superior position, set the fashion for the municipalization of electricity supply. At the time that the Taunton undertaking was acquired, the Corporation obtained power to borrow the money required for a period of 25 years; and then subsequently they secured power for an extension of the period of repayment. This, of course, was a move having the single purpose of making the accounts look superficially better. But it was a bad thing. In the early days of electricity supply, loans were granted for longer periods than is now the practice; and the revision of the old practice was brought about by the enlarged experience as to the actual life of the different classes of plant, and the reticence of municipal bodies (whose constitution is ever changing) to look beyond the immediate future. The Taunton accounts have never denoted a flourishing commercial business; and the time prolongation for repayment of loans has only accentuated the case of the critics of the concern who desire to see the finances established in such a condition of soundness that the existing well-grounded fears regarding the future will be obliterated as time advances. The difference between the Council and the Chamber of Commerce is that the former have only eyes for the present, while the latter have consideration also for the future.

The Taunton Chamber of Commerce are to be complimented on the admirable and instructive report that they have had prepared by Mr. Albert C. Mole, Incorporated Accountant, on the position of the electricity undertaking—a report that is fair, and in the preparation of which Mr. Mole has been guided by taking as his basis of calculation expert views as to the life of the subjects constituting the assets of the concern. His investigation (which will be useful and suggestive in other towns) has been purely a financial one, and confined entirely to the question of the relation of capital indebtedness to its liquidation and the replacement of the assets it represents. Taking the published opinion of experts in this particular class of enterprise as to the rate at which the assets depreciate, and exempting land and buildings, he finds that the annual depreciation works out to £3312, which is equal to an equated percentage of $5\frac{1}{2}$ per cent. on the total cost of the depreciating assets. Taking this percentage on the proportion of the loans applicable to such assets—amounting to £63,298—from the respective dates (approximately) when they were raised to March 31, 1908, there is an accumulated depreciation of £31,533. Setting against this the small reserve fund, revenue contribution to capital, revenue account balance, and loans redeemed—amounting together to £20,971—it is seen that depreciation has run ahead of this amount by £10,562. Included among the assets are such valueless items as discount and expense of stock issue, and preliminary and parliamentary expenses, totalling together to £6964. Adding this to the £10,562, makes the deficiency at March, 1908, no less than £17,526. The defenders of undertakings in this position with regularity bring out the banal argument that repayment of capital and maintenance out of revenue is a sufficient satisfaction of the claim to depreciation; but only recently the Municipal Electrical Association were not admitting this in their negotiations for a depreciation allowance in respect of income-tax. But circumstances alter cases. Mr. Mole shows, by figures, on good expert authority, that the redemption of capital does not cover depreciation; and he also proves, in the case of Taunton, that the charges for maintenance and repairs do not suffice for the balance. Depreciation accumulates in spite of repairs; for all the patching up in the world will not restore a piece of plant to its original state. Therefore, as Mr. Mole very truly contends, the charging of ordinary repairs and maintenance to revenue cannot be urged as any good reason for allowing depreciation to run ahead of the loan redemption and reserve. He gives some striking figures in this connection. In the last four years of the period dealt with in the report, the average amount spent on repairs and maintenance in respect of the assets that he considers are depreciating, has only been on mains and services £17, and on machinery and other items £241; while (calculated on a recognized basis) the annual depreciation figures should have been, respectively, £976 and £2290. It must be admitted that "the mains cannot be constantly under repair; and the smallness of the amount shown is no indication that the repair of them is neglected, but when repairs are necessary they are likely to be extensive, and to be practically renewals." This present maladroit management of financial affairs will, intelligent consideration must assure, produce a serious legacy for the ratepayers of a future day.

There is a consideration, however, for present Taunton ratepayers that is not treated in the report of Mr. Mole. The position he exhibits is not the whole of the financial tale in regard to the municipal ownership and management of the concern. He shows that between a financially sound position and the actual, is a matter of £17,526. That is the position notwithstanding the fact that for many years past (in fact, almost immediately after the taking over of the concern) the ratepayers have been paying very heavy charges for public lighting—probably £800 to £1000 a year more than would have been the cost for gas lighting. The charge last year was between £2600 to £2700 for full service to 11 p.m., and about one-third service from 11 p.m. to daybreak. And the Council, we believe, are considering what more they can do in this way! However, if the figures in the report are accepted, and the unnecessary excess expenditure on public lighting for fourteen years is also taken into account, the local authority is nearly, if not quite, £30,000 to the bad as the result of their becoming electrical undertakers, and there is no prospect of any better results in future. That is not a glorious record. The

Corporation decline to meet Mr. Mole's report fairly and squarely. They will not say whether or not it truly represents the position; nor, if it does not, in what way it errs. The Council merely shuffle from their responsibility by saying that the undertaking is conducted within the terms of their parliamentary powers and in conformity with the regulations of the Board of Trade. That is not sufficient. The law is not in all respects a criterion of what is right or what is wrong. There is a class of company promoters who conduct their businesses without coming within reach of the "long arm of the law;" but they ruin many of their victims. Many municipal undertakings are run in accordance with the terms of their parliamentary powers; but in connection with them is being built up an unpleasant financial position for succeeding owners. It is argued that the revenue will not allow them to do more than they are at present doing. If that is so, then it shows the weak spot is in the prices charged. Very well. Electricity has only one real competitor, and that is gas. A business with only one competitor is not strong commercially if it cannot be conducted with prices on a paying basis. With all the bombastic talk about the superior merits of electricity over gas, this confession that it will not stand a price that will meet all financial obligations, is an admission of the strength of gas.

The susceptibility of electricity supply to failure continues to be of its several demerits. In the issue of the "Electrical Times" for the 11th inst., no less than three failures were noted. One at Brighton, one at Oldham, and one or two at Redditch. With regard to the Brighton failure, it is reported that the whole of the western part of Brighton was plunged into darkness on the previous Sunday evening, owing to the failure of the electric supply. The reporter erred. It was only the consumers and the streets relying on electricity supply that suffered. All the streets and all the private consumers supplied with gas were occasioned no inconvenience; so that the reporter was drawing upon his imagination when he suggested that the "whole of the western part of Brighton was plunged into darkness." Then, as to Oldham, it is stated that a fault on the electric supply mains placed part of the borough in darkness on the previous Friday evening. The comment on Brighton applies here. At Redditch, it is reported that one or two failures of the electrical supply recently produced a crop of complaints against the Electric Supply Company. The explanation is that the troubles in this case have arisen from the puncturing of cables by the picks of workmen engaged in street repairs. This suggests that the cables have been laid without any sufficient protection. The workmen of the gas and water companies and of builders are requested to exercise more care, and in future report all cable punctures of which they have knowledge.

The London and Suburban gas companies will note with some degree of satisfaction, seeing that it is a testimonial to their enterprise, that "the electric supply companies of London are at length realizing that, except in lighting, the gas undertakings have for too long had things pretty much their own way." The statement appears in the "Electrical Times." It will also be noted, and will not lessen gas companies' activity, that with the falling off of electricity revenue due to the metallic filament lamp, drastic measures must be taken to recover lost ground, and to popularize the use of electricity for domestic purposes generally, and that the electric light companies are rising to the occasion. Several of the companies have already started aggressive campaigns. Heating and cooking are the principal directions in which these drastic and aggressive operations are being conducted; it being recognized that, from some of the better class houses, the competing gas companies, although the lighting is electric, are deriving more revenue than the electricity suppliers. The drawback that the latter suffer from is that they have nothing so economical or efficient to offer as the gas companies with which to override them in this business. In other districts where the property is not of such high class, a bold bid, we are given to understand, is to be made for a larger proportion of the domestic lighting.

There have been time and again comment and complaint as to the extraordinary expenditure that local authorities with electricity undertakings go to in lighting main shopping streets—the extravagant lighting going on far into the night after the shops are closed. A goodly proportion of the members of local bodies is constituted of tradesmen, who are not averse to spending money on such lighting in the thoroughfares in which their businesses are located, and charging the cost on to the whole community, the greater part of which never troubles the main shopping streets after dusk. An excellent hint is to be found in two articles in the "Electrical Times," by Mr. Glenn Marston. It is that special lighting of the kind should be paid for by the tradesmen who are the chief beneficiaries. And why not indeed? Mr. Marston does not put the matter quite so bluntly as this; but that is what his articles, to all intents and purposes, advocate. He draws his inspiration in this matter from American experiences. The tradesmen in certain streets in Newark (N.J.) have erected and run flame arc lamps, with festoons of incandescent lamps across the street, entirely at their own (*pro ratâ*) expense—not a cent being drawn from the public funds for the lighting. They find that the expenditure pays, by the attraction it affords to the streets, and so to their shops. The benefit being theirs, it is right they should pay. The writer also refers to the downtown part of Broadway, New York, where again a very small amount of public lighting suffices through the profusion of advertising signs and shop illumination. The idea of letting those pay who want anything more than is considered as being a fair average amount of

illumination for public safety, convenience, and use, is one that has its commendable feature. We are among those heavily taxed ratepayers who have no ardent wish to contribute more to the cost of lighting the street in which our local butcher, baker, and draper do their business, and make profit out of us and our neighbours, than we do to the cost of the illumination of the residential thoroughfare in which our own domicile is situated. But the wish of the majority is not studied in this matter. It is the minority of so-called representatives in the local electricity trading council who decide the matter, and who close their ears to all information as to high-pressure gas lighting for shopping centres. They might, however, consider the point as to tradesmen on streets specially lighted paying for it. Such a scheme would, we are confident, in this country soon cool the ardour of tradesmen on local councils for high-power and high-priced electric arcs.

"Meteor" of the "Electrical Times" has an easy way of running away from awkward criticism. These are his inane remarks on the comments appearing in the "Memoranda" for Oct. 26 and Nov. 9, on the Domestic Electrification issue: "We may be ungrateful, but we found it dull reading. There is nothing so monotonous as column after column of acrid and sour comment: a secretion compounded of pessimism and jealousy. We had looked for the sharp tooth of the serpent and the accompanying venom; and behold, we are treated to mumbling and slaving instead. The intention was good, no doubt; but the performance makes us yawn." Our friend has a pretty way of showing his tail, when directly challenged. Misrepresentation and cowardice are fittingly paired.

MORE MUNICIPAL "UNDUE PREFERENCE" IN MARYLEBONE.

THE "Debenham Despotism" still reigns unchecked in Marylebone; and it is quite evident that no scheme put forward by the Electricity Department of the Borough—however unprofitable, both indirectly and directly to the ratepayers; however grossly unfair to the other supplier of illuminant (and a substantial ratepayer) in the district; and however devoid of sound finance and fair business principles—can be too tough for the digestion of the humble "Say-Ditto-to-Debenhams" at the Marylebone Town Hall. The latest dish hastily swallowed by the Council, with a heavy smearing of "work for the unemployed" grease, consists—as will be seen from the report on p. 555—of a scheme for laying mains through every minor street and byway in the borough, in order to displace gas by electricity in the remaining 1385 public lamps in the borough.

The proposal is prefaced by a "report" upon the already accomplished substitution of electricity for gas in 1964 lamps, which is remarkable for its economy of truth and its suppression of essential facts. The report mentions how much the Lighting Committee paid for gas and maintenance in respect of these lamps prior to their conversion. It carefully omits to point out (1) that the Gas Company offered materially lower terms for the maintenance of the lamps, and (2) that the figures quoted are based on gas at 2s. 5d. per 1000 cubic feet, though the price of gas for street lighting has since been reduced to 2s. 2d. In another part of the report, the reduction from 2s. 5d. to 2s. 4d. announced last June is mentioned, but the further reduction to 2s. 2d. that was announced in September is conveniently overlooked.

The report states that "there is no question that, in actual measured candle-power, the streets have much more light than they had before." It not only adduces no proof of this statement, but it carefully omits to mention (1) that the Gas Company offered to maintain the gas-lamps at a higher efficiency than that at which they were being maintained by a contractor; and (2) that, so far were the electric lamps provided for in the original scheme from giving "more light than before," they so obviously gave less that the Electricity Department had at once to substitute lamps of higher candle power, and, of course, greater current consumption, in all the principal streets in the borough—a further but carefully concealed loss to the undertaking and the ratepayers.

The report also fails to state that the quoted charge of £2500 a year for "repairs, renewals, and maintenance" of the 1964 lamps fitted with electric burners is materially less than the actual cost, which cannot fall much, if at all, short of £3500 a year. The figures given in the report clearly prove this—though no proof is needed to anyone acquainted with the cost of lighting, repairing, and maintaining street lamps—as the cost of the same work in respect of the remaining 1385 lamps is estimated at 27s. per lamp; while that of the 1964 lamps is pretended to be only (£2500 =) 25s. 6d. per lamp, in spite of the fact that over 1100 of the latter number are twin-burner lamps, which would cost at least 10s. per lamp more than the one-burner lamps.

It is further interesting to note that the Electricity Department ask—and will therefore, of course, get—a higher annual payment than the present cost of gas (at 2s. 2d.), to say nothing of the lower maintenance terms the borough could get from the Gas Company for the asking—only they take good care not to expose their Electricity Department to competition.

Another interesting point is that it is deliberately proposed to spend £3077 more on the laying of the mains than the proper cost, in order to toady to the labour element in the borough;

"The capital cost of the mains and ducts would be (a) with ordinary labour £19,965, and (b) with 'unemployed labour' £23,042.

We commend the scheme to the Council, and, as the matter is one of urgency—if any benefit is to accrue to the unemployed—we have asked the Lighting Committee to give it their prompt consideration, and the Finance Committee to bring up the necessary recommendation for application being made to the London County Council for sanction to the proposed loan of £24,000 for this purpose."

The report of the Finance Committee of the London County Council on this audacious proposal—made, be it remembered, after the borough has evaded the authority of the County Council by borrowing the money they wanted for the previous scheme in an unauthorized manner, after their application for a loan had been refused—will provide interesting reading; but we doubt if it will afford as much pleasure as instruction to Messrs. Debenham and Wright, and their zealous (if not always wonderfully discreet) henchman, Mr. Seabrook.

The "discussion" of the scheme at last Thursday's meeting of the Borough Council was of the feeblest, and calls for very little comment. But one remark made in its course deserves to be noted as so thoroughly characteristic of the whole business. The report of the Electricity Committee mentions that (obviously only as a matter of form) they had asked the Lighting Committee to give the scheme their prompt consideration. "Councillor Brinsley-Harper," we read, "asked why the concurrence of the Lighting Committee was necessary!" The Lighting Committee is theoretically, and, of course, should be in reality, the buyer, the Electricity Committee only a tendering seller. But it is widely recognized that the Electricity Committee are the unchecked administrator of the Council's lighting business, so that the dragging-in of the Lighting Committee is regarded as a mere waste of time and trouble. Perfectly true; but one hardly expected the truth to be so glaringly exposed by a member of a Council which only maintains its self-respect by self-deception.

THE GREAT STRIKE OF GAS WORKERS IN ITALY.

The Company's Complete Success within Sight.

THE outlook for a speedy termination of the strike at the gas-works of the Union des Gaz—Milan, Genoa, Alessandria, and Modena—is, at the time of going to press, distinctly hopeful. Yesterday a telegram was received by the Secretary of the Continental Union Gas Company (Mr. W. Martin) that the General Manager at Milan (Signor Grüss) and the Company's legal adviser had had an interview with the public authorities; and they had agreed upon conditions on which the old staff would be re-established. These conditions were to be submitted to the men yesterday; and, as labour at Milan controls the action of the men at the other stations, it looks as though the end of the Company's present difficulties is imminent. At any rate everything was peaceful in Milan yesterday, which marked the completion of the third week of the strike.

PRIOR TO THE ABOVE INTELLIGENCE.

Before the above cheering news was received, the Company and the men on strike had—we learned at an interview with Mr. A. F. Phillips, one of the Directors and the Consulting Engineer of the Company—come closer to agreement than they had been at any time since the presentation of the extraordinary demands of the men, with which we dealt in last week's issue. These demands the men had practically relinquished. Those who have followed up the labour conditions affecting the Company will remember that there existed prior to the strike an *Organico*, which gave the Company very little control over the men. Upon the men striking, the Company took the firm stand that they would not restore the men to their former employment on the conditions of the old *Organico*. To replace it, a declaration for new regulations of work was submitted. These new conditions offered the men exactly the same pay, allowances for sickness, pensions, hours of work, and all other privileges; but, on the other hand, they gave the Company the power to dismiss men when unsatisfactory workers, and to promote men for merit and not according to service. These conditions were submitted to the staffs at the several stations. The great difficulty, however, between the men and the Company in respect of the acceptance of the new regulations was this: The strikers were willing to come back immediately and sign the new regulations, provided the Company would consent to sign them as provisional—subject to arbitration. This the Company refused to do, because experience shows that the arbitration invariably goes against the Company, owing to the constitution of the Court of Reference. The men appoint one arbitrator, the Company one, and the President of the Tribunal appoints the third; and the third is generally a man in favour of the men. What the Company said to the men in their new declaration was practically this: "We offer you all the conditions of labour you had before; but we reserve to ourselves the right to conduct our own business, to engage what men we like, to discharge men who are not satisfactory, and to promote men according to merit." And that is the only way in which a business of the kind can ever be conducted. The Company have tried other

methods under the former order of things; and they have been unsuccessful.

THE WEEK'S NEWS FROM MILAN.

The hope then is that before readers of the "JOURNAL" receive the present issue, peace will have been completely restored. Meanwhile, we may run lightly over the incidents of the past week. The Company and their officials left no stone unturned to guard against all eventualities, as is exemplified by the fact that some 300 additional German workmen were drafted into Milan during one night. But throughout the week, the situation was one of great complexity and perplexity for, particularly, the Chief Engineer (Mr. Clement Hovey) and his colleague the General Manager of the Milan station (Signor Grüss). Internally at the works, things were placed in a perilous position during the week, due to the bad faith of provisional Italian workmen who had arranged a contract to work for fifteen days for a specified remuneration; but on the thirteenth day some 400 men refused further service, and demanded the full payment. As it was impossible to force them to work, and the aspect was distinctly unsatisfactory, it was necessary to place these men under military guard, and to transport them during the midnight hours to the station, and send them back to their homes. Their places were smartly filled within twenty-four hours. Towards the end of the week, other men, who had been subsequently engaged for a similar period, also declined further service, and attempted to extort full payment for the whole period, though they had only worked five days. These were treated in a similar manner to the others. These incidents give an insight into the difficulties of the work with which the officials have had to contend. The conducting and the control of all manufacturing operations with the new men, though unaccustomed to the work required of them, would have been comparatively simple were it not for the character of the Italian peasants upon whom it has been necessary to depend for manual labour. But there was hope that, with the arrival of the German workers, the officials would be able to dispense with the services of these men.

With regard to the gas service generally, the pressure, quality, and quantity of gas supplied have in reality been thoroughly good; but the Company have been assailed in regard to them by the Municipality and certain ill-disposed individuals. "Il Secolo" on Friday stated that the new Municipality had fined the Company over 70,000 frs. since the beginning of the strike. The Company, it should be mentioned, may be fined an increasing amount for every deficiency of quality or pressure of the gas; and quality refers not only to illuminating power, but also to the calorific value. The Company must supply gas of 105 litres to the carcel, and the calorific value should be 5100 calories to the cubic metre, upon which figure a "tolerance" is allowed of 300 calories. The Company have been fined for lamps defective, and for lamps injured. This indicates an unreasonable attitude on the part of the authorities towards the Company during this time of their struggle for very existence.

Some ignorant critics have also been writing to the papers, endeavouring to persuade the public that the composition of the gas is extremely poisonous—that the percentage of carbon monoxide is outrageously high, and so forth. Such foolish criticisms must have been extremely annoying, because they have some effect upon the socialistic public, ever ready to injure or to appropriate the property of others, even if those others are doing a legitimate trade, and giving thoroughly good service and satisfaction to their customers. The strikers were continually pressing the authorities to throw their influence on their side and against the Company; and, of course, the socialists dependent upon the workmen's vote, supported the unjust claims of men who had been treated, as was shown last week, with the utmost generosity by their employers.

The street-lamps it has been found necessary to keep lighted throughout the day, as the protection which would be necessary to enable them to be extinguished and relighted daily would be too great a tax upon the patience of the authorities, and would have increased the risks of injury—perhaps even have resulted in murder. A considerable number of violent strikers have been arrested on various occasions, including prominent members of the Workmen's Federation, and sentences of several months have been inflicted. In passing from one works to another at all times of day and night, Mr. Hovey has had to run the gauntlet many times; and his motor has been considerably damaged by the attacks of the strikers. It is reported in the papers that, while proceeding to one of the works towards midnight one day early last week, large numbers of strikers endeavoured to stop the car, and to injure the occupants. The Captain of the *Carabinieri*—a very smart officer—was with the Chief Engineer. They found themselves subjected to a volley of stones and other missiles. Stopping the car, the Captain drew his sword, and faced the crowd, which he kept at bay for a few seconds, until he was joined by a number of the military guard, who quickly cleared the large piazza in front of the San Celso works, making some arrests where there was determined resistance. The military and civil guards have, it should be said, done throughout most excellent service.

NEWS FROM THE GENOA STATION.

Last week we could not, owing to the absence of definite information, say much regarding the Genoa station, at which the Chief Engineer and Manager (Mr. Philip S. Morton), who is in

supreme control there, has done excellently well. He has been fortunate in having faithful clerks and good supporters—Cucchi, Cesari, Bickley, and others; and their devotion has been of the best throughout.

Let us stay just for a few words on the Genoa works themselves. Mr. Morton has been in charge there now some four years; and he has devoted himself thoroughly to reorganizing all the staff, which was considerably disorganized when he took over the command. He has surrounded himself with some loyal assistants; and, as mentioned above, their influence has materially assisted him in this time of difficulty. There are three stations at Genoa—Sampierdarena, Gavette, and Bisagno. At the first-named works, the retorts are all horizontals, with West's charging machinery; at Gavette they are all verticals; and at Bisagno (which are the old works), they are horizontals, hand-charged. The maximum output of gas at Genoa is 100,000 cubic metres, about $3\frac{1}{2}$ million cubic feet a day; there are 5011 public lamps; and about 38,000 consumers. The coal carbonized during the year amounts to about 70,000 tons.

From these figures will be seen the extent of the responsibility that has rested upon Mr. Morton during the present time of difficulty. His clerks, the foremen at the works, and the inspectors and assistants in the town, remained faithful to him, and have rendered every assistance; and of them he cannot speak in too high terms of praise. Directly the Milan men went out three weeks ago, the men at Genoa (as well as those at Alessandria and Modena) followed suit. The early arrival of English machine men, together with the help of the clerks, enabled Mr. Morton to keep the carbonizing going without cessation; and the output of gas soon reached its normal quantity—there being only a little deficiency the first day or two. All the charging machinery and the exhausters have been driven by Englishmen since the strike, and the remainder of the work has been done by Italians. With regard to the public lighting, the lamplighters left the lamps alight the morning after the strike, with the intention of causing loss of gas. But this was really to the advantage of the citizens and the Company, as the lighting was thus maintained on a much larger scale than would otherwise have been possible. Although a considerable number of lamps were extinguished, the burners broken, pipes cut, &c., during the first days, Genoa soon resumed its normal or quasi-normal service.

With regard to the Sampierdarena works, it is only right that due acknowledgment should be made of the energy of the Works Manager (Mr. Bickley), who was for several years in the service of the Tuscan Company. He speaks Italian perfectly; and he soon had his men well in hand. At Gavette, the vertical retorts worked excellently—in fact, the "scratch" squads of clerks, outsiders, &c., have been doing better work with them than was being done by the ordinary men previous to the strike. But, above all, Mr. Morton's determination and firm stand from the beginning has done much in obtaining good working during the strike; and his firmness with the authorities has also had a beneficial effect. Military protection was freely given by the Prefect, who acted most loyally and impartially in guarding the liberty of work in the interests of the public service. The Chief of the Police has also given valuable assistance. The town, in order to cover its responsibility, has imposed fines nightly; but these will no doubt be contested by the Company later.

Of course, there have been the usual accompaniments of a strike. Many acts of "sabotage" have occurred every day; and two of the men were beaten by the strikers, and seriously injured. As already mentioned, damage has been occasioned to the public lamps. Writing to the Company's offices on the 16th, Mr. Morton stated that the situation at the works was excellent, though somewhat acute, as the number of men returning to work had aroused the wrath of the remainder. At the very time of writing, he said there was going on in front of his office a demonstration in which women were pleased to mix; and it had been necessary to call in force to clear the streets.

The number of men affected at Genoa was about 850. Notices were put up about a week ago discharging all men, and inviting applications from outsiders and from the old staff who wished to return on the new conditions laid down by the Company. Some 500 applications from outsiders were quickly received; and about 150 from old workmen. The latest information yesterday was that 150 men had already signed the new conditions of labour, and others were coming in continually. The collectors had also resumed work. This looks healthy.

We have been interested to receive a copy of "Literary By-paths and Vagaries," and other papers, by Mr. Thomas Newbigging. The book, which is published by Mr. Elliot Stock, of Paternoster Row, is certain to be warmly welcomed by those who have read previous volumes from the pen of the same versatile author; and it should also prove welcome to others who have not had that good fortune.

Mr. Reginald J. N. Neville, who is the Recorder of Bury St. Edmund's, and a Director of the Brentford Gas Company, has been adopted as the Conservative candidate for the borough of Wigan, in succession to the sitting member, Sir Francis S. Powell, who is retiring at the next General Election. As most of our readers are aware, Mr. Neville has from time to time been engaged in cases affecting the gas industry, both at the Law Courts and before Parliamentary Committees.

HISTORY OF THE LIGHTING OF STRASBURG.

Souvenir of the Jubilee of the Continental Union Gas Company.

THE close of fifty years of work, whether by an individual or by a number of people associated together in one enterprise, is generally regarded as a time when retrospect is not only permissible, but sometimes profitable. In the case of a collective undertaking, those who have been connected with it from the commencement naturally feel a pleasure in reflecting that the early difficulties attending a new venture have been successfully overcome, and the concern placed on a sound commercial basis. At such a period in the history of a private business or of a company, any available particulars in regard to its past possess special value for those engaged in it; and should they be collected in permanent form they are generally perused with much interest, and preserved for subsequent reference. It was probably a consciousness of the existence of this feeling that prompted the Directors of the Union des Gaz (the Continental Union Gas Company) to have prepared an account of the progress of the business of gas supply at their Strasburg station from the time they took it in hand in 1858 till the end of 1907—the period of fifty years for which their first concession was granted. The book has been produced by M. Gaston Kern, the Manager, who has sent us a copy of it. When we say that it is a volume of upwards of 300 large quarto pages, it will be evident that the author had a long story to tell. He did not, however, confine himself to the fifty years' operations of the Company, but compiled a history of the lighting of Strasburg from its origin to the present time. It is an exceedingly interesting book; but it is impossible to do more now than briefly indicate the nature of its contents; leaving a fuller notice of them for some future occasion.

The work is divided into two parts—the first consisting of an introduction and a collection of historical documents bearing upon the subject; and the second comprising some comments upon these, followed by the story of the lighting of the city. As the author points out, old documents concerning private lighting are rare; but for a hundred years chronicles of the public lighting of Strasburg have been in existence. This branch of the municipal service has always been in the hands of companies, whose successor is the one now entrusted with it. The first document is an edict promulgated by Louis XIV., in June, 1697, ordering lanterns to be generally employed for lighting the streets. This is followed by an interesting series of documents occupying about 50 pages, and covering the period to the end of 1778, when the first treaty was entered into for lighting the city with oil. This system was continued till 1838, when gas was adopted under a treaty lasting twenty years. In 1858, as mentioned above, the fifty-years treaty was entered into with the Continental Union Company. These documents are followed by details of the legal standard of light, and lists of the streets in the city and suburbs in which mains have been laid. This brings us to the second part of the book. The comments on the documents and some interesting historical particulars bring us down to p. 229, where the story of the Continental Union Gas Company begins. Above the chapter heading is a portrait of Sir Julian Goldsmid, the Chairman of the London branch from 1892 to 1896. Over leaf is one of the first Manager—M. Weill-Goetz. A plan of the works shows their extent up till 1861; another as they were in 1870. This was a terrible year for Strasburg, and, of course, the gas-works suffered, as shown by two excellent views. We now come into later times, and have particulars of the works as they now stand, equipped with up-to-date plant. There is a chapter on the Auer burner, the public lighting arrangements, meter and stove hire, gas consumption, &c. This is followed by one showing how the employees of the Company are cared for; and the final chapter furnishes particulars of the arrangements made for filling balloons.

It only remains, for the present, to say that the book is an excellent specimen of typography (each page has a red-line border), and that the text is interspersed with a large number of illustrations and portraits, which come out well on the fine art paper used for the work. On the title-page is an effective reproduction, in gold and colours, of the ancient banner of Strasburg.

Proposed Memorial to the Late Mr. W. Young.

At the meeting of the North British Association at Stirling in July last, on the motion of Mr. J. W. Napier, of Alloa, it was remitted to the Committee of the Association (with power to add to their number) to consider the matter of providing a memorial to the late Mr. William Young, of Peebles. The Committee met in Glasgow last Friday, Mr. A. Waddell, of Dunfermline, the President, in the chair. The Committee, after consideration, resolved to make an endeavour to raise a fund, to be capitalized and the proceeds employed in the provision of a lecture to be delivered at the annual meeting of the North British Association, and to be known as "The William Young Memorial Lecture." Mr. Alex. Bell, jun., of Peebles, was appointed Hon. Secretary and Treasurer of the fund.

The death occurred on Monday last week, at the age of 77, of Sir Frederick Dixon-Hartland, M.P., who was Chairman of the Thames Conservancy from 1895 to 1904, in which period his name frequently came before the public in connection with the Metropolitan Water Question.

THE LAST GAS EXAMINATIONS.

Report of the City and Guilds of London Institute.

WE have received from the Superintendent of the Department of Technology of the City and Guilds of London Institute (Sir Philip Magnus, M.P.) the report on the work of the department during the past session. We extract from it a few particulars as to the examinations in "Gas Engineering" and "Gas Supply."

Dealing first with the general work of the department, it may be mentioned that the number of subjects in which examinations were held last session was 73, compared with 72 before; and the number of separate classes was 4021, against 3604—the former figure being the highest on record. The number of students in attendance was 48,897, compared with 48,223. In the subjects "Gas Engineering" and "Gas Supply," the number of students increased from 351 to 652, and of candidates from 484 to 626. The programme for the session 1909-10 was issued in July, and was noticed in the "JOURNAL" at the time. Among the alterations in the syllabuses was the decision to have a practical test in the Honours grade examination in "Coal Tar Products."

Turning to the tables which give the results in the separate subjects, the report shows that in the two relating to gas there were 22 centres, with 652 students in attendance, compared with 19 and 351 before. The candidates numbered 311 in "Gas Engineering," and 315 in "Gas Supply," compared with 291 and 193 before. In the Honours grade, in the former subject, 26 passed in the first class, 47 in the second class, and 43 failed; while in the Ordinary grade the passes were 40 and 60 respectively, and the failures 95. There were consequently 173 passes and 138 failures, or 44.3 per cent. In the Honours grade in "Gas Supply," 20 candidates passed in the first class, 32 in the second, and 28 failed; while in the Ordinary grade 58 passed in the first class, 81 in the second, and 96 failed. There were here consequently 191 passes and 124 failures, or 39.3 per cent. Of the total number of students in the two subjects, one who attended classes at the Battersea Polytechnic passed in the Ordinary grade in "Gas Engineering" and two in the Ordinary and one in the Honours grade in "Gas Supply." At the Goldsmiths' College, 25 candidates went up for examination, and 17 passed in "Gas Supply"—13 in the Ordinary and 4 in the Honours grade. From the classes at the Regent Street Polytechnic 28 students were examined in "Gas Engineering" and 9 in "Gas Supply." Of the former, 11 passed in the Ordinary and 6 in the Honours grade—one of the successful candidates being a prize winner. Of the 9 candidates examined in "Gas Supply," 8 passed—6 in the Ordinary and 2 in the Honours grade. There were 28 students at the Woolwich Polytechnic, and 8 were examined—4 in each of the subjects; but only two passed, and both in the Ordinary grade. From the various schools of the London County Council, 3 out of 50 students were examined in "Gas Supply;" and only one passed, and it was in the Ordinary grade. One candidate was examined in "Gas Engineering" and one in "Gas Supply" in Melbourne; and the former passed in the Ordinary grade.

Reporting upon the work of the students in "Gas Engineering," the Examiner (Mr. W. Doig Gibb) says the merits of the papers were very varying in both grades—running from very excellent down to very poor ones; but all the papers of the prize winners merited the awards they gained. Some little confusion appears to exist in the minds of students with regard to the instructions as to answering alternative questions. A number of candidates in the Ordinary grade answered both questions where only one was allowed; while two did nine questions instead of the eight specified. In the Honours grade, eight candidates did both of the alternative questions, and one answered nine.

Mr. J. H. Brearley, the Examiner in "Gas Supply," regards the great increase in the number of candidates presenting themselves for the Honours grade examination as indicating that the need for technical training in gas distribution is receiving much more attention than hitherto. With regard to the papers worked, he says they showed "enormous disparity" in the qualifications of the candidates, even in the same grade. While many of the papers which secured a first-class pass could not be too highly spoken of, it was to be regretted that so many candidates presented themselves who were obviously unprepared for an examination of such a character. In the Ordinary grade, there were no less than 45 students, or 19 per cent., who obtained fewer than 30 per cent. of the total possible marks. There were 35 who attempted fewer than six questions; while 37 others tried to answer six only. Mr. Brearley offers the following observations on this matter: "When it is remembered that the candidates had a choice of no less than fourteen questions all coming strictly within the purview of the syllabus, these figures indicate clearly the need for more systematic training." He considers that most of these candidates must have been denied the means of obtaining tuition by approved educational institutions; and he again urges on the education authorities of all large towns the importance of making extended provision for such candidates. In the Honours grade, only seven papers, or 8.75 per cent. of the total, obtained less than 30 per cent. of the possible marks. While there were few papers of marked excellence in the Ordinary grade, Mr. Brearley says those which obtained first-class Certificates in the Honours grade were of a high order. In this grade, however, few candidates appeared to understand the use of squared paper for plotting

illuminating curves; and as the relative values of various competing forms of artificial illumination become of greater importance each year, he thinks that a deeper study of this branch of gas supply may be usefully commended to candidates. Those who presented themselves at the last examinations appeared to appreciate very much the setting of alternative questions, for out of 80 candidates no less than 75 attempted one of them.

The questions in "Gas Supply," with the answers, were given in the last volume of the "JOURNAL" (pp. 105, 172, 243). The names of the successful candidates in both subjects will be found in the issue for the 6th of July (p. 21), and those of the prize winners in that for the 27th of July (p. 258).

GAS ACTS FOR 1909.

THERE were two Acts—the Bury Corporation Act and the Mountain Ash District Council Act—that were not available for notice in their proper order when reviewing the current session's measures in which gas powers appear. Copies of the Acts have since been issued.

In the Bury Act, lands are scheduled for gas manufacturing purposes; and powers are given for constructing a railway and sidings (with store yard) in conjunction with the Lancashire and Yorkshire Railway. The limits of supply are defined as the borough, and part (as described) of the township of Tottington Lower End. The standard illuminating power of the gas is prescribed to be of 12 candles, tested by the "Metropolitan" No. 2 burner, with the bar photometer and Harcourt's ten-candle pentane lamp. The price to be charged for gas is limited to 5s. A clause in the Bill that was to give the Corporation power of inspection in the case of pipes to be covered over has been removed; as has also been the clause providing that, upon inspection of a prepayment gas-meter by a collector, if the amount due in respect of the gas shown to have been consumed was not found in the box, it should be deemed not to have been paid, and for it the consumer should be liable. There was a clause in the Bill providing for all payments out of the general fund and for all receipts being carried to that fund, but a separate financial statement for the undertaking was to be kept; and when it appeared from this statement that the receipts exceeded the amount of the payments, the Corporation were to make in the next ensuing year such reduction in the prices charged for gas as should amount as nearly as possible to one-half the amount of the difference between such receipts and payments. This clause has now been superseded by a more extended one, which does not provide for the mixing up of the payments and receipts with the general fund, but which imposes the keeping of separate accounts, and defines the purposes to which the revenue is to be applied. These purposes are the ordinary ones, and include the formation of a reserve fund, and, very properly, the "making good to the general fund any deficiency in the revenues of the Corporation in respect of the gas-works undertaking which may at any time hereafter have been provided out of the general fund or general rate." Then, towards the end of the clause provision is made for excess profits being divided between the general fund and a reduction of the gas charges. The exact wording is:

And the Corporation shall carry to the general fund one moiety of so much of the balance remaining in any year of the income of the gas-works undertaking (including interest on the reserve fund when such fund amounts to the prescribed maximum) as may, in the opinion of the Corporation, not be required for carrying on the gas-works undertaking and paying the current expenses connected therewith, and the other moiety thereof shall be applied in and towards the reduction of the gas charges of the Corporation.

[Parliamentary Agents: Messrs. Lewin, Gregory, and Anderson.]

In the Mountain Ash Act, there are a number of ordinary gas clauses, one that is not so, and a variation of the prepayment meter clause. The unusual one refers to stand-by supplies, and is as follows:

Notwithstanding anything contained in the Gas-Works Clauses Act, 1871, or any other Act, a person shall not be entitled to demand from the Council a supply or the continuance of a supply of gas for premises having a separate supply (that is to say, a supply from an installation other than that of the Council) unless he shall have previously agreed to pay the Council such minimum annual sum as will give to them a reasonable return on the capital expenditure and standing charges incurred by them to meet the possible maximum demand for those premises; and the minimum annual sum to be so paid shall be determined, in default of agreement, by arbitration in manner provided by the Arbitration Act, 1889.

The prepayment meter clause is varied by the provision that the maximum charge for the hire of a prepayment meter without fittings shall be at the rate of 8d. per 1000 cubic feet of gas supplied through the meter. [Parliamentary Agents: Messrs. Baker and Co.]

We learn from the annual report of the Directors of the Continental Union Gas Company, Limited, some particulars from which are given elsewhere, that Mr. ARTHUR LUCAS has, to the great regret of his colleagues, resigned the chairmanship of the Company, after occupying the position for nearly eleven years; and that Mr. J. H. Birchenough, C.M.G., has been elected to succeed him. We also learn that Mr. R. HESKETH JONES has retired from the Board.

PROGRESS AT CARDIFF.—NEW PURIFYING PLANT.

A SMALL party of Directors of the Cardiff Gas Company and friends assembled in the offices at Bute Terrace last Wednesday morning, preparatory to driving to the Grangetown Works for the purpose of witnessing the turning of gas into new purifying plant which has just been erected.

Among those present during the proceedings was the Lord Mayor of Cardiff (Councillor J. Chappell), who, singularly enough, was about a quarter-of-a-century ago working at Grangetown in the employ of the Company whose guest he was that day. The veteran Chairman of the Company (Surgeon Colonel W. Taylor, M.D., J.P.), in spite of his age of eighty and more years, was the life and soul of the gathering, and showed, while on the works

and subsequently at the luncheon, that he had all the technicalities of gas manufacture at his fingers' ends. He was supported by the Deputy-Chairman (Colonel H. Oakden Fisher, J.P.), and by Messrs. Charles E. Dovey, J.P., J. P. Ingledew, J.P., G. C. Williams, J.P., and W. Morgan Lewis, J.P., all members of the Board. On the tour of inspection, the party was accompanied by the Manager and Secretary (Mr. George Clarry), the Engineer (Mr. H. D. Madden), and the Works Superintendent (Mr. A. E. Williams); while the Contractors for the new purifiers, Messrs. Willey & Co., of Exeter, were represented by their Chairman (Mr. F. Templer Depree, J.P.), their Chief Engineer (Mr. H. L. Morley) being also present.



Elevation of the New Purifier House and Oxide Store at the Grangetown Gas-Works, Cardiff.

AN INCREASING BUSINESS.

Before dealing with the particular object of the visit to the works, a few words may be permitted with regard to the general business of the Cardiff Gas Company, which, it is a pleasure to record, exhibits a steady increase. In spite of the effect of the Miners' Eight Hours Act upon the City, through its shipping and other interests, Cardiff goes on prospering, and the Gas Company with it. Speaking of the Eight Hours Act, the writer has, when visiting South Wales, taken such opportunities as have presented themselves of trying to find someone who will express a favourable opinion of the Act now that it has been for some while in operation; but the quest has not been successful. There may certainly be persons who still regard the measure as a beneficent one; but if so, they seem difficult to find. This, however, is a digression. In 1904, the consumption of gas in Cardiff was 834 million cubic feet, and last year it was 1145 millions; while for the present year it is confidently anticipated that the make will reach 1250 millions. Results like these cannot, of course, be achieved—in the face of strong competition from municipal electricity—by the adoption of a policy of “masterly inactivity,” and therefore it is unnecessary to say that such a policy does not pertain to this Company. On the contrary, everything imaginable is done to attract custom, with the result that there are now something like 33,000 consumers, of whom 12,000 have prepayment meters. While the price of gas to ordinary consumers is 2s. 7d. per 1000 cubic feet, the Corporation are selling electricity at 3½d. per unit—sometimes, and at other times possibly a good deal less. Then it should be mentioned that the charge for gas-engines is 2s. 4d. per 1000 cubic feet; and there is a 5 per cent. discount off both prices, if the aggregate consumption reaches 200,000 feet in the quarter.

THE USES OF GAS.

The many uses of gas are brought home to inquirers—as well as the multiplicity and artistic character of the appliances designed for lighting and heating—by a visit to the spacious show-

rooms which occupy a large portion of the ground-floor of the Bute Terrace offices. Here is to be seen an exhaustive collection of burners, fittings, fires, cookers, boilers, radiators, &c.; many of the more elaborate of the fittings being displayed to great advantage in large glass cases. Mr. Clarry has seen the difficulty in getting people to come from a distance to the Central Office; and so a branch has already been opened at Penarth, with others in contemplation, where consumers can call and pay their accounts, or transact such other business with the Company as they may desire.

A successful maintenance system is in operation, under which a charge per quarter, for ordinary upright and inverted burners, is made of 7d. per burner for less than six burners, 6d. per burner for six burners and over, and 5d. per burner for churches and chapels. For high-power self-intensified burners, a charge of 1s. per quarter is made. The minimum charge in respect of any premises is 2s. per quarter. Lamps are inspected monthly; but should any mantles or chimneys be required in the interval between the inspections, they are supplied on receipt of written instructions. The charges named, of course, do not include cost of replacement of breakages caused by carelessness; and maintenance is only undertaken upon burners and mantles being in good order. Portions of an incandescent system on any premises are not accepted for maintenance.

Outside the offices, there is an excellent example of Keith high-pressure lighting; and numerous installations of Graetzin and other high-power lamps in different parts of the city help to testify to the capabilities of gas for lighting when consumed under the best modern conditions. The City Engineer (Mr. W. Harpur), too, is doing good work in converting in the public lamps the old flat-flame burners into incandescent lights. This is being done as fast as he can get capital for it; for in the city proper the Company are merely responsible for the supply of gas. In the outside districts, however, where they have the lamps under their control, all the lights have already been converted, with very satisfactory results.



Interior of the Purifier House, Showing the Lifting Gear.

A PROFIT-SHARING SCHEME.

As from July 1 of this year, a co-partnership scheme has been introduced for the benefit of the employees; and here, as elsewhere, the system has been found to work well, by giving an already loyal body of workmen a still greater incentive to do all that is possible in the best interests of the Company. On the date named every man who was admitted to co-partnership received twelve months' bonus as a nest-egg. A succession of four dinners was arranged for different sections of the men; and at each of these the Chairman expounded the scheme, which is based on broad lines. At the present ordinary price of gas—2s. 7d. per 1000 cubic feet—a man receives 4 per cent. on his wages, with 1 per cent. additional for every penny reduction below this figure. The money is to be placed in the hands of three Trustees—the elections of Officers, Committee, and Trustees all being conducted by the workmen. The men, of course, were bound to invest the nest-egg; and the Company also give them the option of banking their savings. To the latter suggestion, it is pleasing to note, there has been a very good response. Many men are paying in their money regularly, and saving up in order to qualify as shareholders. By their 1906 Act, the smallest shareholding in the Company is limited to £10; and till the necessary sum is reached, the Company hold the money, and pay the men 4 per cent. interest on it. This applies both to the share of profits and to other savings. The latter can be withdrawn at any time; and, by consent of the Committee, a man can also withdraw his bonus, though for this he must advance a good reason—such as illness, or demands on his pocket of an urgent and unforeseen character. The Company have not admitted anything like the whole of the men to participation in the scheme. In fact, they have selected none except those who are old and tried servants of at least five years' standing; but there is no reason why every man should not join ultimately—and, indeed, the hope is that in time every man will be

found working hand in hand with the Company to forward the interests of the business. Any of those now outside who wish to take part in the scheme will be selected by the officers, who will have their decision confirmed by the Board. But they do not get the nest-egg. The object of arranging the scheme on these lines is to reward meritorious service; the idea being that if every man was at once included, there would not be the same incentive to special endeavour. Some particulars with regard to the scheme were given in the "JOURNAL" for March 30 last (p. 929).

There is also the suggestion-box to which the Chairman referred at the lunch. This, by inviting from the men suggested improvements in apparatus or working, and offering rewards for valuable ideas, may almost be regarded as a form of partnership in management. At any rate, inviting the co-operation of the men in this way is a plan which has answered well elsewhere, as no doubt it will do also at Cardiff.

THE TRAINING OF BOYS.

The profit-sharing scheme, however, good as it undoubtedly is, does not by any means constitute all the Company are doing for the benefit of their employees. Another thing that may be mentioned is the desire to make the training of the gas-fitters' boys theoretical as well as practical, and give them a thorough grounding in everything. Mr. Clarry, with others, finds that very much more is required from a gas company nowadays than was the case in former times; and it is necessary for employees to have some knowledge of the science of gas and air mixtures, &c. The best time to teach them, of course, is when they are young. Then there is the question of hot-water circulators. These are now extensively used; and it is necessary to have plumbers to deal with them. Therefore the men have to be more than mere gas-fitters. Having realized this, and found that there was some difficulty with the local technical school, Mr. Clarry "took the bull by the horns,"



The "Hurdle" Grids in the Purifiers.

and started classes which are now satisfactorily running, on much the same lines as have been adopted by the Gaslight and Coke Company. They are, as he admits, following a very good lead. Each boy undergoes a course of training; and he attends in the Company's time at the bench and at the class, under a well-qualified teacher, who allows him to use tools when advisable, and sees that he does things in the right way. The Directors have examined specimens of the work of boys who have only been employed seven months; and they are highly delighted with the enthusiasm the lads show in this departure from ordinary routine. The Company have hopes that they will be able to keep the boys on themselves, and train them right through, independently of any other schools. The Board will see that any boy who wishes to go to the college, and cannot afford the necessary fees for his training, receives proper support, though up to the present no boy has applied for these facilities. To any who go there and satisfy the examiners, prizes will be given which will well reward them for their efforts. As being an additional incentive to perseverance, it may be remarked that the Company make it a rule subsequently to take into their regular employ apprentices who prove attentive to their duties.

CHANGES AT BUTE TERRACE.

Until some eighteen months or two years ago, there was a stand-by manufacturing plant at the old works which adjoin the Company's offices in Bute Terrace; but the policy of concentration adopted, has led to gas-making facilities being confined solely to Grangetown. This involved the dismantling of the old retort-house at Bute Terrace; and the building is now being converted into a huge store—to permit of the concentration, also, of this branch. All the buckstave work of the house has been utilized to form balconies round the store; and the roof has, of course,

been made water-tight. With these alterations, and a projected lift to raise the material as required, the building, with the walls nicely whitened, makes an ideal store. Bute Terrace, however, still remains a distributing station; there being left a holder and two governors. There is a somewhat similar station at Taff's Well, too, where there are two holders, pumping plant, and governors. This is in addition to five holders at Grangetown.

Before leaving Bute Terrace, one other sign of kindly feeling on the part of the Company towards the employees should be noted. Arrangements are made for the whole of the indoor staff, numbering over forty, to dine on the premises, where the cooking and everything is carried out. The mess is worked by a committee of the staff; the part of the Company being to provide the room, furniture, crockery, and so on. On a self-supporting basis, it is found possible to supply a three-course meal—soup, joint, and sweet—at 6d. a head. In affording facilities for dining in this way, the Directors are conferring a very great benefit, especially on the younger members of the staff.

AT THE GAS-WORKS.

On arrival at the gas-works, the party at once proceeded to the new purifying plant, where the ceremony of turning on the gas, as duly recorded later in this article, was carried out. An inspection of the works generally was then made, before the return to Bute Terrace to lunch.

HEAVIER CHARGES.

Just at the present time the make is about 4 million cubic feet per day; but the maximum output has risen to as much as 5½ millions. All the coal gas is made in one house, containing 20-foot retorts operated by West's compressed air machinery; and there are in use in addition two sets of Cutler's carburetted water-



The Centre Valve in the Revivifying Floor.

gas plant, each having a capacity of 1 million cubic feet per day. A feature of this plant is the provision of a third generator, so arranged that it can, in case of breakdown, be used with either of the two units. A point with regard to the Sturtevant blowers is that they are operated by two sets of direct-driven turbines. The carburetted water-gas plant is kept in regular use—a constant moderate percentage being added to the coal gas; and the mixture takes place at the outlet of the station-meter. Returning to the coal-gas plant, it may be remarked that Peebles' retort-house governors were fitted some eighteen months ago; and the experience of these is that they have led to a reduction in the number of stopped pipes.

Additional interest was imparted into the visit to the retort-house, by the information that the Engineer is experimenting with heavier charges than were formerly employed. Instead of 7½ cwt. charges of six hours' duration, from 9½ to 10 cwt. at a time is now being placed in each retort, and left for a period of eight hours. It is, of course, early yet to speak of results of this new arrangement; but so far it seems to have been satisfactory. The improvement in the make has been slight; but better tar and better coke have been obtained. A bench of fourteen beds was renewed early this year. Of these, seven beds have done nothing but work on the heavy charges; and with them, it is interesting to note, there have been no stopped pipes at all. At present, Lancashire unscreened coal is being used; and the make per ton averages 10,500 cubic feet. The extremely level charges in the retorts were much commented upon; and the heats were very good.

SOME OTHER POINTS.

While walking round the works, the attention of the party was with pardonable pride drawn to some excellent specimens of flowers grown on the works, and also to the Air Rifle Club Chal-

lenge Cup presented by the late Chairman (Mr. C. H. Williams) and the Edgar Pritchard Base Ball Challenge Cup, which the Works Club hold against all-comers.

The meter-house, of which a formal inspection was made, contains three large station meters, two of which have recently replaced smaller types. The measuring capacity of the three meters—one of which is used for the carburetted water gas, and the others for the coal gas—is equal to 10 million cubic feet a day. The capacity of the two new Laidlaw meters is 180,000 cubic feet per hour each. The exhausters, which were also visited, are of a total capacity of 9 million cubic feet per day; there being three double sets of Waller's four-blade type, each passing 3 million feet.

NEW OFFICES.

Near the entrance to the works, there is a substantially built set of offices, which have been recently erected by the Company's own workmen—the first really big job that has been undertaken in this way. The object of these offices is to transfer the Engineer's department entirely to the works; and it is therefore another development of the policy of concentration. The building consists of two floors, the whole of the top one being occupied by a drawing office, having extensive roof lighting, fitted with Mellows' patent glass, which has a pleasing, softening effect. Below there are the Engineer's office, clerk's office, and weigh-bridge house. By the way, this was not the only specimen—though the largest—of the constructional work of the Company's men that was to be seen; for the party were also able to inspect a coke-screening hopper now being made on the spot.

Still further evidence of the endeavour to concentrate wherever possible is to be noted in the conversion (now in progress) of an old Grangetown retort-house into an extensive platers', joiners', and carpenters' shop.

COKE—AND SMOKELESS FUEL.

In the course of the luncheon, the Chairman referred to the fact that there were on the table and in the fire samples of a smokeless fuel—or partly carbonized coal—made at the Company's works. A commencement has not yet been made with the sale of this; but the Company, as soon as there is sufficient demand for it—and, of course, if they feel confidently assured that it will not injure their ordinary coke traffic—are quite in a position to market a material which they are certain will be as good for use in open grates as any of the other kinds of smokeless fuel to which special names have been given. In the ordinary way, the Cardiff Company are blessed with a very good demand for coke, and last Wednesday had only a few tons in stock. In fact, until a week previous, they were cleared out every morning by 10 o'clock—and all was taken by retailers in small quantities. They are, it may be noted, obtaining the satisfactory figure of 15s. a ton at the works.

The New Purifying Plant.

After the party had been photographed on the stage of the new house, by a workman in the employ of the Company (who, by the way, is responsible for the excellent illustrations of the plant which accompany this article), a move was made to the valve, on the discharge floor under the purifiers, by means of which the Chairman was to turn the gas into the purifiers. On reaching this,

Mr. F. TEMPLER DEPREE remarked that it was his privilege, as the Chairman of the Company who had been erecting the plant, to ask the Chairman of the Gas Company to be good enough to turn the gas into the purifiers; and it had occurred to his co-Directors and himself that Dr. Taylor might accept a small memento of the occasion. The souvenir was a silver wheel which was connected to the valve by which he would ask the Chairman to turn on the gas. He believed that in these purifiers the Company would have the most up-to-date thing in the country; and by their aid they would be able to deal with a much larger quantity of gas than hitherto.

The CHAIRMAN, after turning the valve, remarked that the new purifiers only formed one of four sets; there being 24 boxes altogether on the works. Every effort was made to ensure the gas being pure, by means of frequent testing.

The silver wheel, when removed from the valve, had a table clock fitted into its centre. It bore the following inscription:

With this wheel, the gas was turned into the new purifiers at the Grangetown Works of the Cardiff Gas Company, by the Chairman, Surgeon-Colonel William Taylor, M.D., J.P. 1909.

A DESCRIPTION.

The following description of the new plant, bound up with photographs, was handed to the visitors.

The new purifying apparatus is constructed on the most modern lines, with a view to the complete purification of the gas; and advantage has been taken of the utility of steel framing, which particularly lends itself to the class of building required for the housing of a purifying plant.

The building is divided into two sections: (1) The purifying-house proper, which contains the apparatus. This house is 153 feet long by 73 feet wide by 28 feet high to the eaves, and is formed of rolled steel joist stanchions braced together with two lines of lattice girders; the angles formed by the stanchions and girders being filled with ornamental brackets. The roof of the building is formed of 14 plated steel principals designed to provide a pathway for the broad band conveyor on the centre of the main tie-bar. The roof is battened with steel angles, covered with Duchess slates, and finished at the apex by a neat cast-iron ridge capping. A ventilator 12 ft. 6 in. wide runs up to the last principal, and is fitted with three tiers of louver boards on each side. (2) The lime and oxide house, where the purifying material is stored and prepared ready for use. This house is 60 feet long by 73 feet wide by 20 feet high to the eaves, and is built of brickwork; the inner wall forming the end of the purifier-house. The roof and covering are similar to that on the purifier-house; but the end and division walls are finished with stone copings.

The new purifiers are six in number, four being 50 ft. by 30 ft. by 5 ft. deep, and two 40 ft. by 30 ft. by 5 ft. deep. The purifiers are constructed of cast-iron plates, $\frac{3}{4}$ -inch thick, with outside flanges; and the side plates have a neat panel moulding cast on to them. Each purifier has four outlets for the spent oxide, with self-sealing mouthpieces on the underside.

The four larger purifiers have each four covers 22 ft. 6 in. by 12 ft. 6 in.; and the two smaller ones have each four covers 17 ft. 6 in. by 12 ft. 6 in. The covers are formed of $\frac{3}{4}$ -inch thick steel plates, with strong angle curb, and are stiffened by steel bulb tees running the length way of the covers. The joints between the covers and the purifier top-plates are made with the "Green" type of patent rubber joint, bolted to the underside of the covers; and the covers are held down with swivels, bolts, and wing-nuts of special design, spaced about 20 inches apart.

The purifiers are fitted internally with Spencer's patent hurdle grids, which hold the purifying material very lightly, and allow the gas to be perfectly treated.

Two travelling cover-lifts of special design run the full length of the purifier-house on steel rails fixed to the top of the purifiers.

Around the boxes is a platform formed of red deal 6 feet wide, access to which is gained by two steel staircases.

The foundations are composed of concrete built from the gravel which was found at a depth of 18 feet. A superstructure of rolled steel joist girders and longitudinal joists carried on cast-iron columns—resting on the concrete foundations—supports the purifiers.

The purifiers are worked by means of two Pickering patent centre-valves, one of which controls the four larger boxes; the other controlling the two smaller ones. These valves are entirely connectionless, being bolted to the underside of the purifiers, and are capable of working any combination of boxes in rotation. The gas is brought to the Pickering valves by means of a 24-inch main from the scrubbers.

The plant for handling the purifying material consists of a bucket-elevator; the boot of same being in the oxide house and the head in the purifier-house. This elevator delivers the material on to a band-conveyor 24 inches wide, which carries it to any desired point by means of a throw-off carriage. Mechanical power is supplied by a 15 B.H.P. vertical "Colonial" type steam-engine to the elevating and conveying plant, which can deal with about 30 tons of material per hour.

The Chairman and Directors of the Company in providing this apparatus for the needs of their Grangetown Works have—in view of the multifarious uses and application of gas for light, heat, and power in the city—made every provision to ensure the supply being effectively manufactured and thoroughly purified, and have availed themselves of the latest improvements which are best adapted to the carrying out of these processes.

Messrs. John Aird and Sons, Limited, of London, carried out the foundations and the brickwork; and Messrs. Willey and Co., Limited, of Exeter, were the Contractors for the purifying plant, together with the steel and iron work of the building.

To this it must be added that the new plant was the subject of many complimentary remarks on the part of the visitors. The new purifying house is a continuation of a closed-in one of the same size, also containing six purifiers; but the more modern form of the new plant enables the boxes to cover a so much greater area than, while the capacity of the old house is about $2\frac{1}{2}$ million cubic feet per day, that of the new purifiers is 4 million feet. These additional six boxes, it may be stated, bring the total purifying capacity of the works up to about $8\frac{1}{2}$ million cubic feet per 24 hours.

At the close of the inspection, the party returned to Bute Terrace, and in the Board Room there were entertained at luncheon by the Chairman and Directors. Dr. Taylor presided; and on his right hand sat the Lord Mayor of Cardiff. In the course of the proceedings, some interesting speeches were made.

The CHAIRMAN, after the Loyal Toast had been honoured, proposed "Success to the New Purifying Plant." He expressed the hope that those present were satisfied with what they had seen at the Grangetown Works. The aim of the Directors was to supply the public with as pure an article as it was possible to send out. He had the pleasure of welcoming among them that day the Lord Mayor of Cardiff; and from what he knew of him, he was quite sure that at the end of his year of office he would have reflected credit on himself and on the city. Referring to general matters, he pointed out the importance of the residual products to a gas undertaking. Altogether, he said, there were about 150 known commercial products derived from coal tar. Many of them had doubtless heard from time to time about what was called "Coalite," which had been very much boomed by those who wished other people to take an interest in it. "Coalite," of course, was really half carbonized coal; and their own Company could, if desired, supply a fuel of this character. In fact, there was some on the table in front of him, as well as upon the fire in the room. The advantage of using it in place of ordinary coal was that it gave off no smoke or dust. Gas was a never-failing source of light; but they could not say the same of electricity. It had, however, been claimed for the latter that it was more convenient because of the ease with which it could be switched on and off; but now it was possible to do the same with gas. [This was demonstrated by the lighting-up and turning-out of a handsome cluster of inverted burners in the centre of the Board-Room.] Perhaps they had observed in use at different times electric fans for clearing the air. Well, they had now the same sort of thing operated by gas. [This also was illustrated by the turning on of a gas-fan.] In addition to the fuel to which he had already referred, he had in front of him some coal and some sulphate of ammonia. The latter article the Company did not at present manufacture; but he hoped that in time they would do so. Mixed with certain other substances, it gave one of the very best manures imaginable. He need not point out the various uses to which gas could be applied; but he would just like to say that for street lighting purposes in Cardiff comparisons were very favourable to gas—it was cheaper than the electric light. The Cardiff Gas Company had now nearly 33,000 customers; and of these something like 12,000 used penny-in-the-slot meters. They found that the consumption of the latter came out at about 15,000 cubic feet a year per meter; and last year their collectors brought into the office over 62 tons of coppers. The output of gas was increasing most satisfactorily. In 1904, they sent out 834 million cubic feet; while last year the quantity was 1,145 millions—or an increase in this short period of 33½ per cent. They had in their staff a set of officers who did everything possible in the interests of the Company; and they had also an excellent body of employees generally. During the past year, the Board had endeavoured to encourage the men by starting a profit-sharing scheme; and this had already proved an immense advantage. It meant an increase of pay to the employees; but, on the other hand, it led to them saving all they possibly could in the way of materials they had to use, and it also induced them to see that no man shirked his fair share of work. In many other ways, too, the Company had provided for the comfort and welfare of their men. In conclusion, he

coupled with the toast the name of Mr. Depree, the Chairman of Messrs. Willey and Co., who had erected the new purifiers.

Mr. F. TEMPLER DEPREE remarked that the Chairman had drawn attention to the fact that there were at the present time something like 12,000 slot-meters in use; and that the consumption through them averaged 15,000 cubic feet per meter. This, he might say, was a very high average. For something like forty years it had been the privilege of Messrs. Willey and Co. to supply the Cardiff Gas Company with meters, &c.; and they regarded the fact of being entrusted with large extension work like these new purifiers as a great additional proof of confidence in them. He took credit for the fact that in the West of England they were able to turn out work equal to any other firm of the kind in the country. It was, however, impossible for contractors to carry out a job in the best possible way if they were not assisted by the permanent staff of the undertaking for which they were working. His firm had had from the first the utmost help, not only from Mr. Clarry, but also from Mr. Madden and every other member of the staff.

Mr. E. W. M. CORBETT, J.P., proposed "The Corporation of Cardiff," coupled with the name of the Lord Mayor. The Corporation, he said, had done for Cardiff many great, and lasting, and praiseworthy things. The foresight of the men who provided the city with water from the Breconshire Hills was one matter which they could never be too grateful for. But, as ratepayers, they had not the same reason to be thankful that the gas-works were not purchased when there was a very good opportunity of doing so. As ratepayers, he believed they were suffering for this neglect to purchase; but as gas consumers he did not know that they were, because he did not believe that if the undertaking had been in the hands of any public body there would have been shown the same enterprise as they had seen in the case of the Cardiff Gas Company, and he did not believe that the people would have been so well supplied.

The LORD MAYOR, in response, said that, speaking as a member of the City Council, there was a bitter regret in his heart that the Corporation had been silly enough not to purchase the gas-works at the time to which the previous speaker had referred. He thought, even at the price they would have had to pay, the undertaking would have worked out its own salvation. The Corporation recognized that the existence of a gas-works was quite necessary to a town; and though they had bartered and bargained with the Company, he was pleased to say they were getting on together in the most pleasant manner. When the last Bill was promoted, the parties met, and the matter was settled without any trouble.

Colonel H. OAKDEN FISHER, the Deputy-Chairman of the Company, proposed "Our Guests," and said he hoped that, from what they had just seen, they would still continue to have confidence in the Company. The Directors believed they were doing the best for the shareholders and the gas consumers; and he hoped this would always prove to be the case.

Mr. J. W. BOTSFORD replied to the toast.

The LORD MAYOR proposed "The Chairman and Directors of the Cardiff Gas Company." He said he was an old employee of the Company, to whom he owed a great deal. Many years ago he entered Cardiff as a stranger; and the first regular employment he obtained was at the Grangetown Gas-Works. He well remembered the old plant in existence then; and it was a surprise to him to see the vast changes that had since taken place. A great amount of energy and brain-work had been put into the manufacture of gas; and the labour and capital that had been involved was immense. In going round the works that day, he had been very pleased to see a number of men still there with whom he worked side by side when he was in the employ of the Company. It spoke well for the character of employers when they could so long retain the services of their men. He was also glad to notice the introduction of the co-partnership principle, in which he had the very greatest faith. There was nothing that would contribute so much to the success of an undertaking as a body of employees well satisfied with their conditions.

The CHAIRMAN, in returning thanks, referred to the remarks of Mr. Depree, and said it was quite true his firm had been connected with the Gas Company for very many years. In addition to this, some time ago, when they were thinking of introducing slot-meters, it became (in the absence of the then Chairman) his duty, with Mr. Morley, who was at that time Engineer, and Mr. Clarry, to receive samples of the different kinds of coin-meters; and, among others, they had one from Messrs. Willey and Co., which seemed to them one of the best. They visited Exeter, and finally selected Messrs. Willey's meter, with which from that time to this they had been supplied. They had been satisfied with the firm's meters; and he trusted they would be equally satisfied with the new purifiers. The Lord Mayor had referred to the time when there was an opportunity for the Corporation to buy the gas-works. Well, as a ratepayer, he (the speaker) might feel it was a mistake they did not do so; but as a Director of the Gas Company he was glad things had remained as they were. He would be only too glad if at the present moment they could see their way to cheapen the cost of gas in Cardiff. In 1906, the Corporation opposed their Bill; but they were able to arrange terms. The price of gas was then 2s. 9d. per 1000 cubic feet; and the Corporation insisted on a reduction of 1d. then, and a similar concession in 1907. This brought the charge to 2s. 7d. If they were called upon now to make a reduction of 1d. per 1000 feet, it would cost them £4500 per annum. This they could not at present afford; but the employees would not be satisfied until they had got the price down to 2s. 6d., because they themselves would benefit to a certain extent. Under the profit-sharing scheme, they were paying the men 4 per cent. on their earnings, at a price of 2s. 7d. per 1000 cubic feet; but if the price were reduced to 2s. 6d., they would get 5 per cent. Then there was also a "Suggestion" scheme in operation. If any man thought he could suggest an improvement in the manufacture of gas, or in any other direction of interest to the Company, he could write it down and deposit it in a box on the works, which would be opened periodically. If on examination the suggestion was found to be an improvement, the man would get a prize—perhaps a valuable one.

Mr. C. ST. D. SPENCER proposed "The Permanent Staff," coupled with the names of Mr. Clarry and Mr. Madden, of whom he spoke in terms of warm appreciation. For something like thirty years, he said,

Mr. Clarry had worked morning, noon, and night in the interests of the Company. He did not think any company could be better served than they were by these two gentlemen. But he felt they could not do what they did unless those below them were performing equally good work in their various departments.

Mr. GEORGE CLARRY, in responding, remarked on the changes he had witnessed in the Company. A rise from 8000 to something like 33,000 consumers was a big jump; but the progress had been so steady and so sure that there had been no possibility of thought of ever turning back. Their interest was to serve the consumers with a good article as cheaply as possible. They had a very loyal staff; and the co-partnership scheme had welded everybody together to serve the interests of the consumers. The only persons left, as it were, out in the cold were the shareholders. They did not seem to benefit from the little improvements in labour-saving and other things; and this always struck him as being something of an anomaly.

Mr. H. D. MADDEN also replied, and said he had found under the co-partnership system the men had worked even more willingly than before; and this was saying a good deal. It was the earnest ambition of the workmen to give the Board the most loyal support, so that they might if possible reduce the price of gas, and at any rate give Cardiff a thoroughly efficient supply.

This brought the pleasant and successful day's proceedings to a close.

THE DISTRIBUTION OF GAS.

WE have received from Messrs. John Allan and Co., of Bouverie Street, E.C., a copy of the second edition of "The Distribution of Gas," by Mr. Walter Hole (Superintendent of the City of Leeds Gas-Mains and Distribution Department, and Lecturer on Gas Distribution at the University of Leeds), the first edition of which was, on its appearance somewhat over two years ago, reviewed at length in our columns. In a prefatorial note, the author remarks that advantage has been taken of the demand for a second edition to revise, bring up to date, and considerably extend the scope and purpose of the work.

In carrying out the last-named idea, seven new chapters have been added, dealing with the principal aspects of supply and consumption of gas upon the consumer's premises—*i.e.*, meters, internal pipes, fittings, and lighting, and gas fires, cookers, and engines. There are also over a hundred additional illustrations. On the other hand, in order to keep the size of the book within manageable proportions, it has been found necessary to compress certain portions of the matter as first published. Even thus, however, the book extends to nearly 850 pages. The 33 chapters contain about 650 illustrations; and there is a useful index. Heavily gilt, and neatly bound, Mr. Hole's "Distribution of Gas" (the price of which, it may be remarked, is fixed at 15s. net) will be an ornament to any bookshelf; but the weight of the paper used, while excellent from the point of view of the illustrations, makes it perhaps just a trifle heavy for holding in the hand. The contents of the book constitute a valuable contribution to a subject the importance of which is daily becoming more emphasized; and the profuseness of the illustrations is also an excellent feature, which deserves recognition. The author is to be congratulated upon the fact that a second edition of the work has so soon been called for; but this is a matter which need occasion no surprise, when one considers the subject of which it treats, and Mr. Hole's qualifications to deal with this subject.

Winter Meeting of the Association of Water Engineers.

This meeting will be held in the rooms of the Geological Society, Burlington House, on the 10th and 11th prox., under the presidency of Mr. R. Askwith, M.Inst.C.E., Engineer of the Weardale and Consett Water Company. We learn from the programme issued by the Secretary (Mr. Percy Griffith) that the proceedings will be opened at two o'clock on the first-named day, when the paper on "Public Water Supply for Fire Extinguishing," presented by Mr. C. W. S. Oldham, of Ipswich, at the summer meeting, will be discussed. This will be followed by the reading and discussion of papers, of which four have been promised—*viz.*, "Reservoir Outlets," by Mr. G. N. Yourdi; "Evaporation from Water Surfaces," by Mr. S. R. Lowcock; "A Sterile Boring in the Inferior Oolite (Somersetshire)," by Mr. W. Phelps; and "Ferro-Concrete as Applied to Water-Works Construction," by Mr. H. W. Taylor. On the morning of the second day, ballots will be taken for the election of the Council and officers for the year 1910-11, and also for new members, after which the remaining technical business will be disposed of. A discussion will follow on "The Control of the Accounts of Municipal Water Authorities," to be opened by Mr. E. Antony Lees, the Secretary of the Birmingham Corporation Water Department; and the meeting will close at half-past one.

The London and Southern District Junior Gas Association will meet at the Cripplegate Institute on Friday next, when Mr. W. Wright, of the Tottenham and Edmonton Gas Company, will read a paper on "Cleaning Gas-Cookers by a New Process." This will be followed by a series of lantern slides on the gas industry. The Association will visit the Tottenham Gas-Works on Saturday, the 4th prox.

THE DESSAU VERTICAL RETORT INSTALLATION AT SUNDERLAND.



THE DESSAU VERTICAL RETORTS AT SUNDERLAND.

It will be remembered that in the "JOURNAL" for July 6 (p. 25) we were able to give a detailed description of the first installation of Dessau vertical retorts in England, which were then in course of construction at the Ayres Quay (Sunderland) Gas-Works. The first of the three photographs reproduced showed the bench

in its then incomplete state; and it is now possible to supplement that by the accompanying photograph of the finished retorts. The installation, it may be remarked, consists of six beds of ten 4-metre retorts; and arrangements are being made to start work with it next Monday.

German Chemical Industry.—The Engineering Supplement to "The Times" last Wednesday contained a long article on this subject; and the following reference was made to it in one of the editorial notes: "In a vague manner, it has long been the custom to admit that in certain chemical industries, and particularly in those relating to coal-tar products, this country is behind Germany. But when this undefined admission is replaced by exact knowledge of the extent of the German undertakings that have developed from discoveries originating in England, we may well pause in wonder, and inquire further into the cause. A correspondent puts forward figures of a surprising character, which indicate that the annual German exports of aniline and allied substances must be valued at about seven millions sterling, corresponding to the

employment of many thousands of workpeople. To this number must, of course, be added those engaged upon producing the machinery and other equipment necessary for the various processes. His clear and impressive statement of the conditions that have alienated from us much of this business is complete in itself; and it calls for little accentuation, except, perhaps, in so far as concerns the difference between an industry in which the workers are 'engaged the whole year through at full pressure' and an industry in which output is spasmodic. It is the unsteadiness of labour in this country, as much as its average decline, that constitutes the difficulty and the bitterness of the problem of unemployment. . . . Every effort should be directed towards encouraging chemical industries that provide steady work."

COAL STATISTICS FOR 1908.

A Decreased Output.

GREAT interest always attaches to statistics relating to that price-less national asset coal; and so a ready welcome annually awaits Part III. of the Home Office Report on Mines and Quarries, which gives full particulars with regard to the output and value of the minerals raised in the United Kingdom, the amount and value of the metals produced, and the exports and imports of minerals. A fortnight ago, the statistics for 1908 were published. Compared with its immediate predecessors, the year dealt with was not altogether satisfactory so far as coal is concerned; for, in place of the increases to which one has become accustomed, there falls on the present occasion to be recorded a decrease both in quantity and value of the output. It may, however, be remarked that the falling off, though substantial enough when considered by itself, loses much of its seeming importance when taken in conjunction with the heavy increases that have been experienced of late years.

The total quantity of coal raised in 1908 was 261,528,795 tons, of a value at the mines and quarries of £116,598,848—the figures for 1907 being 267,830,962 tons, of a value of £120,527,378; for 1906, 251,067,628 tons, of a value of £91,529,266; and for 1905, 236,128,936 tons, of a value of £82,038,553. Thus there was a decrease last year as compared with 1907 of 6,302,167 tons in the output, and of £3,928,530 in the value. These decreases in output and value are not exactly proportional to each other, it may be pointed out, inasmuch as the average price of coal was 8s. 11d. per ton in 1908, as against 9s. in 1907. The value of the coal at the mines for each of the past five years has been: In 1904, 7s. 2½d. per ton; in 1905, 6s. 11¾d.; in 1906, 7s. 3½d.; in 1907, 9s.; and in 1908, 8s. 11d. Thus, in the period named 1907 was the only year in which the price realized averaged more than in the twelve months now under review; while exactly the same remark applies to the output.

As regards the decrease of 6,302,167 tons in the output last year, the major portion of the falling off was naturally borne by England, whose total output annually is more than twice as much as that of Wales, Scotland, and Ireland combined. The output in England in 1908 was 181,709,283 tons, of a value of £79,160,339; in Wales, 40,558,129 tons, of a value of £22,295,026; of Scotland, 39,158,225 tons, of a value of £15,087,819; and of Ireland, 103,158 tons, of a value of £55,664. Compared with the preceding twelve months, these outputs show, in the case of England a falling off of 5,677,234 tons, in that of Wales a gain of 305,936 tons, for Scotland a decrease of 934,323 tons, and for Ireland an addition of 3454 tons. As usual, the term "coal" in these statistics includes anthracite, the total output of which in 1908 was 4,080,460 tons, of a value of £2,286,630. This item shows an increase in amount but a decrease in value as compared with the previous year, when the output was 3,850,437 tons, and the value £2,308,259. Of the total supply of anthracite, 3,089,576 tons, or 75 per cent., came from Carmarthen and Glamorgan; but the output in Brecon, also, was 590,567 tons. Pembroke supplied a small quantity—50,931 tons; and of the remainder, 268,382 tons are credited to Scotland, and 81,004 tons to Ireland.

As to the prices of coal per ton at the pit's mouth in the different fields, it may be stated that in 1908 these were as follows: In the Scotch coalfields, 7s. 8½d. per ton; the Northern coalfield, 8s. 8½d.; Yorkshire, &c., 8s. 3¾d.; Lancashire and Cheshire, 9s. 0½d.; Midland coalfields, 8s. 2½d.; small detached coalfields, 9s. 5¾d.; North Wales, 8s. 4¾d.; South Wales, 11s. 0¾d.; and the Irish coalfields, 10s. 9½d. The average price per ton at the pit's mouth was for England 8s. 8½d. per ton; for Wales, 10s. 11¾d.; for Scotland, 7s. 8½d.; and for Ireland, 10s. 9½d.; while, as already stated, over the whole of the fields it was 8s. 11d. per ton. The average price in the London market was 17s. 6d. per ton in 1908, as compared with 19s. 9d. per ton in 1907, 15s. 9d. in 1906, 15s. 6d. in 1905, 15s. in 1904, 15s. 10d. in 1903, 18s. 1d. in 1902, 19s. 5d. in 1901, and 22s. 9d. in 1900.

The quantity of coal exported (exclusive of coke and patent fuel, and of coal shipped for use by steamers engaged in foreign trade) was 62,547,175 tons, as compared with 63,600,947 tons in the preceding year, when the amount showed an increase of more than 8 million tons over 1906—the figure for that year being 55,599,771 tons. In 1905, the exports were 47,476,707 tons; and in 1904, 46,255,547 tons. The declared value of last year's exports of coal was £39,546,169, and of those of the preceding year £40,170,296. In addition to this, there was in 1908 the equivalent of 1,988,393 tons of coal exported in the form of 1,193,036 tons of coke, and of 1,296,394 tons in the shape of 1,440,438 tons of patent fuel. If to this be added the 19,474,174 tons of coal shipped for the use of steamers engaged in foreign trade, there is arrived at a total quantity of coal and coal equivalent shipped of 85,306,136 tons. The declared value of the exports of coke was £955,432, and of patent fuel £1,114,322. It may be pointed out that the coal equivalents are ascertained by assuming that for every 60 tons of coke exported, 100 tons of coal were consumed in its manufacture. The patent fuel exported is computed to contain 90 per cent. of coal; the remaining 10 per cent. consisting mainly of pitch. It is interesting to glance at the list of countries to which this enormous quantity of coal was exported last year. Our three largest customers remain the same; and they occupy the same relative positions as for the previous twelve months. France took 10,415,430 tons of coal,

of a value of £6,257,652; Germany, 9,646,868 tons, of a value of £5,234,408; and Italy, 8,742,634 tons, of a value of £5,650,302. These figures are for coal alone; but in the case of France and Italy, they would be increased by over 200,000 tons by the addition of the coke and patent fuel. The coal, as such, exported to these three countries in the three preceding years was as follows: 1907—France, 10,694,136 tons; Germany, 10,107,877 tons; and Italy, 8,317,637 tons. 1906—France, 9,444,528 tons; Italy, 7,810,024 tons; and Germany, 7,629,653 tons. 1905—Germany, 7,626,377 tons; France, 6,731,655 tons; and Italy, 6,412,686 tons.

Thus, though on the present occasion there is some slight decrease in the case of both France and Germany, the large growth which has taken place of recent years must be regarded as having been fairly maintained. Imports of "coal, culm, and cinders" into the United Kingdom—which are never of an extent which renders them worthy of a moment's consideration—are even smaller than usual in the statistics now under review. In 1908, the total quantity imported was 3842 tons, and the value £4689. For 1907, the tonnage was 18,834, and the value £20,845. Germany, with 1856 tons, was last year the largest contributor; while at the other end of the scale came Japan (including Formosa), with 15 tons. After meeting all the requirements from abroad there remained, of the total output of 261,528,795 tons of coal, 176,222,659 tons for home consumption for all purposes; and reckoning the population of the United Kingdom at 44,546,822, this represented a quantity of 3·956 tons per head—an amount which has only been exceeded (and then by very little) on five occasions since 1873, the date to which the statistics go back. In 1907, the amount remaining for home consumption per head of the population was 4·142 tons. There were used in blast-furnaces for the manufacture of pig iron 18,742,464 tons of coal, as against 21,119,547 tons in 1907.

Particulars in regard to the making of coke and briquettes, and the number of coking-ovens in use during the year 1908, show that returns of production of coke were received from 164 colliery owners (comprising 231 separate works), 1452 gas works, and 19 other owners of coke ovens (comprising twenty works). The counties of Durham and York furnished 68 per cent. of the total quantity of coke made in coking-ovens. Of the 251 works, other than gas-works, where coking plant is in use, bye-products were recovered last year at 69; the principal of these bye-products being sulphate of ammonia and tar. Returns as to the manufacture of briquettes were obtained from all firms known to be engaged in the industry; South Wales being by far the largest contributor in this respect. The report states that very fine slack, which would otherwise be of little value commercially, is used in making briquettes. The total quantity of coal used in the manufacture of coke in 1908 is given as 35,233,523 tons; the total amount of coke obtained being 18,537,468 tons (7,323,817 tons from gas-works, and 11,213,651 tons from coke-ovens), of a value of £12,467,287. Of the gas-works output, 6,252,529 tons came from England, 141,522 tons from Wales, 777,841 tons from Scotland, 142,045 tons from Ireland, and 9880 tons from the Isle of Man. Of the 26,214 coke-ovens in use, 19,478 were of the beehive pattern; the second and third in order being: Coppée 2198, and Simon-Carvés 1044. Of Otto Hilgenstocks there were 876, and of Semet-Solvays 760. Of briquettes there were produced 1,604,649 tons, valued at £1,175,652.

There are, of course, many other materials than coal dealt with in the report; and these may in conclusion be shortly touched upon. The output and value of the bog ore taken from open workings in Ireland last year shows a decrease on the preceding twelve months; the figures being: 1908, 4295 tons, of a value at the open works of £1074; and 1907, 6290 tons, value £1573. Going back to 1880, the year of greatest output was 1891—16,075 tons, value £8037. The output of iron ore last year was 15,031,025 tons, of a value of £3,724,165. This was 700,579 tons less than in the preceding twelve months. With regard to natural gas, the statement in the report is on very much the same lines as during the last few years: "Natural inflammable gas was discovered at Heathfield, in Sussex, some years ago, when a hole was being bored with the object of obtaining water. During the year 1904, the amount of natural gas obtained at Heathfield was 774,800 cubic feet, valued at £155; but none has been obtained since for commercial purposes. The railway station at Heathfield, however, is lighted by it; but the quantity is not ascertained." There has been no output of petroleum in the United Kingdom since 1906, when the amount was 10 tons; but, needless to say, the imports remain on the usual enormous scale. Last year, the imports were 343,613,048 gallons, of a value of £6,662,811, compared with 304,134,482 gallons, value £6,067,285, in 1907. The sources of supply were: Russia, 32,945,950 gallons; the United States, 245,739,336 gallons; and other countries, 64,927,762 gallons. The feature of these figures is the same as for the last few years—a falling off in the Russian supply, and a more than counterbalancing increase in the quantity derived from other sources—mainly the United States. In 1904, the imports from Russia amounted to no less than 129,599,066 gallons. The value of last year's imports was: From Russia, £708,682; from the United States, £4,537,110; from other countries, £1,417,019.

The Council of the Royal Society have, with the King's approval, awarded the Hughes Medal to Dr. R. T. Glazebrook, F.R.S., the Director of the National Physical Laboratory, for his researches on electrical standards.

A GLANCE AT THE TECHNICAL DEVELOPMENT OF THE GAS INDUSTRY.

By Dr. W. VON OECHELHAEUSER, the General Manager of the German Continental Gas Company.

On Sept. 29, His Royal Highness, Prince Ludwig of Bavaria, presided at the Annual Meeting of the German Museum at Munich; and Dr. W. von Oechelhaeuser, the distinguished General Manager of the German Continental Gas Company, of Dessau, gave an address, which constituted a review of the technical development of the gas industry. The address has now been published in the "Journal für Gasbeleuchtung."

Dr. von Oechelhaeuser began by saying that the glance which he proposed to take in his address at the evolution of the technical side of the gas industry, could necessarily be only a fleeting one and of very restricted scope. The gas industry in its widest sense comprised not only coal-gas central works, but also the many individual installations in which oil, wood, petroleum, benzoline, acetylene, and mixtures of air and volatile hydrocarbons were the materials applied. Many of these branches of the gas industry really constituted distinct manufactures, such as the production of oil gas, which had been brought to a high state of development by the firm of Pintsch, the acetylene industry, and in former times, the manufacture of wood gas, which was at one time very prevalent in the south of Germany. The carbonization of coal represented a process of far-reaching character for perfecting fuel. On gas-works, the raw material, which could only be burned in the air with much evolution of soot and smoke, was, by dry distillation with the exclusion of air, made to yield products which burned without producing soot and smoke. The most valuable product, however, rendered possible the transport under the soil, in an easy and cheap manner, of energy in the gaseous form by means of a system of pipes extending to hundreds of miles in length. This distribution was effected under the quite small pressure of gas of about $\frac{1}{160}$ th of an atmosphere—say, from 2 to 3 inches of water. The average loss in this transport of gas amounted to about 5 per cent.; and the gasholders formed ideal reservoirs competent to store nearly the whole consumption of a winter day. The gasholders constituted most valuable equalizers for the greatly fluctuating consumption, and thus admitted of the load on the retort-settings in which the gas was manufactured being kept uniform. Such a uniform load was quite as important in the working of furnaces as it was in engineering work where steam-engines, turbines, and motors of all kinds were now used. These great accumulators worked without any loss, as the pressure which was requisite for filling the gasholder was utilized again on its discharge. This unique and extremely valuable characteristic afforded a great advantage to the gas industry from the point of view of a central supply of energy.

The exhibits in the German Museum at Munich were next referred to by the speaker as affording a graphic history of the development of the gas industry in the past and as being very valuable from the historical standpoint. After a reference to the technical literature, in which the progress of the gas industry was chronicled, and to the good work done by the technical associations, such as the German Association of Gas and Water Engineers which has this year celebrated its Jubilee, mention was made of the instructional and experimental gas-works established by the Association at Karlsruhe. Passing on to the evolution of the technique of gas manufacture, the speaker put the development of retort-settings in the foreground. Classifying settings broadly according to the position of the retorts, he referred to the labour which was required for the service of each class. In the early decades of the life of the gas industry, all the settings had horizontal retorts, to which, in the seventies, regenerative firing was first applied.

The ever-increasing wages bill was combated by the introduction of mechanical appliances driven by steam, compressed air, hydraulic power, or electricity, and at the same time the oppressiveness of the manual labour was reduced. Then followed the introduction, through the French gas engineer, M. Coze, of retorts set at an angle of about 30°, which facilitated the automatic charging and discharging of the retorts. A few years ago, the Chief Chemist of the German Continental Gas Company had devised and perfected a system of vertical retorts, which Herr E. Körting, of Berlin, had been instrumental in introducing on a large scale and in many countries. The labour required with these retorts was about one-quarter of that necessary with horizontal retorts, and was of a considerably lighter character, so that the working of gas-works had been brought up to modern demands in the hygienic respect. Simultaneously almost with the introduction of the Dessau vertical retort, there had been devised by Herr Ries, the Manager of the Munich Gas-Works, a form of large chamber-ovens with sloping bottoms, in which coal was carbonized for the production of gas. Models of both these new carbonizing plants would shortly be placed in the German Museum. In England, an attempt had been made with the Woodall-Duckham system to effect the continuous carbonization of coal in retorts; but this fascinating principle had long since shed its charm for German technical men.

In contrast to the diversity of systems of settings and carbonizing processes, the purification of coal gas was effected at all

gas-works on practically the same lines. It was rather in the perfecting of the construction of purifying plant than in fundamental innovations that progress had recently been made.

While Germany stood in the forefront in the technical development of the gas industry, especially in regard to systems of carbonization, it was nevertheless considerably behind England and America in the use of gas for lighting and heating. The magnitude of the operations in America might be indicated, for instance, by the size of the latest gasholder at the Astoria works, at New York, which was nearly three times that of the largest in Berlin. It was difficult to estimate the consumption per head of the population for America; but in England it was absolutely and relatively more than two-and-a-half times as great as in Germany. Yet even in Germany there had been a greater increase in the consumption of gas since the introduction of electric lighting than at any previous time.

This enormous consumption of "our Anglo-Saxon cousins" depended, on the one hand, on the possibility of manufacturing gas cheaply, and, on the other hand, on the more energetic introduction of automatic coin-freed gas-meters. Probably, however, their standard of life, which in all directions, especially with the middle classes, was more pretentious than in Germany, came into account in this matter. In the eighties and the early part of the nineties of the last century, America had taken up the manufacture and distribution of the cheaper water gas in place of coal gas; but in Germany this example had not been followed, because, owing to tariffs and the small native production, the petroleum requisite to raise the water gas to the necessary calorific standard could not be obtained cheaply enough. Special water-gas plant was used in Germany almost solely for the sake of its elasticity of output and the small ground area it demanded, as a supplement to existing coal-gas installations.

Reverting to the use of gas, it might be said that, whether for lighting, heating, or the development of power, it now depended on the most intimate preliminary mixture of the gas with air. Thus the highest attainable temperature was secured from the smallest possible quantity of gas. The great revolution in the development of light from gas was the work of the Vienna scientist Auer von Welsbach. But it should be remembered that the upright and inverted regenerative burners of Frederick Siemens and others constituted a great advance in economy and intensity on the earlier types of gas-burners. When the speaker first saw the incandescent light of Welsbach at the University laboratory at Vienna in 1885, it impressed him as an interesting, rather than a striking, exhibit. This, however, was the first type of the Welsbach light, which afforded a new and unfamiliar lighting effect, without a higher intensity or a greater economy than existing gas-burners. It was in 1891 that the intensity and economy were nearly quadrupled, and the new type of Welsbach light made its triumphant *début* to the world.

Dr. von Oechelhaeuser then proceeded to refer to the composition of the Welsbach mantle and the theories advanced to account for its lighting effect. Next he spoke of the inverted incandescent light, which, he said, required only a fifth the quantity of gas for the production of the same light as was necessary with the Welsbach burner of eighteen years ago. He passed on to refer to high-power and high-pressure gas-lamps, and to their application for public lighting. In concluding his remarks on gas as an illuminating agent, he mentioned that its lighting value now depended on its calorific power, and that the calorimeter which had thus superseded the photometer was, by comparison with the latter, an instrument of precision.

The lecturer did not attempt to deal exhaustively with gas as an agent for heating as distinct from lighting; but mentioning its general employment for heating and cooking, he spoke of the use of coal gas for heating purposes in industrial operations, ranging from the large scale hardening of armour plate, &c., at works such as those of Krupp, to the small-scale tempering of watch springs, &c. The multifarious uses of gas for heating were brought about, he said, through the ease with which the heat attained could be controlled—automatically, if need be—and the freedom of gaseous firing from smoke and soot.

The third principal use of gas—viz., for the development of power, was distinguished by the fact that poor gases, from blast-furnaces, coke-ovens, or special generators, were used instead of coal gas for the larger units. The limit of economical employment of coal gas was reached at 100 to 150 H.P. in one cylinder, and for higher powers the poorer gases were required. Experiments had led the lecturer to the conclusion that the economy of gas-engines—large sizes in particular—would be improved in the same manner as had the efficiency of the incandescent gaslight—viz., by a much more thorough preparatory admixture of the gas and primary air.

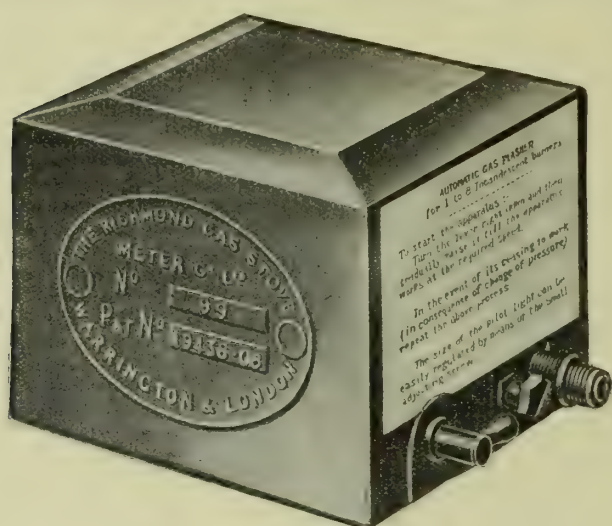
After referring briefly to the history of the origin and development of the gas-engine (his own share in the evolution of the large sizes of which Dr. von Oechelhaeuser omitted to mention), the speaker noticed the recent introduction of rapid-running engines of $\frac{1}{2}$ to 12 H.P. to consume coal gas, the design of which had been largely borrowed from the automobile industry.

The distribution of gas at high pressure to a great distance next came under notice. Then, by way of summarizing the general applicability and economy of gas, it was stated that a cubic metre (35 cubic feet) of it would yield either from 1000 to 2000 candle power, or 2 H.P., or 5200 calories (about 20,800 B.Th.U.) for an hour, according as light, power, or heat was demanded of it. Recently the German Continental Gas Company

had developed a process for the production on a working scale by the carbonization of coal of a gas of about 0.225 specific gravity, eminently suitable for filling balloons. [See "JOURNAL," Vol. CVIII., p. 180.] This latest application of coal gas indicated the peculiar and innate advantages which it possessed in virtue of its physical qualities, apart from its immense value as a fuel. Finally, the gas industry, aided by chemistry, should in the future, as in the past, play an important rôle in transforming and transporting the sources of energy which had been stored up in the bosom of mother earth from long spent ages and suns. Notwithstanding every industrial competitor, the gas industry would continue to move onward.

RICHMOND'S AUTOMATIC GAS-FLASHER.

CONSIDERABLE interest is being taken just now in the question of the use of gas for flash-signs. It is years ago now since attention was first drawn to some (for the period) excellent examples of the products of inventiveness in this direction. But they were somewhat cumbersome, and occasionally showed a little hesitancy in complying with the desideratum of regularity; and so they did not meet at the time with the success that was hoped for. But gas flash-signs have been vastly improved. Their action is easier, more constant, and they are subject to the nicest of regulation as to speed and to attractive variation. There is a field for them; and in their effects they can vie with electricity. Our columns have borne testimony to this; and gas engineers were, at the recent Southern Association meeting, giving their views on the question, and were looking at the field of the gas flash-sign as a promising one, and one that permits of great expansion. In America, the use of flashing advertisements has grown at remarkable pace; and electric signs have taken a hold in this country. But it has to be recognized that gas occupies a larger field in lighting than electricity; and therefore the scope for the introduction of illuminated advertising signs is a more extended one than that possessed by the competitor. The proof that electricity does not hold the monopoly of this business can readily, and in the most practical manner, be afforded nowadays—and the sooner the better in every district. No field for business should be allowed to be occupied unchallenged—more especially when, as in this case, the consumption of gas is not the only benefit for consideration, but such signs are a constant advertisement for gas.



The Richmond Gas-Flashing Apparatus.

The Richmond Gas Stove and Meter Company have, after much thought and experiment, developed a very simple and useful gas-flasher, originally with the view of advertising their "A. B. C." gas-fires, by mutual arrangement with gas authorities, at show-rooms and offices. Though its original designed purpose was limited, it has now been decided to launch out into general business in these signs. The operating apparatus is contained in the box-like structure shown in the illustration; the working medium being the ordinary gas pressure from the distributing mains. As we say, the apparatus (for which a patent has been applied for) is very simple, consisting of a diaphragm similar to that used in a gas-meter, with suitable chambers, passages, and tumbler balance-weight, enclosed in a tin case, with connections screwed for iron barrel. This apparatus flashes the incandescent light "on" and "off" with the greatest of regularity. By the adjustment of a lever, any required number of flashes may be effected, from (say) eight to twenty per minute, depending on the pressure of the gas, and the number of lights used. The apparatus does not rely on a motor or clockwork of any description; so that, when once started, it requires little attention, and can safely be left to work of its own accord. The character of the signs used—projecting or other forms—to which the apparatus can be applied has palpably unlimited range; and the flashers can also be designed to illuminate existing shop facias. Several signs can be made for the same box for changing day by day, or at other periods.

ILLUMINATING ENGINEERING SOCIETY.

THE Inaugural Meeting of the Society was held last Thursday in the famous hall of the Royal Society of Arts, under the first PRESIDENT (Professor Silvanus P. Thompson, D.Sc., F.R.S.). To those attending the meeting, the report of the Council and a list of the office-bearers and members were handed. From the latter, it is seen that gas has not a big numerical representation; the electrical element in the composition far outweighing the representation of coal gas, air gas, acetylene, and oil. The list of office-bearers and members is an imposing one for a new society; but it is remarked that several of the Vice-Presidents and members are drawn from the Continent and America. Of twenty-five Vice-Presidents, only seven are of this country. We see among them the names of Bunte, Crookes, Drehschmidt, Elliott, and Lewes; and several others high in the scientific world. The Council is composed of nineteen members, among them being Mr. W. R. Herring and Mr. F. W. Goodenough. Mr. Leon Gaster is the Hon. Secretary and Mr. J. S. Dow the Secretary. Up to the time of the meeting, 164 members had been enrolled. In the list appears the names of the gentlemen already mentioned, as well as those of Mr. Alfred Colson, Mr. R. A. Dibdin, Mr. N. H. Humphrys, Dr. R. Lessing, Mr. W. Okey (Commercial Gas Company), M. Sainte Claire Deville, Professor H. Strache, Mr. W. W. Topley and Mr. W. H. Topley (Croydon Gas Company), and Mr. L. Trewby (North Middlesex Gas Company).

REPORT OF THE COUNCIL.

When Mr. Leon Gaster rose to read the report of the Council, there was an excellent attendance; the privilege of listening to an address from the eloquent and learned President no doubt being the chief magnetic cause. The report dealt with the aims and objects of the Society—above all others being the provision of an impartial platform for the consideration of illumination questions. There is reference to the international character of the organization, which, it is explained, has been made a feature with the view of securing as wide an outlook as possible on matters of illumination. It is hoped that the existing representation may be made even more complete as the value of the movement comes to be more and more generally appreciated. On the subject of the provision of an impartial platform, it is observed:

Among those interested in the formation of the Society, it has been recognized that, owing to the absence of such a platform, there has been a tendency for misleading or one-sided statements to be circulated, and there are many questions which are allowed to remain in a vague state and on which authoritative information is badly needed. It is therefore desirable to provide a common meeting ground, not only for engineers connected with different systems of lighting, but also for members of the medical, architectural, and other interested professions. Through the free exchange of views thus brought about, it is hoped that not only will those connected at present with some particular aspect of illumination learn from one another, but that eventually a certain number of experts fully qualified to take a wide and impartial view of the whole problem will be evolved. The ideal expert of this kind has been called the illuminating engineer; and there are doubtless many matters of public importance, such as street lighting and the illumination of schools, hospitals, libraries, museums, and other important public buildings in which his services would be invaluable. But for the present the career of the Society will be largely one of mutual education and the spreading of knowledge among the general public.

The ground to be covered by papers is naturally extremely wide; and there are many points of common interest to those connected with all illuminants. The nature of the papers delivered at the past three Conventions of the Illuminating Engineering Society in the United States, and the amicable and stimulating discussions to which they gave rise, suffice to show that there is plenty of matter which can be discussed for the common benefit. But, at the same time, the Illuminating Engineering Society, having expressly framed its constitution with a view to impartiality, can justly claim to be in a position to deal with problems in which the spheres of influence of the different illuminants are concerned in a manner in which no other society can do. Under these conditions the claims put forward by representatives of one or other illuminant will be examined impartially, and the possibility of misunderstandings or one-sided discussions reduced to a minimum.

In reality, the ground which it is desirable to cover in a session is almost too wide to be treated in the course of the meetings available. It is hoped, however, that the Society will be able to cover additional ground in the future by organizing courses of lectures to deal with elementary matters, or with detailed questions which appeal to experts of a certain class, but are not such as would be suitable for prolonged discussion at a general meeting. In the future the Society also hopes to be instrumental in organizing Congresses for the discussion of points of special consequence, and exhibitions of the most recent developments in lighting and photometrical and measuring apparatus.

In addition, it is hoped eventually to be in a position to accumulate information, and to deal with technical points by means of committees of specialists. In such cases, it is suggested, the international connection of the Society will be specially valuable, as it will enable the Society to be in touch with experts in all parts of the world, and, if necessary, to organize series of researches in different countries on a common and predetermined course of action. It is also anticipated that the international connection of the Society will enable it to be specially instrumental in dealing with points of international importance, such as questions connected with units, nomenclature, standardized conditions of testing, &c. At present it is recognized that, owing to the difference in the conditions under which researches in various countries are carried out, often the results obtained are not inter-comparable.

PROFESSOR THOMPSON'S ADDRESS—NEEDS OF ILLUMINATION.

We can do no more than run lightly over the Inaugural Address of the President, as a copy of it was not available—its prior publication *in extenso*, we suppose, being reserved for the official organ of the Society, of which organ Mr. Gaster is Editor. In the prelude of his deliverance, the President remarked that in these days when so many Associations exist for the diffusion of knowledge and looking after the interests of industries and art, the foundation of any new society would be a questionable expediency if it could not justify its claim to existence. To justify its claim, the founders must be prepared to show there has arisen some new industry, science, or art, or that there has arisen some real need which the existing societies fail to meet. Those who have founded this Society have no hesitation whatever in assigning justification for its existence on both the grounds named. The Society has been founded for bringing together all interested in the problems (practical and theoretical) of the art of directing and adapting light—that prime necessity of civilized as well as uncivilized existence—for the use and convenience of man. To utilize light properly, without either waste or excess, is an art or business concerned with many things other than mere production. Few members of the community are producers of light; and those who produce light have many diverse and rival processes. Between the producer and the user, there stand a considerable number of persons who are concerned with the immediate questions of distribution and utilization—men for whom no professional name has hitherto existed. They have had no organization as a body to bring them together, and to consolidate their experiences, views, and opinions. The term “illuminating engineer” is entirely a proper one. To advance the subject of illuminating engineering, to investigate throughout their length and breadth the facts within this domain, and to diffuse knowledge with respect to them, are among the Society's objects. The ascertained facts in this domain are few—all too few. Their significance is immense; their economic and social value is great; but, alas! the ignorance respecting them is as general as colossal. The subject is new—practically and essentially so, though for a hundred years there has been in use systematic distribution of the means of artificial illumination. Before 1800, however, there were no means of systematic illumination. Only in the larger cities and towns had there been any organized attempt to light streets by rows of oil-lamps. In 1819, the Commons refused to light the House by gas. In truth, there has not been much more than half-a-century of real development of organized illumination. All the newest things, both in gas and electric lighting, are affairs of only a year or two. Many people realize the immense stride made by the introduction of the mantle for incandescent gas lighting; fewer people realize the significance of the corresponding step forward which has begun by the metallic filament electric glow lamp. We are on both sides, and on every hand, only at the beginning of the art of illumination.

There has been another, and a very different, development going on—the growth of that branch of optics which deals with the measurement of luminous values. Photometry has been growing into an exact science by the exploration of its laws, and by the improvement of the means of light measurement. The President traced the progress of photometry from 1760. It was in the early eighties that there came photometers for the measurement of the illumination of surfaces. The field of activity is wide enough here. We deal in it with illumination rather than lights—illumination by day as well as by night. We have to reduce the present chaos to an exact science. We have to secure some common means for the measurement of illumination, and the establishment of reasonable rules as to the amount of illumination that is required in different cases. Foremost, in the objects of the Society, stands the question of the units of measurement and the instruments to be used. We have to get international agreement as to the unit of light, and what shall be taken as the requirement for the illumination of a surface. “One candle” is no longer to be a vague thing, dependent upon the humidity of the atmosphere, and liable to change of temperature. The new definition agreed upon professionally is an ideal unit, in terms of which one can describe the several standards that are in use. We shall have henceforth an international candle equal to the *bougie decimale* accepted in France, and related to the Hefner in Germany in relation of 10 to 9. Existing standards will not be interfered with. We may still have our Harcourt 10-candle pentane, or Fleming's 10-candle lamp, or the German Hefner, or the French 10-candle Carcel. It is the unit for which we seek international agreement—the ideal candle.

We have still to find agreement in the standard of illumination. In England, we have grown accustomed to deal with illumination in terms of the candle-foot—meaning the intensity of illumination on a surface situated at a distance of 1 foot from a light of 1 candle. On the Continent, others have attempted to get us to adopt the term “lux.” Adopting the candle-foot, some competent authorities say that, for the purpose of reading, an illumination is required not less than 1 candle-foot; some other authorities say $1\frac{1}{2}$ candle-foot. [The President prefers in using a term of the kind to keep to the singular.] The facts appear to be that reading is impossible with illumination so small as $\frac{1}{10}$ candle-foot; reading is fatiguing at $\frac{1}{2}$ candle-foot. It is, however, comfortable with $1\frac{1}{2}$ or 2, 3, or 4 candle-foot. If it exceeds 8 candle-foot, the glare is too great. The necessity of the degree of illumination depends upon a number of factors, size of type, or nature of work, and something also depends upon the sight of the eye.

Very seldom does one find in any ordinary room an artificial illumination exceeding 3 candle-foot. By day, on a writing-table placed near a north window, or, in fact, near any window receiving direct illumination, there will be from 3 to 4 candle-foot. What is the meaning of the term “well lit” as applied to any factory, workshop, or school room? “Well lit” was at one time vague; now we have exact terms for expressing it. For a writing-table one must have at least $1\frac{1}{2}$ candle-foot. In school-rooms where, on the desks, the illumination is less than 1 candle-foot, it is suspect. This comes from being in a position to apply numerical terms to illumination by the aid of scientifically devised apparatus. The naked eye is notoriously a bad judge. The powers of its discrimination are very limited. The eye can equate; but it cannot appraise.

It is convenient here to mention that there are three distinct things a photometer may be employed to measure. First, the intrinsic brightness or the effulgence of a source of light, the amount of which is expressed by saying it has a power equal to so many candles. Secondly, photometry is wanted for illumination at the surface, to be expressed in terms of candle-foot, candle-metre, or lux. Illumination is independent of the nature or colour of the substance on which the illumination falls; just as rain is on ground. We need photometers to measure not how much light looks on a surface, but how much light falls upon it. Thirdly, photometry is wanted to measure the luminosity or the specific brightness of a surface. The amount of light given off from an illuminated surface, per square inch, varies enormously. It will depend upon the quantity of light thrown by the source, and upon the surface itself. The photometry of the specific brightness of an illuminated surface has been very little studied. It is, however, of great importance; and we ought to be able to give accurate figures. We should be able to say just how much a certain wall paper or a certain coloured paint will throw back the light that it receives. The President referred to the various illumination photometers—the Preece-Trotter, Edgcumbe, Haydn-Harrison, and others, and to his own work.

Referring further to the openings there are for useful activity by the Society, the President suggests the appointment of Technical Committees, charged with the duty of preparing reports on different branches of the subject of illumination, the collection of scattered information, scientific research, &c. The specific brightness of surfaces, refraction, and reflection are subjects of vital interest to illuminating engineers, and are awaiting inquiry. Physiological problems also demand investigation. How the unshaded arc lamp cuts the eye by the very concentrated action of its rays, and how great can be the specific illumination of a surface without the eye enduring irritation, are also queries of importance. There is much work at hand. There are even more important questions before us—more important in the sense of their relation to the body politic and to the public welfare. With a standard of illumination, and simple portable photometers with which to measure the illumination, there can be no excuse for ignorance in respect of the lighting of any place. School-houses are the most important of all places. The bad results which come from the imperfect illumination of schools are greatly to be deplored, because they imperil the eyesight of the nation. The light a desk receives should not be less than 1 candle-foot. The fact that we can measure the illumination, and need no longer guess what it is, should be made widely known. Surely all these things can be reduced to scientific terms. Progressive myopia is the result of bad lighting. We have to stop that by having places well lighted, with the walls and the ceilings properly surfaced. What is the use of covering walls and ceilings with that which will not reflect light? Shade itself may also be a right thing in a room. A desk well lighted, with shade in other parts of the room, is liked by the President; the latter being very restful for the eyes. Glare and its avoidance in illumination is to be the first subject to be taken in the business of the session. The Home Office, the President says, ought also to thoroughly look into this subject of illumination, and place the illumination of factories and workshops on a proper scientific basis. At present, all they ordain is that such a building must be “adequately lighted.” There are various views as to what constitutes adequate illumination; and the employer should be given proper regulations, and made to give proper illumination. In Holland, an adequate lighting standard for ordinary factories is prescribed at from 10 to 15 candle-metres. Divide the 15 by 11 and one gets rather more than 1 candle-foot as the amount of prescribed illumination. Another thing the Society can do is to assist architects and surveyors to do their work. The President criticized the architects' inaction in regard to illumination, and stated a case where an architect had not prepared any specification as to the lighting of a building, or even stated where the lighting was to be, but left the whole thing to the builder. Architects and builders, however, are not to be blamed, because there has been nothing definite hitherto to guide them. Mr. Voysey, the Electrical Engineer for the Corporation of the City of London, had scientifically gone into the question of street lighting, and had stated how much light is required on the surface of the street. Henceforth lamps must not be placed in any haphazard fashion; but the lighting contractor must be told what is to be done. A Committee of the Society might, the President thinks, be appointed to draw up specifications for different classes of lighting.

The President sees a great work in front of the Society. There is a definite mission before it; and no other Society is doing the same kind of work. Therefore the Society may claim to be one

the gas-engine as it exists to-day. We find a solid piston with its water-cooling arrangements, its piston-rings, its piston-rod and somewhat expensive type of gland packing, and the usual connecting-rod, cross-head and guides, and then the crank-shaft and fly-wheel with the massive bearings, lubricating devices, and strong framework. If we take the Otto engine as the simplest type of engine, and which often dispenses with the piston-rod, we yet have the two-to-one gearing with the side-shaft carrying the cams to operate the necessary levers and valves. How much of all this is really necessary? In answering this question, a list of the actual essentials which a gas-engine must possess may be made out as follows: A working cylinder, an inlet-valve for the combustible mixture, an exhaust-valve for the burnt products, a fly-wheel, and an ignition device.

Obviously, the numerous things which belong to a gas-engine outside of these essentials would readily be dispensed with if it were possible to do without them; and we should then arrive at a gas-engine in which the energy was delivered direct to the fly-wheel without any intermediate gearing. To retain this degree of simplicity, the fly-wheel would also have to fulfil the functions of a piston which draws in a fresh combustible charge and compresses it in the cylinder. If we imagine everything discarded which first principles do not demand as necessary, our ideal engine will have the following properties and parts: (1) It must be capable of giving four unequal strokes. (2) It must utilize the whole possible range of expansion down to atmospheric pressure. (3) The energy must be delivered direct to the fly-wheel without any intermediate parts. (4) There must be internal cooling arrangements, so that the cylinders may be made of any size within the limits of structural possibility. (5) There must be an ignition device, but, as there is no two-to-one shaft to operate it, it must be entirely automatic, and depend only upon the compression pressure having reached a maximum. (6) Difficulties connected with contraction and expansion must be eliminated.

Having evolved our conditions for an ideal engine from first principles only, the question is: How far can a practical machine be made to meet these conditions? So far as a prime mover on these lines is concerned, the author believes that a practical solution can be found; but the following considerations tempt him to depart from a direct solution. Granted that water is needed for internal cooling, then surely it is better to use a water-piston. If this piston is made heavy enough, it may well serve as a fly-wheel; but it will be a reciprocating instead of a rotary fly-wheel. Here, then, the temptation to extreme simplicity comes in. Let us for the moment abandon the idea of a prime mover with a rotating shaft, and allow our water fly-wheel to so reciprocate that at each working stroke it leaves a quantity of water at a higher level or pressure. This only requires the fitting of a single water-valve; but our final apparatus becomes a pump instead of an engine, and our gas power appears as water power.

The arguments and conclusions having been stated, we are in a position to proceed with a description of the apparatus employed by the author in carrying out the principles involved. The simplest form consists essentially of a combustion chamber, fitted with an inlet-valve for the combustible mixture, and an exhaust-valve for the burnt products. A pipe connects the bottom of the combustion chamber to a low-level and a high-level tank, and between this pipe and the former there is a water-valve. The inlet-valve is normally kept shut by means of a spring; but the exhaust-valve has no spring to hold it up, and falls by its own weight when a pawl is removed from under a collar fastened on the exhaust-valve stem. This pawl is operated from the water-valve in a simple manner, so that when the water-valve opens it releases the exhaust-valve. Supposing all the valves are shut and a compressed combustible charge exists in the top of the combustion-chamber, the rest of the chamber and the pipe are full of water. Explosion occurs at a sparking plug, and the increase of pressure drives the water downwards in the chamber, and forces the column of water contained in the pipe to move towards the high-level tank, so that a quantity of water is discharged into it. From the moment when ignition occurs to the time when expansion reaches a pressure equivalent to the static head of the water in the high-level tank, the excess pressure in the combustion chamber has been increasing the velocity of flow towards the high-level tank, so that at the end of this period the column of water has considerable velocity. The kinetic energy thus acquired causes the water to continue to flow in the same direction, until the pressure on the under side of the water-valve is less than that above it, and the difference of pressure causes this valve to open. This occurs when the products of combustion have expanded to about atmospheric pressure. The opening of the water-valve releases the exhaust-valve, and now water from the low-level tank flows past the water-valve partly to follow the column of water still moving towards the high-level tank and partly to flow into the combustion chamber to expel some of the exhaust gases. There is, of course, a tendency for the water to rise in the chamber to the same level as the water in the low-level tank; but usually a little before this level is quite reached the kinetic energy of the moving column has been expended in forcing more water into the high-level tank, and the column has therefore come to rest.

At this point of the cycle the spring on the water-valve quietly closes this valve, and is assisted by the water now trying to flow back from the high level tank to the chamber. It cannot flow back far, because there is already a considerable quantity of water in the chamber; and as the column rises farther, it reaches the exhaust-valve, and, striking against it, shuts it by impact. The

exhaust-valve is immediately locked shut, by the pawl engaging under the collar of the valve-stem; and now that there is no longer any outlet for the small quantity of burnt products which remain, they are imprisoned in the top of the chamber, and suffer compression as the water continues to rise, until the energy thus stored in the compressed elastic cushion is equivalent to the energy given out by the falling water. Thus the elastic cushion serves to bring the column of water again to rest; and as the compression pressure considerably exceeds the static head of the water column, a reverse flow is set up while this cushion expands again. If there were no friction losses, the water column would be forced back by the cushion to the same point as that from which it started—viz., to a level in the combustion chamber a little below the level of the water in the low-level tank—but it actually does not move quite so far. However, when the water passes the level of the exhaust-valve, the elastic cushion is again at atmospheric pressure, and the further descent of the water in the combustion chamber tends to create a vacuum. But the inlet-valve is only held shut by a light spring, and can therefore readily open to admit a fresh combustible charge during the rest of the descent, and until the water column is once again at rest. The state of affairs now reached is, of course, still unstable, because of the unbalance pressure due to the head in the high-level tank; and this head produces a second return of the column, so that water ascends in the combustion chamber, and compresses the fresh combustible charge. The explosion of the charge by means of the ignition-plug now starts a fresh cycle. The whole operation is so simple that when an actual apparatus on these lines was first tried it ran steadily at the very first attempt.

Height of Lift.—The quantity of water delivered considerably exceeds what might be described as the stroke of the pump or the change in volume of the gases from the time they are ignited until they expand to atmosphere. This is due to the water entrained from the low-level tank to follow the moving column of liquid going to the high-level tank. Consequently, if an indicator diagram could be obtained, and the mean pressure of the stroke calculated, such pressure must be in excess of the equivalent pressure due to the head against which the water is raised. The burnt gases always expand down to atmosphere; therefore their mean pressure is less than that obtained in an Otto cycle gas-engine, since the stroke is so much greater. As a result, the head against which the water is lifted is limited to some 35 to 40 feet in most cases. This limitation is, however, entirely overcome by one of several arrangements which enable water to be raised to practically any pressure required.

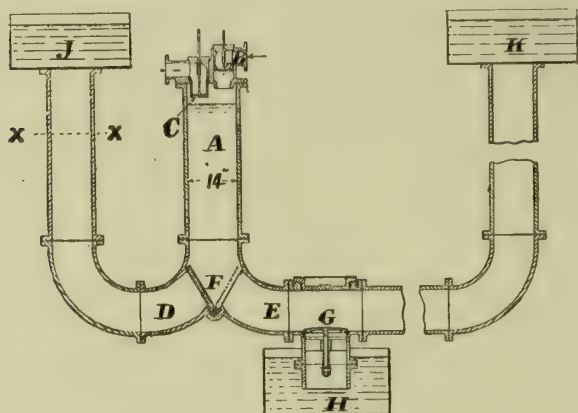
Length of Pipe.—The length of pipe between the combustion chamber and the high-level tank must be sufficient to contain such a mass of water that its kinetic energy at the maximum velocity shall ensure the burnt gases being expanded to atmosphere. This is the limiting condition; but the pump will work with any greater mass of water. If we fix, as an example, 10 or 12 feet per second as the maximum velocity, then the smallest quantity of reciprocating water can be calculated for a given set of conditions. Theoretically, a comparatively short pipe of large diameter is better than a long pipe of smaller diameter; for not only can larger quantities of water be pumped without exceeding the maximum velocity of flow, but the time of a cycle is less with the short pipe.

Supply-Tank.—Since the volume of combustible mixture drawn into the combustion chamber is partly dependent upon the level of water in the supply-tank, any alteration in this level affects the working of the pump, and affords one simple method of regulating the amount of energy developed at each cycle. Thus, by raising the level of the water, smaller charges are drawn in; and, conversely, by lowering the level, larger charges result.

Compression Pressure.—The fact that the column of liquid which returns to compress the fresh combustible charge in the pump attains velocity in so doing, and then has its kinetic energy transformed into pressure energy, is most useful; for it enables compression pressures to be used greatly exceeding the static pressures due to the head of water which causes the return flow. As the compression pressure is raised, the average pressure throughout the stroke is also raised, which means that the pump can deliver water against a greater head. But the greater head causes a greater compression pressure; and hence the pump is largely self-regulating. Thus, if called upon to pump against a greater head, the compression pressure automatically rises, and brings about conditions favourable for the increased work.

Starting, Stopping, and Controlling.—In first starting the pump, all that is necessary is to allow a charge of compressed air to flow into the combustion chamber, and so depress the water-level a little below the usual charge volume. If the exhaust-valve is now forcibly opened, the water will rise in the chamber, close the exhaust-valve, and give the cushion and charging strokes. The charge drawn in is then fired, and the pump starts working. If the pump is at work and it is desired to stop, it is only necessary to switch-off the current which operates the sparking coil. The pump then stops with a charge of unexploded mixture in it, and can at any time be started again by merely switching-on the current. Such simple and instantaneous means of starting and stopping enable the pump to be controlled from a distance. It can be operated from a switchboard at any convenient place. The general methods of controlling a gas-engine are applicable to the pump. The author has invented an ignition apparatus in which ignition is determined by the compression pressure reaching the maximum incidental to each particular charge.

Two-Cycle Pumps.—The pump so far described is what may be called a four-cycle pump, because there are two outward and two inward movements of the column of liquid in each complete cycle. It would clearly be advantageous to suppress the cushion stroke and the suction stroke, and so produce a two-cycle pump. We are familiar with two-cycle gas-engines in which outside pumps are used to draw in the gas and air and to force them into the working cylinder; but the production of a two-cycle pump is arrived at without any such complication. Up to the present, four types of two-cycle pumps have been constructed, and of these the simplest to explain is that shown in the diagram. A is the combustion chamber, fitted at the top with an inlet-valve B for the combustible mixture and an exhaust-valve C for the burnt



products. The bottom of the chamber is attached to a pipe having two branches D and E, and a single valve F which can close communication with either of the branches. One branch leads to a supply-tank J containing water at the level shown, the other leads to the delivery-pipe and the high-level tank K, and is fitted with a water-valve G, which in this case is shown as closing a suction-pipe dipping into a low-level tank H. When the valve F is in the position shown by full lines and the compressed combustible charge exists in the top of the chamber A, explosion takes place, and water is driven along the delivery-pipe towards the high-level tank; the gases meanwhile expanding and imparting velocity to the column of water. When expansion has been carried to atmospheric pressure, the exhaust-valve opens; and by this time the pressure on the left-hand side of the valve F will exceed the pressure on the right-hand side, and the valve swings across so as to open communication between the combustion chamber and the tank J and to close communication with the delivery-pipe. The moving column of water now has to entrain more water by sucking it up from the tank H past the valve G to follow the moving column. In the meantime, the water-level in the combustion chamber being considerably below that in the tank J, water will rise up in the combustion chamber, close the exhaust-valve by impact, and cushion the burnt products imprisoned in the top of the chamber above this valve, until their pressure exceeds that due to the static head of the liquid in the tank. A reverse flow now occurs as the compressed cushion expands again, and a charge of combustible mixture is drawn into the combustion chamber. If there is still time for the action to take place, there will be a slight compression of the fresh charge by water again flowing from the tank J into the chamber; but the main compression of the charge occurs when the column of water in the delivery-pipe, having come to rest, returns, again closing the valve G, and forcing the valve F from its dotted position back to the full-line position—thus giving free communication between the delivery-pipe and the combustion chamber, and closing communication with the tank J. When the water column has been brought to rest by expending its energy in compressing the charge, a spark at the ignition-plug ignites the charge, and a fresh cycle is started. It is not necessary that the level of the water in the tank J should be above the exhaust-valve, because if it is at a level XX the oscillation which takes place from the tank to the chamber may still carry it far enough up the combustion chamber to close the exhaust-valve. The return flow, which draws in the new charge, will then be due to gravity, as the liquid in the chamber tends to regain the level of the water in the tank J.

Passing over a large number of modifications of the types of pumps so far dealt with, the author came to a pump having two chambers, in which the explosions take place alternately. A diagram of this arrangement was shown; one of its chief differences from the other pumps being found in the fact that the introduction of the combustible charge does not depend either on cushioning or on an oscillation of the kind described.

Pumps for High Lift.—When it is desired to lift water to a height exceeding the head equivalent to the mean pressure of the indicator diagram, an attachment is added at the end of the discharge-pipe. This addition may consist of a small air-vessel, placed at the end of the discharge-pipe close to the large air-vessel into which the high-pressure water is to be delivered. The inlet into the large air-vessel is fitted with a non-return valve, and the action, when working in conjunction with a two-cycle pump, is as follows: When the explosion occurs in the pump-chamber, the water is forced along the discharge-pipe and rises in the small air-vessel, gaining velocity and compressing the air therein until

the rise in pressure is sufficient to open the valve. The energy of the water column is then spent in delivering water into the larger vessel, and any backflow from it is prevented by the valve closing. There is now sufficient energy stored in the compressed air in the small chamber to produce the return flow of the column towards the pump required to compress the next combustible charge; and then the whole operation is repeated.

Pumps as Air-Compressors.—The great flexibility of the author's system is shown by the readiness with which it can be adapted to the case of compressing air. The column of liquid which reciprocates backwards and forwards from and to the pump can be made to enter an air-compressor chamber fitted with suitable valves attached to the end of what has so far been called the discharge-pipe. The energy of the moving column of water is utilized to compress air, and also to store sufficient energy in an elastic cushion to produce a return flow towards the pump so as to give the compression stroke. This movement of the column also serves to draw a fresh quantity of air into the compressor.

Efficiency Tests.—The first experiments were carried out at Brimsdown; but in the early part of 1908 a testing-station, specially designed to facilitate the testing of the pumps, was erected on ground belonging to the South Staffordshire Mond Gas Company at Dudley Port. Many tests of efficiency have been made with the plant described; and an official test of a four-cycle Humphrey pump was carried out by Dr. W. Cawthorne Unwin, F.R.S., and his assistant at Dudley Port on the 21st and 22nd of September this year (see *ante*, p. 254). As to thermal efficiency, it has already been mentioned that theoretically the pump cycle is superior to that of the Otto gas-engine or of any other gas-engine in which the volume of the expanded products is the same as the original charge volume. Although the pump-cycle curve is always above the Otto-cycle curve, the efficiencies of the pump are greatly in excess of those of the Otto engine at low compression pressures. This is much to the advantage of the pump, because it enables a good commercial efficiency to be obtained with relatively low working pressures.

Application of the System for Power Purposes.—The curves just mentioned are specially interesting, because they lead one to recognize the possibility that, as the author's system comes to be developed in the future, internal-combustion pumps may be substituted for gas-engines in central electric power stations. If the water pumped is passed through an ordinary water-turbine driving an electric generator, and the water is then returned to the pump to be used over and over again, we arrive at a gas-power electric system with the water forming a hydraulic coupling. Even now the combination of the author's pumps with water-turbines gives far greater economy than that reached by any internal-combustion turbine so far constructed. It is, of course, dangerous to prophesy, but there is no harm in looking so far ahead into future possibilities in order to see what a central station on the new lines might be like. The advantages of an arrangement suitable for this purpose are fairly obvious, and arise chiefly from the simplicity of the working parts, the absence of noise and shock, and the exceedingly low cost of upkeep. In gas-engine stations using cheap producer-gas or blast-furnace gas, the cost of lubricants and stores frequently exceeds that of fuel; but in the present instance there is practically no lubrication required, and the author has worked one of his pumps for a week at a time with absolutely no lubrication whatever. Based on the efficiencies so far obtained, a Board of Trade unit can be generated for 2 lbs. of anthracite coal; and with the large units of plant required in central stations, this figure should be much reduced. If the internal-combustion pump proves in the future to be a successful competitor of the gas-engine for power purposes, it is probable that one of the most useful fields for its employment will be found in the propulsion of ships.

[In an appendix to his paper, the author gave a summary of Dr. Unwin's report to which he had referred.]

Discussion.

The PRESIDENT, in opening the discussion, said the members had been shown that once again some of the functions of the steam-engine were going to be absorbed by the gas plant; and if, as they hoped, the author's prophecy came true, it looked as if, while they had been accustomed to get a silent drive by means of the excellent workmanship (he would say) of the Renold chain, the author was going to give them a fluid drive which would enable them to pass on the liquid chain in a ceaseless flow, and in this way give a perfect mechanical drive.

Mr. HENRY DAVEY (London) said the author commenced his paper by endeavouring to establish a comparison between the economy of steam-worked pumps and gas-worked pumps as they exist. Mr. Humphrey stated that the South Staffordshire Mines Drainage Commissioners had replaced steam-engines by gas-engines in five pumping-stations, with beneficial results. This was scarcely correct. The facts were the Commissioners had recently erected three new pumping-stations provided with steam plant; and they had also erected five gas-engine plants for temporary purposes, where it was not desirable to put up permanent plants. He had last year's report of the Commissioners, in which it gave in detail the cost of working all the plants—steam and gas, both new and old; the net result being that the average annual cost of raising a given quantity of water at a given height was twice as much with gas plants as it was with steam plants. The report also showed that one of the steam plants which had

been at work night and day for the last 25 years was twice as economical as the best gas plant. The gas plants were small as compared with the steam plants; and, as they knew, a small gas-engine was nearly as economical as a large one. The author also stated that compound condensing direct-driven steam-pumps of modern construction and large size were among the most economical of all steam-using plants; and, under favourable conditions, they would give a pump-horse-power-hour for an expenditure of about 18 lbs. of steam. As a matter of fact, such plants as these described gave a pump-horse-power-hour on an expenditure not exceeding 12 lbs. of steam; and there were recent examples much lower even than that. But taking 12 lbs. as quite common now, the 18 lbs. of steam was a disreputable example. While on this question of economy, he should like to make one or two observations on the results obtained in working Mr. Humphrey's pump. From a thermal point of view, 13,000 B.Th.U. per pump-horse-power-hour was not much better than the best results got with the best water-works engine. But they did not put B.Th.U. into their banking accounts, but bawbees. As to the money point of view, and taking Mond gas at 2d. per 1000 cubic feet (which was the price paid for working the gas-pumps already alluded to), the 0.85 cubic foot per pump-horse-power-hour taken by the author's pump would cost 0.17d. With cheap slack, which would evaporate 5 lbs. of water per pound, and not cost more than 4s. 6d. per ton, a steam-pump, using 20 lbs. of steam per pump-horse-power-hour, would cost for fuel, not 0.17d., but 0.06d. In water-works generally, coal cost 16s. per ton. To evaporate 8 lbs. of water per pound of coal, and taking 12 lbs. of steam per pump-horse-power-hour, the cost worked out at 0.13d. per pump-horse-power-hour. The result obtained by the author from the thermal efficiency point of view was a remarkable one; and it promised very much for the success of the pump. It was quite a refreshing thing to meet with an inventor who recognized the advantage of direct application, and did not waste any of his power in transformations. With regard to making use of the water-pump to secure the functions of a fly-wheel, that in itself was old; it existed in the water-ram of more than a century ago, and in many direct-acting pumping-engines. The author, however, had made quite a new departure in the application of the principle. It was difficult to see the possible extent of the application, because they had not yet the experience of pumps applied to doing actual work under ordinary conditions. At first sight, the pump appeared very bulky for its power; and one would have liked to have seen examples of pumps designed to meet the ordinary conditions of everyday work. No relative particulars were given of power, size, or cost; so that it was difficult to discuss the pump from the practical point of view. What he meant by the pump being very bulky was that the pipes must be regarded as part of it. He also commented upon the weight of metal it would be necessary to have in the pipes.

Dr. UNWIN (London) thought it was rather unusual for the Institution to receive a paper dealing with engineering practice in the pumping of water which contained an absolutely novel method of dealing with the problem, carried out past its experimental stage to a point at which the pump could be applied to order for any required conditions. He had had some knowledge of what Mr. Humphrey was doing for about a couple of years past. He saw a pump exactly like the one he finally tested, but of somewhat smaller size, working a year ago perfectly satisfactorily, and of nearly the same efficiency as the pump he had tested. So far as his experience went, he could speak only of this particular form of pump. Mr. Humphrey had shown an extraordinary fertility of resource in designing numerous other forms, some of which the inventor had experimented with considerably. He (Dr. Unwin) should like to say that the action of the pump, though he was a pretty old engineer, came upon him as a real surprise. Once started, it not only worked without the slightest hitch whatever, but it had a curious flexibility which enabled one to play tricks with it—for instance, to alter the lift, and to alter other conditions of working—and the pump seemed to take no notice of it at all. He (Dr. Unwin) worked through a whole series of trials throughout a whole day, with varying lifts, without the slightest alteration of anything about the pump. All they did was to put more pressure against the pump. But it worked without any hitch whatever, without missing a single ignition, or anything happening that was wrong. The results, so far as efficiency went, were, he thought, rather extraordinary. As to Mr. Davey's remark that a steam-engine requiring 18 lbs. of steam per pump-horse-power-hour was disreputable, he thought that gentleman had overlooked just one point. He (Dr. Unwin) was perfectly well aware that there were triple steam pumping-engines working with 12 lbs. of steam; but he thought it would be found that they were working on fairly high lifts. It so happened that the losses of working of a reciprocating pump were nearly the same whether the lift was great or small; and therefore the efficiency of a pump working on a low lift was very much less than one working on a high lift. He would challenge Mr. Davey to produce a pumping-engine working on a 40-foot lift, and working on much less than 18 lbs. of steam per pump-horse-power-hour. The pump he tested was working under conditions of ordinary practice; and repeated experiments led to the same results. As Mr. Humphrey had indicated, if they could do pumping as cheaply as this pump seemed able to do, it had many applications. If there was any fault at all with it, it was that it was a somewhat cumbersome pump for the amount of power developed. This would limit its use in certain cases; but there were a large number of cases where the cum-

brousness of the pump was of no importance. It consisted almost entirely of pipe work; and this was cheap work. The use of the pump for compressing air seemed to him to be an important one, because it would be competing with machinery which was only of very moderate efficiency.

Mr. W. B. BRYAN (Metropolitan Water Board) remarked that, looking at the invention from his point of view as a Water Engineer, it seemed to him that for low lifts, it had a magnificent field before it, though it might be a little bulky. There was one point in connection with the pump upon which he should like information. It was, Would the products of combustion of the gas cause any tarry or oily appearance on the surface of the water? This was important in his view, although for the filling of large reservoirs from a river (with a lift of, say, 20 to 30 feet), the water being subsequently filtered, perhaps a minute amount of oil or tar on the surface would not matter much. As to the efficiencies spoken of in regard to steam pumping, he could not agree with Mr. Davey that 18 lbs. of steam per pump-horse-power-hour was disreputable. Those of them who had to pump hundreds of millions of gallons of water per day, week in and week out, knew that, if they got only 18 lbs. of steam used per pump-horse-power-hour, it was not at all bad. They had engines doing on trial 12 to 13 lbs. But taking the year through, there were a great many losses, cleaning-out of boilers, &c.; and they had to take into account also that every pound of coal that went into the stoke-hole worked up against the year's financial account. He did not know just what losses there would be in Mr. Humphrey's pump in twelve months' working; but he thought it was quite a novel departure from all ordinary pumping installations. He hoped they would, in a very short time, have some trials on a large scale. Then Mr. Humphrey would be able to come before the members twelve months hence, and tell them the results that had been obtained in actual working over a long period.

Professor C. VERNON BOYS (London) remarked that the paper by Mr. Humphrey had appealed to him from the scientific point of view very strongly indeed. He had been struck by the one distinguishing feature of this pump above all other pumps—that was, the getting rid of the non-return valve. The thing was so revolutionary and surprising that one could not help being struck by the fact, and admiring the result. The expansion to atmospheric pressure was scientifically of the utmost importance, and was responsible for a considerable proportion of the efficiency obtained. Perhaps, however, the most surprising part of this pump or engine, as compared with any other machine yet made was this—that, when all was cold, and all was absolutely at rest, just one touch of the "button" instantaneously started the machine, and set it going full speed. No other engine was in any respect like this. Another thing that had struck him was that the valve gear was equally applicable whether the engine was working two-cycle or four-cycle. But he was not quite certain whether it was fair to say that, because, when he read the paper, he found, on looking at it very closely, though the pump was working two-cycle the valve gear was working four-cycle; so that the valve gear did not know what the pump was doing. [Laughter.] This pump was one of those things that, if he had had the good fortune to think of it, he should have had some hesitancy in trying, because he should have had doubt that the thing would work in the beautiful way it had done. In actual work, they should look upon it as a combination of a "Pulsometer" steam-pump on the one hand and a water-ram on the other. The material that Mr. Humphrey had to deal with was a mixture of permanent gas and steam; and when they met in the hot state, the steam which was immediately adjacent to the water was no doubt at once condensed, so that the steam did not have to do the work that the pulsometer was doing. This machine, unlike many other machines, appeared to have this extraordinary merit: It had so far been made of what they might call moderate low power; and it would seem that, in going from a small machine to a big one, the difficulties, instead of being larger, would be less. If a 10 or 15 horse-power engine went as described, how much better would a 1600-horse power engine be? He could not help thinking this would be the case, because, when a machine was made large, the losses were less in proportion. There were no difficulties of conduction of heat through the walls of a cylinder, and there was no chance of the bursting of any cast-iron part, because that which contained the working mixture could be made out of boiler plates, riveted together—a kind of thing which did not burst. [Laughter.] He also asked, supposing a pump of this sort was set to work to pump water in which was mixed fine igneous sand, whether the many water inlet-valves were of such a kind as would be likely to last; and, if they were not, whether they would be easily replaced without doing much mischief? Also whether the exhaust-valve, on being smacked on the face with the dirty water, would get enough sand upon its seating to coat it, and make it leak? If this was the case, would it not be possible, on the water rising and shutting the valve by impact, for the water to act on some intermediary, so as to save the valve from direct contact with the water?

Professor THRELFALL said he should like to see the pump turn out the gas-engine at once, with its heavy charges for oil and maintenance. Mr. Humphrey said he could do a kilowatt-hour upon a consumption of 2 lbs. of anthracite. Comparing this with a good gas-engine, it was an enormous consumption of fuel; but if the author was going to do away with oil and repairs, he could start "right now" and make a very successful gas-engine business. It was true the engine would be very large; but he did not think that would be of the slightest importance. The only thing was

that one liked a small engine on account of the small house. He thought there would be danger, if the gas was not purified from sulphur, of sooner or later the water becoming saturated with sulphurous acid. The thing that appealed to him, and did so very strongly, was the extraordinary simplicity of the invention. Further discussion was adjourned.

AMERICAN APPRECIATION OF THE SLIDING-SCALE

At the recent Annual Meeting of the American Gas Institute, a paper on "The Sliding-Scale Regulation of Prices and Rates of Dividend for Gas Companies," prepared by Mr. ALFRED E. FORSTALL, of New York, was read, in the author's absence, by Mr. WALTON FORSTALL. The following are the principal portions of the paper.

The early recognition of the fact that all men, and not especially those from Missouri, have to be "shown"—that is, must learn from actual experience rather than from the example of others—is indicated by various ancient proverbs. Such a necessity seemed reasonable when only inadequate means existed of ascertaining the exact facts as to the experience of others and the results of this experience; but it seems very unreasonable whenever, as is now usually the case, it is possible to obtain complete information in regard to the history of the development of an industry in the country in which it originated, and the method of conducting it which this development has proved to be the best of those at present known. Nothing, however, shows greater inability to profit by the experience of others, and so save the disastrous results of repeating experiments which have failed, than does the development in the United States of the control of the prices charged and the rates of dividend paid by gas companies.

In spite of the facts that the business had already had in Great Britain a history covering about fifty years when it began to become of importance in America, and that the teachings of this history were recognized and proclaimed by the leaders on the technical side of the industry many years ago, the gas industry was allowed, or rather forced, to parallel the experience in Great Britain. This had shown that unlimited competition between gas companies was detrimental not only to the companies but also to the communities served by them; but nevertheless such competition was advocated and put into effect in America as if it were perfectly untried. Only after the goal of low prices for gas had been placed at a much greater distance, and rendered much more difficult of attainment, by the excess of investment necessarily involved in competition between gas companies, was the next stage reached. This stage was practically that of maximum price and maximum dividend which had already been tried in Great Britain, and largely discarded in favour of something better. Again was this experience ignored; and for the last twenty years the method of regulation followed in the United States has been, with only one important exception, that which Great Britain began to discard in 1875. Only within the last five years has any general consideration been given to the adoption in our country of the system of regulation which has been in satisfactory operation in Great Britain for upwards of thirty years.

This system is that of the sliding-scale. It consists in the determination for each company of the proper initial or standard price for gas and rate of dividend upon the stock, and the provision that for a unit reduction or increase in the price of gas the rate of dividend may be increased or shall be decreased by a definite amount. The theory is that, the initial price being such as will enable the company, under fair management, to earn and pay, and to continue to earn and pay, the initial rate of dividend, the incentive to, and the reward of, management sufficiently better than fair to make possible a reduction in the price is found in the increased rate of dividend which can then be paid if earned, while with poor management it is impossible to continue paying the initial rate of dividend by increasing the price. The community, on the other hand, since it is only entitled to the results of fair average managements, benefits by the reduction in price secured by better management, and is not made to suffer all the loss resulting from poor management. Practical working in Great Britain for thirty-four years has shown that the theory is correct, and that the sliding-scale system furnishes a real community of interest between company and consumer which is not reached in any other way. Even in the few cases where the incentive afforded by it has not proved sufficient to produce the better management, neither the community nor the company has been in any worse position than would have been occupied under any other system of regulation that has obtained in the United States. So it would seem the adoption of the system was not only advisable but imperative, if the greatest benefits derivable from the industry for consumers and companies are to be obtained.

It is essential, however, that the basic quantities of initial price, rate of dividend and amount to which this rate is to apply, and the relation between change in price and change in rate, shall be fairly determined in each individual case. In Great Britain, this determination is made by Committees in Parliament appointed each session to consider and report on the Private Bills by means of which all statutory gas and other companies are incorporated, and also obtain authority to raise such new capital as is required. [The author explained the nature of the work of the Committees.] Since no equivalent of the Private Bill Committees is found either

in Congress or in the Legislature of the various States, the adoption of sliding-scale regulation in the United States would involve the selection of the body by which the basic quantities of the system are to be established for each company, or its creation in those cases where no suitable body is in existence. In States possessing Public Service Commissions, the work would properly be included among the duties of these Commissions, either by virtue of their existing powers in regard to the fixing of rates, if these are sufficiently broad, or by means of suitable amendments to the Acts authorizing them. Such amendments should contain merely the general authority; leaving the application to individual cases entirely in the hands of the Commissions. In States which do not already possess such Commissions, it would seem as if it would be necessary to create them in order to put the system into effect, since the Legislatures have neither the time nor the ability to conduct the investigations into the circumstances of each individual case that must necessarily be had before the basic quantities can be determined correctly. Legislatures already have the power to regulate rates; and what is here advocated is merely the delegation of this authority, to be exercised in accordance with general rules laid down by the Legislatures, to bodies which, if properly constituted, are more competent for the purpose than the Legislatures.

The determination of the proper initial price, the proper initial rate of dividend, and the proper amount upon which to allow the payment of this rate at the start, involves practically the same investigation of the circumstances of each case as is necessary for the fixing of the proper rate under present methods of regulation. But with these quantities properly fixed, there would be no occasion to repeat the process as must now often be done. This fact of the practical permanence of the initial price makes it essential that this price, when fixed, shall contain a margin for contingencies beyond the control of the management—such as an increase in the price of gas-making materials—and shall be such as to recognize and reward management better than the average where it exists. In British practice, the contingency element is recognized by permitting the company to earn, in addition to the amount required to pay the initial or any increased rate of dividend, extra amounts which can be set aside yearly to an insurance fund at the rate of 1 per cent. of the paid-up capital of the company, or added to the amount carried forward to the next year's accounts until this amount is equal to that required to pay the dividend for a full year at the rate corresponding to the price then charged. The amount carried forward can be used to pay dividends when these are not earned, and thus helps to take care of fluctuations in prices of materials; but the insurance fund can be used only to meet extraordinary claims and damages arising from accidents which "due prudence and management" could not have prevented, nor can it exceed a total equal to 5 per cent. of the capital of the company.

A careful following of the hearings on the Bills of gas companies, and the action of the Committees after these hearings, as reported at great length in the "JOURNAL OF GAS LIGHTING," has left the impression that there are few, if any, cases in which the initial price incorporated in the company's Act has not been higher than that at which they were selling gas at the time—thus placing the company in a position to pay a higher rate of dividend than the initial one if they could earn it at the existing price. In view of the invariable practice of complainants in rate cases to advocate the fixing of a price based upon the (from their standpoint) most favourable view of the expenses of operation for a single year, this necessity of providing for accident and contingencies and rewarding existing good management must not be lost sight of in the adoption of sliding-scale regulation.

The initial rate of dividend and the initial amount upon which this rate should be paid are to a great extent dependent upon each other; and the relation between them can be varied widely without affecting the interests of the community, provided that the product of the rate and the amount do not exceed the sum produced by a fair rate of return upon the value of the property. This fact has been recognized in Great Britain by the conversion, in the case of a number of companies, of stocks entitled to an initial dividend of 10 per cent. and an actual one of from 12 to 14 per cent. into an amount of stock entitled to an initial dividend of 4 or 5 per cent., which would yield the same total amount of dividend—that is, a 10 per cent. stock would be converted into twice the original amount of 5 per cent., or $2\frac{1}{2}$ times the original amount of 4 per cent. stock. The variation in the rate of dividend for the unit change in price would also be reduced in the same proportion. Provided the total amount which can be paid in the way of return upon the investment is properly fixed, it is also true that the division of this total between interest on bonds and dividends on stock, either preferred or common, has no effect upon the interests of the community as a body of gas consumers. These points can thus be settled with a view solely to offering the greatest attraction to the investment of capital in the business consistent with the proper application and efficient administration of the system.

While the amount, character, and rate of interest borne by the securities authorized for immediate issue when a company is put under sliding-scale regulation is immaterial to the community, it is important that the total annual amount of interest and dividends be fairly and correctly fixed. It would seem that the most equitable method of doing this would be to pay no attention at first to the securities actually outstanding at the time, but to value the property of the company as a going concern, and determine

the proper rate of return upon this value. From these factors, the total annual return to be allowed is determined. The value as a going concern would necessarily include, in addition to the value of the plant and working capital, an allowance for the value of an established business, which, although it is as real an asset as a stack of retort-benches or a gasholder, is commonly called an "intangible" asset, because its value cannot be measured in exactly the same way as can those of the different parts of the physical property.

The rate of return to be allowed initially upon this value should be determined separately for each individual case, since no one rate can be taken as being fair under all conditions. In all cases, however, it should be higher than the rate at which bonds or preferred stocks of gas companies can be sold, since it is impossible to secure all the money needed for the establishment of a gas plant and its business by means of bonds and preferred stock bearing the ordinary rates of interest. Some of this money cannot be obtained unless there is a practical certainty that it will in the long run return more than the rate of interest that can be secured by investment in the bonds or preferred stocks of well-established companies whose net earnings available for interest and dividends are much larger than the amount of bond interest or preferred dividends. This larger rate of return is expected to be secured with ordinary management, and must be recognized, therefore, in the initial rate of return; the reward of management better than ordinary being obtained by the increase in the rate of return as the price of gas is reduced.

The rate of return upon the capital required for the extension of a well-established business, after the company has been put under the sliding-scale, will take care of itself if provision is made that the sliding-scale securities are to be sold by auction at or above a price to be fixed in advance of the sale, and that all premiums received from such sale at prices above the par value of the securities are to be applied to the extension of the business, but will not be entitled to a return. As the business becomes sufficiently established to be attractive to capital at a lower rate of interest, the price at which the stock can be sold will be increased, and the actual rate of return upon the money put into the property will decrease.

The fixing of the extent to which the rate of dividend on stocks under the sliding-scale shall change for the unit change in price of gas would seem to deserve more careful consideration than has been given to it in Great Britain. Under the provision that the rate shall always change one-quarter of 1 per cent. for each change of 1d. in price, the proportion borne by the total amount of extra dividend allowed the stockholders to the saving accruing to the consumers has grown steadily smaller, until in some cases it is as small as 1:6, or even 1:7. The result of this has been to decrease the incentive to achieve further reductions of price. There is no good reason why the savings effected by management better than the average should not be divided equally between the consumers and the company, not only at prices for gas near the standard price, but also at those far removed from the standard. This equal division cannot be exactly obtained by any fixed relation between change in rate and change in price, unless the amount of securities under the sliding-scale is always the same per 1000 cubic feet of gas sold. This amount will, however, vary from year to year, and it tends to decrease constantly, not only because the actual investment per 1000 cubic feet of gas sold tends to decrease as the business is built up in any given community, but also for the reason that, as the rate of dividend increases and the securities command a premium, part of the investment required will be supplied by the premiums, and therefore will carry no return.

In order that there shall be an equal division of the saving in spite of changes in the amount of sliding-scale securities outstanding per 1000 cubic feet of gas sold per year, it must be provided that a change of 1 cent in the price of gas shall carry with it a change in the percentage rate of dividend to be obtained by dividing 1 by the number of dollars of sliding-scale stock outstanding per 1000 cubic feet of gas sold in the year immediately preceding. Under such regulation, the company and the consumers would each receive one-half of any saving effected by the energy and skill of a management better than the average; and this equal division would continue, no matter how the relation between investment and sales varied, nor how this investment was divided between fixed-rate and sliding-scale securities. By the method outlined above, the sliding-scale system could be applied to the regulation of any gas company, with no disturbance of existing conditions, unless the company were earning more than a fair rate of return upon the value of their property; and even in such a case the disturbance would be no greater than if the ordinary form of rate regulation were applied.

In Great Britain, an official audit of the accounts of companies under the sliding-scale must be made, and their approval by the auditor obtained, before any dividends can be declared. In the only case of sliding-scale regulation in force in America, no such official audit is included, but the company are required to publish their accounts each year in one or more of the newspapers of the city, and they must have had the accounts audited by public accountants before making this publication. It would seem, therefore, that an official audit is not an inherently necessary part of the system.

Companies need not come under sliding-scale regulations when they are first incorporated. In fact, it would be a very difficult

matter to accurately fix the basic quantities, upon which the success of the system depends, for a company starting business in a new territory. The business must have been carried on for a sufficient length of time to have become fairly well established before it is for the best interests of either company or community that the sliding-scale should be applied to it. In Great Britain, all the companies now under sliding-scale regulation had been in existence for many years before it was applied to them; and many of the smaller companies are still working as limited liability concerns without any statutory rights. The advantages to be derived from the application of the sliding-scale are sufficient to ensure that, if it has been generally and fairly applied to the established companies, the new ones that may be formed will take steps to come under it as soon as they have passed the formative period, and reached such a position that it is possible to fix a fair standard price and rate of dividend for them.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

Visit to the Greenock Corporation Gas-Works.

The members of the Western District Division of the Scottish Junior Gas Association, to the number of about forty, paid a visit to the Corporation Gas-Works at Greenock on Saturday afternoon. They were received by Mr. James M'Leod, the Engineer and Manager, Bailie Taylor, the Convener of the Gas Committee, Bailie Chalmers, the Sub-Convener, and other officials.

The works, which are about thirty years old, are situated at Inchgreen, at the eastern extremity of the town. They have railway communication at two levels, and a gateway in the northern boundary wall gives access to a quay jutting into the Firth of Clyde, by means of which sea communication is obtained. The retort-house is a spacious building, affording ample room for coal storage and for stoking machinery. The retort-bench, standing north and south in the centre, contains 204 retorts, 22 in. by 16 in., and 9 ft. 9 in. in length, set back to back. They are fired regeneratively, partly by the system of the West Gas Improvement Company, Limited, and partly by that of Mr. G. R. Hislop, of Paisley; and the Klönne system. The coal is brought in by rail at each side of the house, upon the stage-floor level, and is emptied by hand; the combined storage accommodation under cover being equal to 2800 tons. The coal is again lifted by hand and put into the breakers, from which it is elevated to storage hoppers, of which there are six, each of a capacity of 15 tons. The charging and drawing of the retorts is done by West's machines, driven by compressed air. Each charger carries about 2 tons of coal. The machines run with great smoothness, and with very little noise. It is found that men are easily trained to work them, and that after a short experience it is possible for the charging and drawing of about 140 retorts an hour to be accomplished. A hot-coke conveyor, furnished by the New Conveyor Company, Limited, serves each side of the retort-bench. The coke is quenched as soon as it leaves the retort-house; and it is then carried forward to the screens, which deliver the round coke into a gravity bucket conveyor and elevator, by which it is passed on to a range of receivers, of a capacity of 300 tons. They are arranged to discharge at the bottom, into railway waggons or carts, and some of them are fitted with an appliance for the bagging of the coke. The coke plant is steam-driven; the steam being provided by two Lancashire boilers, hand-stoked, and worked by forced draught; a pressure of 80 lbs. of steam being maintained.

Since Mr. M'Leod was appointed Manager of the works, he has had an engineering shop fitted up, which is found to be a great convenience. The machines are those of Messrs. Dempster, Moore, and Co., of Glasgow. Beside it is the steam-driven air-compressor—a West machine, which works automatically, and furnishes air at a pressure of about 350 lbs. In the exhaustor-house there is a steam-driven exhaustor by Messrs. Robert Laidlaw and Son, of a capacity of 3 million cubic feet per 24 hours; and, as a stand-by, two reciprocating exhaustors, built by Messrs. Hanna, Donald, and Wilson, of Paisley, in 1872. The condensers are of the tubular pattern, and the scrubber is a Holmes vertical, of a capacity of 3 million cubic feet per 24 hours. For purification, oxide alone is used. There is a set of eight boxes, 20 feet square, and a new set of two deep boxes, 40 ft. by 30 ft. In the meter-house are two station meters—one furnished by Messrs. Laidlaw and Son several years ago, of a capacity of 100,000 cubic feet per hour, and the other by Messrs. James Milne and Son in 1866, of 70,000 cubic feet capacity, which is used as a stand-by. It is in contemplation to add a test meter to the equipment of the house. The gas is tested by a bar photometer, using the "Metropolitan" No. 2 burner and candles. The Corporation are allowed to supply gas of as low as 14-candle power; but they maintain an average of 20 candles—a Maxim-Clark carburettor being employed to enrich it up to this figure. The governor is on the Foulis system. There are three holders—two of 600,000 cubic feet, and the other of 400,000 cubic feet capacity. They are in cluster—an arrangement which allows the guide-framings to be braced together by girders at the top, giving vastly increased stability to the structures.

The sulphate-house stands in the north-east corner of the

works. Mr. M'Leod has had it reconstructed, and new plant—that of Messrs. C. & W. Walker, Limited, of Donnington—is in course of being fitted up. The plant is of the continuous type, and contains a 4-feet still, and a centrifugal pump. A bucket conveyor carries the sulphate to a lead-lined store which abuts upon the railway.

The works throughout were in a condition which made it evident that they are being well looked after. There is ample space in them, and the various parts are conveniently arranged for economical working.

At the conclusion of the inspection, in the course of which Mr. M'Leod and his assistants were assiduous in their attention to the visitors, tea was served to the party in an improvised tea-room in a store-room in the sulphate-house, which was brilliantly lighted by two Hands lamps with double inverted burners.

Baillie TAYLOR, who presided, said it had given the Corporation very great pleasure to meet the members of the Junior Gas Association, and give them an opportunity of looking over their works. He need not say that they did not regard theirs as being first-class gas-works. He supposed the members had, in their travels, seen something better than the Corporation could show them at Greenock. At the same time, he might say that, although they were fairly well satisfied with what they were able to do at present, they were looking forward to doing something better, under the able management of Mr. M'Leod and those associated with him. They had a smooth-working establishment. Everything at present was going on in an orderly and regular way.

Mr. W. M. MASON (Glasgow) explained that, owing to the President (Mr. D. Currie) having met with an accident the previous day, and the absence of the Vice-President, the duty devolved upon him to express to Baillie Taylor and the other members of the Gas Committee, the Association's appreciation of their kindness in allowing them to go through their works, and in providing excellent refreshment for them. While he might not be competent to speak about the appearance of the works at Greenock, he felt he could speak of the ability of their Engineer and Manager, whom he had known for many years. In Glasgow, Mr. M'Leod was the Senior Chemist in the Corporation gas-works; and he was always looked up to, by their Engineer and everyone else, as a leading light in the undertaking.

Baillie CHALMERS expressed concurrence in what had been said by the Convener of the Gas Committee. He said he considered they were only on the fringe of what they might expect from gas. He had been associated with gas-fitting for a very long time, and he could speak as to the vast strides which had been made in the uses of gas for lighting and heating during the past ten years or so. He believed the young men before him would, probably in the next ten years, make still more progress. He knew that when Mr. M'Leod obtained the ear and confidence of the Gas Committee, there was nothing they would refuse him, if they felt that it was going to enable him to make good gas, and, more especially, leave them a good surplus at the end of the year.

Mr. M'LEOD also expressed his pleasure at having the Association there, and asked them to accord a very hearty vote of thanks to Baillie Taylor for presiding.

This having been cordially agreed to, and acknowledged by Baillie Taylor, the gathering broke up.

Institution of Civil Engineers New Building.

A circular-letter from the Secretary of the Institution of Civil Engineers (Dr. J. H. T. Tudsbery) conveys the information that arrangements have now been concluded with His Majesty's Office of Works for the acquisition of a freehold site in Great George Street, Westminster, upon which will be built the new home of the Institution. The site is on the south side of the street, immediately opposite Delahay Street, and is bounded on the west by Prince's Street, which will be widened to the extent of 20 feet, so that the Institution building will occupy the east side of the street, and abut upon His Majesty's Stationery Office. It will consequently be within a few yards of Storey's Gate and the Institution of Mechanical Engineers. Competitive designs have been invited from six architects; and it is hoped that a definite selection will be made and an architect appointed early next year. It is expected that the building will be completed some time in 1912, by which time members may be able to be accommodated in their new quarters. It may be remembered that one feature of the new building is proposed to be a great hall, of a character similar to the halls of the Inns of Court. In it, general gatherings of engineers will be held, and memorials of distinguished engineers placed. The special building fund has so far been promised—£13,443 from 306 members; and the increase of the Institution's revenue is to be secured by a fee of £10 10s. on transfer to full membership, admission direct to which will mean an entrance fee of £21. In other respects, the subscriptions remain as before.

During his first six months' tenure of the position of Distribution Superintendent to the Hythe and Sandgate Gas Company, Mr. C. E. Rosevear has, his old friends in the London and Southern Junior Association will be glad to learn, connected up 149 new consumers, which is an increase of 15½ per cent. There has also been laid under his supervision about 2¾ miles of new mains, which have brought within reach of the village of Saltwood the advantages of gas for lighting, cooking, and heating.

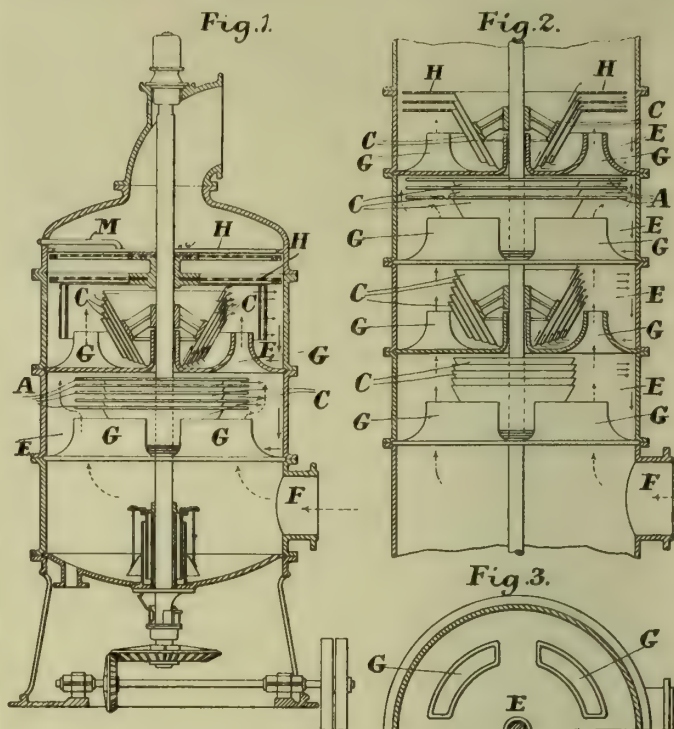
REGISTER OF PATENTS.

Subjecting Gases or Vapours to Action of Liquids.

FELD, W., of Hönningen-on-the-Rhine, Germany.

No. 15,683; July 23, 1908.

This invention has for its object to provide simplified apparatus of the character described in patent No. 11,206 of 1905.



Feld's Gas-Purifying Vessels.

Fig. 1 is a vertical section of one form of the apparatus, fig. 2 shows a modification, and fig. 3 is a half cross-section of one of the vessels showing the gas-passages.

As shown by fig. 1, the apparatus consists of vessels E, one above the other (each for holding liquid), the bottoms of which are provided with gas-passages G, which also serve as overflows for the liquid (although special overflows may be provided if desirable). Passing down the centre of the apparatus is a rotatable shaft, driven (say) by gearing, as shown. Secured to the shaft are concentric funnels or pipes C, each carrying at the top an annular plate A, as shown in the lower vessel, or without one, as shown in the upper vessel. The funnels or pipes C at their lower ends dip into the liquid in the vessels E, and are arranged concentrically; so that there are spaces between them for the passage of liquid up between the funnels or pipes and on to, and off from, the annular plates (when plates are used). The passage of liquid is induced by centrifugal action due to the rotation given to the several parts by the shaft. The liquid is thus thrown off from the upper ends of the funnels or pipes, or from the annular plates, so as to form a fine spray throughout the cross-sectional area of the space between the upper edges of the funnels or plates and the interior of the vessels E. The gases enter from below at F, and are thoroughly subjected to the action of the sprayed liquid—passing, as they do, through sprayed liquid only. After the gases pass from the uppermost division of the apparatus, they enter perforated or reticulated rotating screens H (two screens are shown), which are arranged inside the upper part of the apparatus; so that the gases are compelled to pass through them and thence to the outlet. The screens are to separate any liquid which may be carried up with the gases or vapours. The screens are secured to, and rotate with, the shaft. The liquid is admitted to the upper vessel through any suitable inlet (such as that shown at M, for example, which may lead the liquid upon the middle of the uppermost screen) and pass off through an outlet at the upper part of the apparatus.

The construction shown in fig. 2 is generally like fig. 1, but with a larger number of vessels. There are shown in the two upper vessels the rotating perforated or reticulated screens as being carried by the funnels C, at the top, which combines the action of the plate A with the screen H.

Gas-Producer Apparatus.

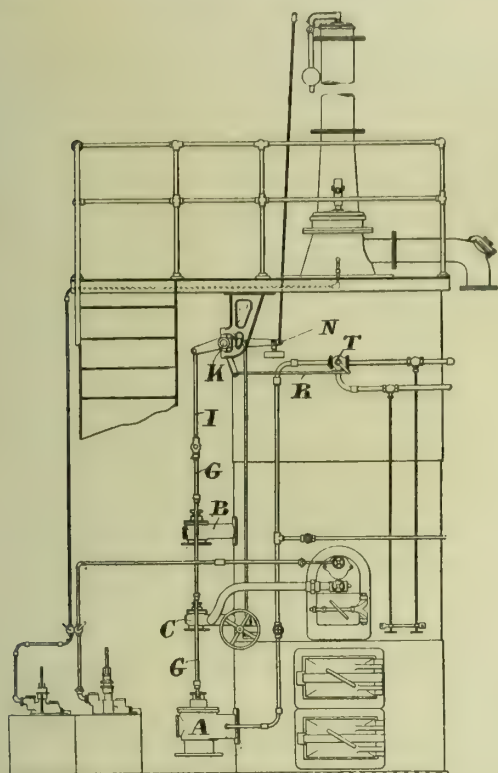
TULLY, C. B., of Wood Green, N.

No. 22,851; Oct. 27, 1908.

This invention relates to apparatus for the production of gas suitable for heating and illuminating purposes, and particularly to plants in which the gas-producer comprises a lower fuel-chamber and a vertical retort for the decomposition of coal, tar, or the like, heated externally by combustion of gas derived from the lower fuel-chamber; air being supplied through a primary valve to the fuel-chamber and through a supplementary valve to the combustion-chamber pertaining to the retort. The object of the invention is "to provide a system of connections whereby the simultaneous opening or closing of the primary and supplementary valves together with the stack valve causes also a valve to be operated to supply steam to the lower fuel-chamber while the valves are closed, and to cut off this supply and direct the steam to the

stack to which the stack valve pertains when the valves are open, as happens in a known but different type of gas-producer having only a primary air supply."

Two arrangements of valve connections according to the invention are illustrated in the specification, with different arrangements of valve connections.



Tully's Valve Arrangement for Methane-Hydrogen Plant.

In the arrangement shown, the primary-air valve A and secondary-air valve B are of the ordinary mushroom or disc type, as is also a subsidiary valve C, which is used for supplying air to the generator for a special purpose described in patent No. 24,803, of 1908 (below). The three valves are operated by crossheads, adjustably mounted on a pair of vertically movable stay-rods G carried by a fourth crosshead suspended from a point intermediate of its length by a rod I attached to an arm secured upon a rock shaft K, which is mounted in bearings near the upper end of the generator, and provided at one end with a weighted arm N connected by a rope to the stack-valve, and at the opposite end to an arm connected by a rod R to the arm of a three-way cock T in a system of steam-piping which has branches leading respectively to the laterally arranged stack surmounted by the stack-valve and to the fuel-chamber of the generator through the primary-air supply inlet.

The movement of the parts may be effected by directly rocking the shaft K through a hand lever extending sufficiently far to enable it to be operated from above the platform shown, or the movement may be imparted through any mechanism within the reach of an attendant at the base of the plant.

Gas-Producers.

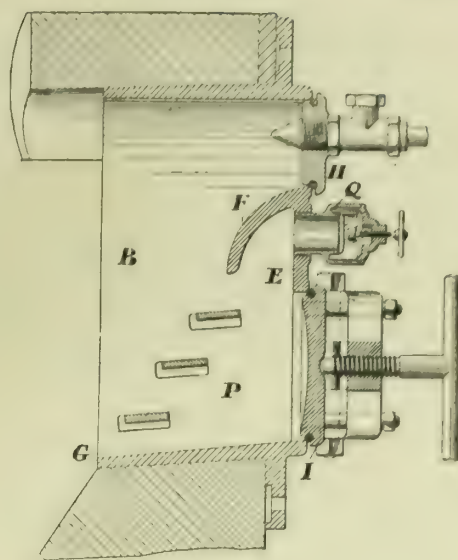
TULLY, C. B., of Wood Green, N.

No. 24,803; Nov. 18, 1908.

This invention relates to apparatus for the production of gas in which heavy liquid hydrocarbons—such as tar—are introduced into a generator and caused to impinge against a bed of incandescent fuel for the purpose of being decomposed thereby. The object of the invention is to provide means whereby, in the act of "blowing" the generator, a supplemental supply of air is caused to enter it in the region of the space where deposit is liable to be formed, and in this way cause the removal of any deposit by combustion; the means being so constituted that recourse can be had to devices for the mechanical removal of the deposit if this should be found necessary at any time.

The wall of the generator is provided at points around its periphery with openings, in each of which is fitted a frame B having a curved top surmounted by an arch in the usual manner. The bottom of the air-receiver is inclined slightly. Intermediate of the top and bottom of the frame is a transverse bar E, having an overhanging portion F curved towards the lowermost inner edge G of the frame. The spaces which exist above and below E are closed by doors or covers H I, hinged to the frame or otherwise removably secured to it; the upper door carrying a nozzle J for injecting the hydrocarbon. Between the lower edge of the curved portion F of the bar and the lowermost inner edge of the frame B, and so that their forward edges are in a plane between such edges, are arranged (say) three grate-bars O, which partially overlap one another and are also inclined downwardly towards the interior of the generator, but at a lesser angle than the plane containing their forward edges—thereby constituting a louvre-like wall. The bars may be formed integrally with the frame, or (as shown) be removably fitted therein, as found most expedient. The air supply to the receiver P thus constructed, may be by way of openings in a valved case Q screwed into the transverse bar of the frame; and the valve is adjusted by a hand wheel and screw, so as to regulate the supply of air to the receiver.

The supply of air to the valve-case Q may—as described in patent No. 22,851 of 1908 (above)—be controlled by a separate valve so interlocked



Tully's Gas-Producer.

or interconnected with the valves used for supplying and cutting off air, steam, and hydrocarbon to the gas-producer in a predetermined order that air will be supplied to the receiver P when the valve-operating mechanism is actuated to cut off the supply of steam and hydrocarbon to the fuel in the producer and admit air thereto for again raising the fuel to incandescence.

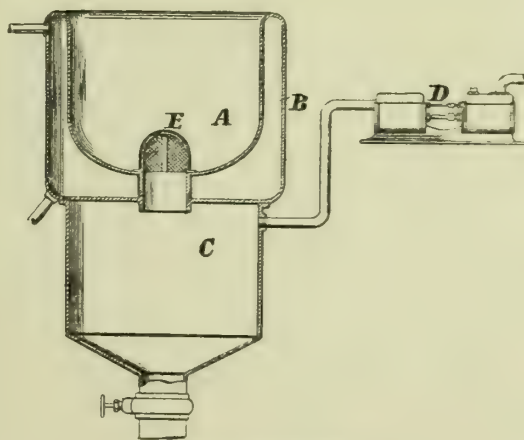
Purifying Tar.

REILLY, P. C., of Indianapolis, Ind., U.S.A.

No. 22,853; Oct. 27, 1908.

This invention relates to "the treatment of tar so as to remove a portion of its constituents by mechanical means and render the remainder more useful than the whole tar would be for such purposes as impregnating wood." As a "cheap, rapid, and efficient" method for separating such suspended matter from tar, the patentee says he has found that if the tar be heated to a temperature of from 150° to 250° Fahr., and then pressure be applied to the liquid, either by the creation of a vacuum below the filter or by artificial pressure above the filter, it is possible to cause "a satisfactory, and probably complete, separation of the suspended matter from the tar, rapidly and cheaply, by mechanical filtration alone."

The products of the process are principally the free carbon which remains upon the one side of the filter, and the other constituents of the tar which pass through the filter. Each of the products obtained is claimed as "a new article of manufacture," and each has specific commercial value, and may be applied to uses which are "new and distinctly advantageous." The residue remaining upon the filter, consisting substantially of free carbon, is available for any of the uses for which finely-divided carbon is employed—such as the manufacture of paint, electric light carbons, battery electrodes, and other similar uses. Further, the residue has marked differences from that obtained by other processes and ordinary carbon.



Reilly's Tar-Purifier.

The filtrate which passes through the filter may be employed for the manufacture of hydrocarbons from it by distillation. The filtrate may also be employed for impregnating wood, as it is found not to contain any free carbon; and when compared with oils heretofore derived from tar, it is relatively not volatile. At ordinary temperatures, it has a gravity of about 1.05 to 1.20, which is greater than that of any oil heretofore derived from coal tar, and can, by the usual methods of impregnation, be forced into and through the pores of wood, so as to fill the pores and interstices of the wood, and make it antiseptic and waterproof. This process has been made the subject of a companion patent—No. 22,854. The filtrate thus derived contains practically all the oils of the original tar in a liquid state, including the anthracene contained in solution.

A simple apparatus by which the process can be carried into operation is shown. The vessel A, in which the tar is placed, is provided with a steam-jacket B, for the purpose of heating the tar to the desired

temperature. C is a receiving vessel closed, except for its opening into the vessel A and to the air-pump D, which is used for the purpose of reducing the atmospheric pressure in the vessel C. E is a filter in the bottom of the vessel A preferably made of conical form for the sake of strength, and covered with wire cloth, over which is placed a finer filter of textile cotton cloth or the like, of a suitable mesh—preferably double twilled muslin.

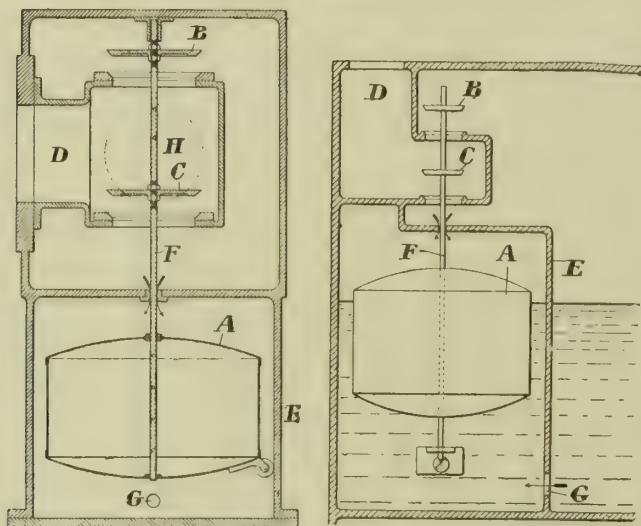
The vessel A is open to the atmosphere. It is partially filled with tar, which is heated to a temperature of 150° to 250° Fabr. The air-pump is started, and the pressure in the tank is reduced to about 25 inches of mercury; but the greater the vacuum, the more rapid the process. The pressure may be augmented by closing the upper tank, and applying air pressure or steam pressure to the top of the tank, or the vacuum below the filter may be wholly dispensed with, and pressure above relied upon. The tar will then flow slowly, but fast enough for practical purposes, through the filter, and the free carbon will be left upon the filter.

Gas-Meters.

GLOVER, W. T., of Oldham, and METERS LIMITED, of Manchester.

No. 27,268; Dec. 15, 1908.

This invention relating to wet gas-meters has for its object to provide means for neutralizing the effect upon the meter inlet-valve of any sudden increase of pressure in the main.



Glover and Meters Limited Compensating Gas-Meter.

The illustrations represent the float and inlet valve box of a meter, in sectional elevation, when arranged separately from the meter, or within the meter casing itself.

A is the float connected to the inlet valve for controlling the flow of gas through the meter; but, instead of employing an ordinary single valve disc, it is proposed to secure upon the float spindle two valve discs B C, of equal area, which act in the manner of an equilibrium valve, and so are unaffected by any changes of pressure in the inlet pipe D. If, however, the float chamber E were freely open to the incoming gas, as usual, a sudden rise in pressure in the inlet pipe, while not directly affecting the valve, would act upon the water and float and tend to momentarily displace the water and lower the float. This action would result in the closing of the valve discs if the latter were already near to their seating surfaces—due to the lowering of the water level in the float-box by waste or other ordinary cause. It is therefore proposed to have a small gas-inlet aperture around the float stem F where it passes through the casing, as indicated by the arrows, and a water-inlet G near its lower end—below the water-level in the meter.

When a sudden rise in pressure occurs in the main, the valve B C is unaffected (being of the equilibrium type) and, owing to the small aperture round the stem F of the valve, the gas cannot act as quickly upon the water in the float-chamber E as upon the water in the meter, to which it gains access through the outlet pipe H. Hence the effect of the increased pressure is to force the water into the float chamber E, thereby raising the float and further opening the equilibrium valve. But as the pressure upon the surface of the water in the float-chamber and in the meter soon becomes practically uniform, the water level is quickly equalized and becomes the same as inside the measuring drum of the meter.

Automatic Igniters and Light Extinguishers.

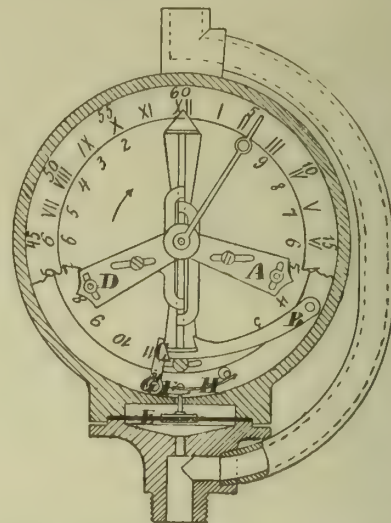
BRÖNDUM, M. W., of Aarhus, Denmark.

No. 24,793; Nov. 18, 1908.

This device, for the automatic ignition and extinction of lights, is actuated by a clockwork, of the kind in which, in accordance with the varying hours of daylight, two release arms which may ignite or extinguish the lamps receive an additional movement. This invention consists in the provision of means whereby the release arms may be influenced not only by the clockwork, but also by gas or pneumatic pressure, or by an electric current, in such a manner that, within given times, an ignition or extinction of a number of lighting appliances may take place; an alteration of the ignition time of the lighting apparatus outside these limits, however, being made impossible.

The invention, as made for gas-lamps, is illustrated as applied to apparatus constructed in accordance with patent No. 10,715 of 1908. The release arms, for igniting and extinguishing respectively, do not consist of two parts as is the case in the earlier patent, but each of them is made of one part only.

The operation of the apparatus is as follows: If the release arm A, with its pin, has forced down the lever B, the detent C, with its hook, will fall upon, and arrest, the lever. The first part of the releasing action is thus effected. If the lever be released by the pin about half-an-hour earlier than the normal time of ignition, it is arrested by the detent, which latter, however, reaches so far in an upward direction that it enters the course described by the release pins. If the pin on A then, about half-an-hour after the normal ignition time reaches the detent C, it will push the latter aside, thus completely releasing the lever B, and thereby igniting the lamp half-an-hour after the normal ignition time. The extinguisher D will act in a like manner.



Bröndum's Automatic Gas Lighter and Extinguisher.

Between the first and second part of the releasing action—which, in the example shown, may take place about half-an-hour previous to about half-an-hour after the normal time of ignition or extinction—the second part of the releasing action can be effected by a suitable increase of the gas pressure, whereby the membrane E, and with it the arm F, are forced in an upward direction. The shaft G will be turned a little and, by means of its projection and pin, will turn the detent C so far that the lever B is released. If, now, the pressure is repeatedly increased—for instance, by a return wave of pressure, or because not all the lights have been ignited on the first increase—the repeated turning of the shaft G would have no effect. Likewise, an increase of pressure before or beyond the half hour of the normal ignition time—that is to say, before or beyond the time in which the pins are situated between the nose of the lever B and the detent C—would have no effect, as the lever is arrested by the detent only during the time of the first and second part (or half) of the releasing action. By tensioning the spring H, pressure can be produced enough to turn the detent sufficiently aside to release the lever. The detent is thereupon returned into its operative position to the right by means of a spring or the like (not shown), or the detent may advantageously be provided with a counterweight adapted to effect the return movement.

If an invariable, uniform releasing action—for instance, at 11 or 12 o'clock p.m.—is desired, it can be effected by providing the dial with a release pin at the desired point.

Gas-Purifiers.

MILBOURNE, R. J., of Muxton, near Newport, Salop.

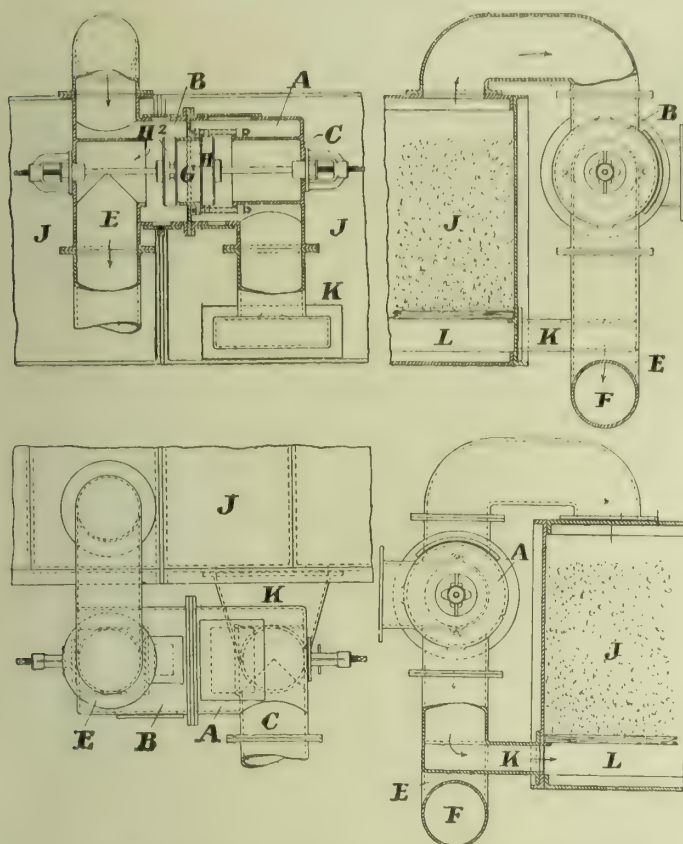
No. 1630; Jan. 22, 1909.

This invention relates to the valvular arrangements of gas-purifiers, as described in patent No. 11,356 of 1901; the object being to simplify the construction and also, if desired, to render the valves capable of being operated from the sides instead of from above. The present valve arrangements are more especially intended to be placed outside the purifiers, whereas those described in the prior patent, although capable of use outside the purifiers, if desired, were more especially designed for use inside.

In each valve arrangement as illustrated, the chambers A and B, into which the pipe C from the inlet main D, and from which the pipe E to the outlet main F, respectively open, are arranged in horizontal line with each other; and the opening G, between the chambers, is surrounded by valve-seatings—one in each chamber. In horizontal line with the opening G, is, in the chamber A, the open end of the inlet pipe C, having a valve-seating around its edge; and in the other chamber B is the open end of the outlet pipe E, having also a valve-seating around its edge. There is sufficient space between the respective valve-seatings to allow of the movement of the valves H H², which are arranged vertically; the one valve H being between the valve-seating on one side of the opening G and the valve-seating on the end of the inlet pipe C, and the valve H² being between the valve-seating on the other side of the opening G and the seating on the end of the outlet pipe E. The valve spindles pass horizontally in reverse directions out through stuffing-boxes on the reverse sides of the valve arrangement; the valves being operated by screwing, or otherwise, so that they can be moved horizontally to open and close the inlet and outlet pipes and the opening between the two chambers to control the flow of gas, after the manner in which the valves control the flow of the gas in the arrangement according to the prior patent.

The ends of the inlet and outlet pipes within the two chambers are formed by elbow continuations passing through the walls of the chambers, but preferably cast in one with the respective chambers as shown. The chambers A B are in communication with the purifiers by passages which answer the same purpose as the inlet hood and outlet

column described in the 1901 patent; these passages and chambers being simply means for continuing the passage-ways for gas between the valve arrangement and the lower and upper parts of the purifiers respectively.



Milbourne's Valvular Arrangement for Gas-Purifiers.

In the arrangement shown, the outlet bend or box leading from the purifier is connected to the chamber B, so that it leads from an opening in the top, or permanent cover, of the purifier J to the chamber; and there is a box K, in communication with the chamber A, secured to the outside of the purifier and communicating by an opening with the space underneath the lowest tray supporting the purifying material—the opening being preferably made long and narrow, and the box K being correspondingly shaped, so that the space is of small depth. By this arrangement—dispensing, as it does, with inlet hoods and outlet columns inside the purifiers—the purifiers “are kept clear of unnecessary obstructions, and the space saved is available for purifying material.” The last chamber A of the series communicates with the passage M leading back to the first purifier of the series.

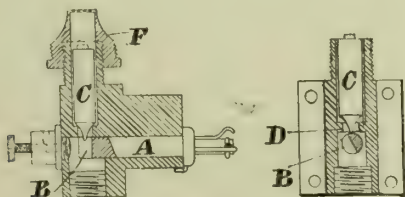
Cocks for Automatic Gas Light-Controllers.

SPARKS, E., of Tufnell Park, N.

No. 2630; Feb. 3, 1909.

This invention has reference to a removable lift plug having a conical point which is raised, when the plug is to be lifted, by a part-revoluble shaft (having operating cams) turned over at intervals by clockwork mechanism. The arrangement has been designed for use in conjunction with the mechanism described in patent No. 11,751 of 1902.

The stem is adapted to be part-rotated by clockwork mechanism in the manner in which the hollow plug of the cock described in patent No. 27,005 of 1908 is turned. There a conically pointed lift-plug, having a cylindrical body, was shown mounted in a casing and adapted to enter its seat when permitted to fall. The stem was provided with a transverse flat and an operating cam or lug in such a manner that, when the weighted lever was at one end of the stroke, the flat was below the apex of the conical plug so that the plug was in its seat, and when the weighted lever was at the opposite end of its stroke, the cam was below the apex of the conical plug and held the latter out of its seat.



Sparks' Automatic Gas-Lighter Cock.

In the preferred form of the invention (as shown), instead of a transverse flat and projecting cam, the end of the stem A is cut away to form the operative cam B. The lift valve C, mounted in its seat D, is arranged immediately over this end of the stem, so that, upon turning it by means of the weighted lever to the “gas-on” position, the plug or valve will be lifted by the cam to permit the passage of gas, and when the cam is brought from under the point or apex of the plug by the part turn of the stem in the opposite direction, the plug falls and the

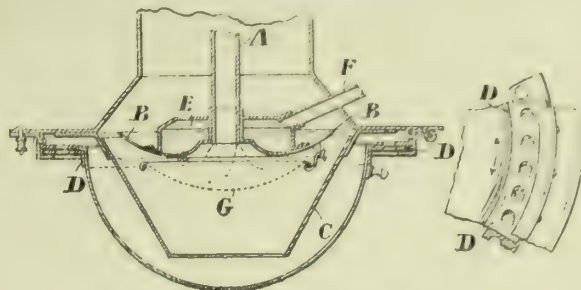
gas-passage is closed. The valve is returned to its seat by gravity and it may, when desired, be removed out of position after unscrewing the perforated cap F.

Inverted Incandescent Gas-Lamps.

KÜTTNER, E. W., of Berlin.

No. 3948; Feb. 17, 1909. Date claimed under International Convention, Feb. 17, 1908.

The patentee's initial claim is for an inverted incandescence gas-lamp, having a saucer or plate-shaped incandescence body, characterized by means for throttling to a high degree the outer air of combustion fed towards the incandescence body, and by a flared flame-spreading body surrounding the lower end of the mixing-tube and adapted to keep the chimney draught from those parts of the incandescence body which are covered by the flame-spreading body.



Kuttner's Inverted Lamp with Flat Mantle.

The illustration shows a vertical section of the lamp and a part plan of the regulating device for the secondary-air feed.

A is the mixing-tube for feeding the mixture of gas and air—in this case arranged within the chimney of the burner. The mouth of the mixing-tube is provided with the covering body or flame-spreader B. The outer globe C and the second glass (open at the bottom) are attached to the chimney; the former being suspended by a ring fixed to the chimney, and carrying an annular member furnished with holes. A rotatable ring D is provided beneath the inner ring, being also provided with holes which may be caused to register more or less with the other holes, so that more or less air will be allowed to enter the outer globe. Above the flame-spreader a hollow chamber E is provided, which communicates with the outer air by means of a pipe F, passing through the chimney wall, and with the mouth of the mixing-tube by means of holes, through which the air can pass to the under side of the spreader. The incandescence body G is entirely covered at the top by the spreader, and is carried by a ring suspended by hooks from hooks on the spreader. The glass, which is open at the bottom, tapers towards the lower end; so that the incandescence body is partially closed from below—thus forcing the external air for supplying combustion against the underside of the incandescence body, owing to the suction caused by the chimney, and thus “assisting the desired flat formation of the flame.”

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- 25,775.—UNWIN, J., “Internal combustion engines.” Nov. 8.
- 25,776.—BETTS, S., “Attaching inverted mantles.” Nov. 8.
- 25,791.—SUTHERLAND, A. G., “Meter diaphragms.” Nov. 8.
- 25,795.—SHEPARD, J. W., and BROWN, G., “Hollow brick lamp which can be lit or illuminated by either the ordinary gas-mantle or electric bulbs and used for lighting the names of streets or advertising purposes.” Nov. 9.
- 25,862.—GRIGSBY, W. R., “Inverted burners.” Nov. 9.
- 25,867.—MORRIS, H. J., “Gas-meters.” Nov. 9.
- 25,993-4.—HARRISON, B. S., “Gas-tight joints.” Nov. 10.
- 26,068.—CAMBRIDGE, A. S., “Generating gas.” Nov. 11.
- 26,073.—HOYLE, J. S., “Lighting burners.” Nov. 11.
- 26,107.—LAMPLOUGH, F., “Rotary blower or exhauster.” Nov. 11.
- 26,124.—OTTO AND CO., G. M. B. H., “Removing tar from hot gases.” Nov. 11.
- 26,149.—ANDERSON, D., “Cocks and switches.” Nov. 11.
- 26,162.—HELPS, G., “Gas lamps and burners.” Nov. 11.
- 26,169.—GRICE, H. J., “Suction plants.” Nov. 12.
- 26,197.—WHITELEY, R. H., “Gas-turbine.” Nov. 12.
- 26,211.—BLACK, E., “Artificial fuel.” Nov. 12.
- 26,217.—SCHNORRENBERG, L., “Distance igniters.” Nov. 12.
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- 26,349.—FORTI, V., “Igniting and extinguishing gas-burners.” Nov. 13.
- 26,370.—BETTS, S., “Inverted mantle carriers.” Nov. 13.

Public Lighting of Westward Ho.—Complaint was made at the meeting of the Northam Urban District Council last week of the low illuminating power of the gas in the public lamps at Westward Ho. It was said to be due to some difficulty with regard to the purification of the gas; and Mr. J. Harris explained that a change had been made from lime to oxide. He had told the Gas Manager he thought the new method was being so used as to reduce the illuminating power of the gas. It was decided to call the Gas Company's attention to the matter.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Proper Allowance for Depreciation of Gas Plant for Income-Tax Purposes.

SIR,—As the question of the recent circular issued by the Board of Inland Revenue to Surveyors of Taxes, with reference to the disallowance of deductions for depreciation on gas plant, is one which seriously affects gas companies, I am instructed by Mr. H. E. Jones, the Chairman of this Association, to forward to you a copy of a letter which the Association has received from Mr. Cash upon the subject, and trust that you will be able to find room for it in your columns.

FRED. E. COOPER, Secretary
Gas Companies' Protection Association.

5, Victoria Street, S.W., Nov. 18, 1909.

[ENCLOSURE.]

To the Secretary of the Gas Companies' Protection Association.

Dear Sir,—I beg to refer to the interview which I had with your Committee on the 7th of October last, when the question of the circular recently issued by the Board of Inland Revenue to Surveyors of Taxes, as regards depreciation allowances to gas and water undertakings was discussed.

As I informed you, I have since been in communication with the authorities at Somerset House; and I have had the advantage of more than one interview with certain of the officers there—being the Superintendent Inspectors of Stamps and Taxes—on the whole question. These gentlemen (who extended to me their usual courtesy) were good enough to put before me the views of the department on the question; and I think it would be useful to the members of the Association, and others interested, for me to here state the views thus expressed on behalf of the Board.

I am informed that the circular was issued as the result of numerous interviews which the department had had with certain representative bodies acting on behalf of statutory undertakings.

The question arose, in the first instance, with regard to tramways; then with regard to electric light undertakings; and, subsequently, gas and water undertakings were also brought in.

The aim of the department, throughout, has been to obtain uniformity in assessment of these kindred undertakings; but the officials admit that the gas companies were not specially represented at the conferences, as the existence of your Association was unknown to them, and have expressed their regret that some representative body, other than corporation officials, was not there to represent the gas companies, so that any argument which they desired to adduce might have been discussed.

The department rely on the general principle that a trading concern cannot be allowed, in the assessment of its profits for income-tax purposes, for both renewals and depreciation; and this proposition, I think, no one would venture to dispute. Further, the department suggested that, by their allowing for all renewals, as they take place, the companies are getting all they are entitled to; and that, in old established companies, it made very little difference whether the allowance was made under one head or the other, and that any question of estimated life—involving, as it might do, variation in practice in different parts of the country—is avoided, and that actual results, instead of estimates can, therefore, be dealt with. Further, they state that, where there might be difficulty in assessing the amount of the renewals—as, for example, with regard to stoves, where the numbers and varying types at different prices complicate the question—they would be prepared to deal with the matter upon generous lines and estimate the renewals on average prices, dealing with total numbers in use by consumers. They, therefore, invite the gas companies to come in on these lines and accept the arrangement outlined in the circular.

On the other hand, the department admit that no company can be compelled to come in, but that the right of appeal to the Commissioners under the Income-Tax Acts remains with the company in each case.

I ventured to suggest that a distinction might be drawn between an allowance for depreciation on fixed plant—such as buildings, retorts, gasholders, &c., where the general practice has been to charge renewals as they fall due—and depreciation of short-life plant, including under this head meters, stoves, and internal house fittings. But I was informed that there was considerable doubt as to whether—so far, at least, as stoves and house fittings were concerned—this was machinery and plant at all within the meaning of the Income-Tax Acts; and, therefore, no depreciation could be allowed under the Statute, but only actual repairs and renewals.

I venture now to add my personal opinion with regard to the position created under the circumstances detailed above.

I would say, at once, that I would not recommend the gas companies to accept the suggested arrangement proposed by the department, so far as it relates to short-life plant—such as meters, stoves, and fittings. Having regard to the large development of business, of late years, by gas companies—particularly in respect of prepayment installations—I see no reason why a company should be asked, for income-tax purposes, to defer the charge against revenue, for renewals, until these actually take place, and to depart from what is a well-established principle of making an annual allowance for depreciation, as recognized by the Income-Tax Acts, and allowed to all traders.

Expenditure on internal fittings in the houses of prepayment consumers is of an extremely doubtful value, and, indeed, may be regarded almost as a charge on revenue account spread over a number of years. Many of the larger companies have kept this expenditure out of their capital accounts, and treated the sum spent as an asset in the balance-sheet while it is being written off; and it should certainly, in my opinion, be extinguished as soon as possible, because the realizable value of the asset is extremely small.

Apart from the subject of income-tax, there can be no question whatever as to the desirability, and, in fact, necessity, of a gas company making provision out of current profits for depreciation which is going on continually, and which will have to be met when the plant in question has to be renewed, either because it is worn out or because it is superseded by something more modern or better suited for the purpose for which it is employed than the apparatus employed at the date of installation.

A gas company which was conducted on other lines, and which divided as profits the rents authorized by Parliament to be charged for the hire of meters and stoves, and the extra charge collected through the slot-meters as a provision for deterioration of the fittings and other appliances provided by the company, would be embarking on a system financially unsound and certain to lead to disaster.

If the income-tax authorities demand, as they do require, that the tax shall be paid on these receipts, they should allow, on the other side, the expenditure which this class of receipt is authorized and designed to cover. A mere plea for uniformity or simplicity should not be allowed to outweigh the reasonableness of this contention.

Bound up with this question is a further question, arising out of the increased use by gas companies, under modern methods, of labour-saving machinery. Much of this machinery is of a quick-running type, with considerable wear and tear; and I see no reason why a gas company should not claim and be allowed, like any other trader, for depreciation on assets of this nature.

It is admitted that, if the gas companies decide to adopt this view, they have each the right to appeal to the Commissioners against an assessment which ignores depreciation. But, personally, I regret the issue by the department of the circular in question, as it is a direct instruction to surveyors, and thereby many companies may be compelled to appear before the Commissioners where, in past years, there has been no difficulty in arriving at an equitable basis of assessment with surveyors.

It is agreed, on all hands, and, indeed, urged on gas companies that it is highly desirable, in the interests of the shareholders and consumers alike, that capital expenditure should be kept at as low a level as possible, and all proper writings-off are to be welcomed as part of a policy in this direction. It would be manifestly unjust, under these circumstances, that a corresponding allowance for income-tax purposes should not be allowed to the companies.

In conclusion, I would point out that, if the accounts are prepared on the lines suggested by the department, no provision is made, or allowed, for the fact that, at any given date, all the meters, stoves, fittings, and other appliances, out on hire, are not new, but have exhausted part of their ultimate life. Under these circumstances, I should have no hesitation in recommending any company, where the local surveyor has declined to make proper allowances for depreciation, that an appeal to the Commissioners should be prosecuted, and arguments on the lines given above urged in support thereof. Should such an appeal fail, then I am of opinion that steps should be taken to carry the question, on a stated case, to the High Court for settlement.—I am, &c.,

90, Cannon Street, E.C., Nov. 8, 1909.

(Signed) WM. CASH.

Lamson's American Institute Paper.

SIR,—Had the paper entitled "A Pound of Coal"*** been read by Mr. Lamson, as per programme given out for the recent meeting of the American Gas Institute, the writer would not have felt justified in asking for space for the following letter. But because of events not in his control, he was obliged to leave the meeting before either Mr. Lamson's or Mr. Africa's paper was reached.

Almost at the beginning of his admirable paper, Mr. Lamson uses the following quotation: "A prominent gas engineer stated that, in view of the recent results obtained in vertical retorts, he thought it waste of time to discuss horizontal retorts in any shape, with or without machinery, for large, medium, or small works, and the sooner all concerned wake up to these facts, the better for these companies and their stockholders." While the writer disclaims any eminence whatever, yet as there can be no doubt as to whom was meant by the author of the paper, the subscriber does feel that it would be only fair play to submit a few statements of facts to make clear his position and to defend the views quite rightly attributed to him by the highly-esteemed author of the paper.

All who know Mr. Lamson will join the writer in saying that the accuracy of the author's figures, his honesty and integrity of purpose, or his professional skill and eminence can never be doubted. But notwithstanding all of this, Mr. Lamson may be somewhat mistaken in his deductions, as he himself appears not to be altogether certain when saying: "The paper is not to be considered as a final statement, as I have said before. We have carried on many experiments, and are constantly developing new results. We will therefore call the paper a report of progress." Should eventually the very ample mains of the new works at Worcester be found closing up with pitch, might we hear of this? The author, by the text of his very interesting paper, would lead the reader to infer that not only the "prominent gas engineer" whom he quotes, but all gas engineers of the past or present generation—and not sparing himself either—were woefully deficient in knowledge of one of the most important branches of their profession, until the wonderful discovery was made by means of the new (and splendid) retort-house at the Worcester, Mass., Gas-Works.

The subject of remarkable results from coal which did not yield so much before reminds the writer strongly of a portion of Mr. Samuel S. Clement's ("Mark Twain") story "Life on the Mississippi," Chapter XIII.—"A Pilot's Needs." As the story points a moral or lesson, permit me to quote a few lines from it. "Mark Twain" had become a good steersman, and having been left alone in the pilot-house by Mr. Bixby, his "Boss," to test him, he became uneasy on seeing a group of the boat's officers and passengers gathering on the deck below him, while the Captain pointedly asked "Where's Mr. Bixby?" They were crossing a particularly deep portion of the river at the time. "Twain,"

* This paper was, in great part, reproduced in the "JOURNAL" a fortnight since, p. 392.—ED. J.G.L.

becoming alarmed, called for the leads-men for soundings—the whole culminating in his getting so excited as to “loose his head” and begging the engineer, through the speaking tubes, to “back her; if you love me, Ben, back the soul out of her”—when he heard the door behind him closing gently, and there beheld Mr. Bixby. The following conversation then took place: Twain: “It was a fine trick to play on an orphan, wasn’t it? I suppose I’ll never hear the last of how I was ass enough to heave the lead at the head of 66.” Bixby: “Well, no, maybe you won’t, maybe—in fact, I hope you won’t, for I want you to learn something by that experience. Didn’t you know there was no bottom in that crossing?” Twain: “Yes, Sir, I did.” Bixby: “Very well then, you shouldn’t have allowed me or anybody else to shake your confidence in that knowledge. Try to remember that.” I have said that Mr. Lamson’s figures may be accepted as absolutely accurate, and that his personal and professional standing is of the highest order. Upon what grounds, then, can the practical value of the operations at the new Worcester retort-house be called in question or give reasonable grounds for doubt?

The writer visited the plant in June last, and was delighted with all he saw at the time. He had never expected to see such perfection in any retort-house containing only horizontal retorts operated with stoking machinery; and to others who asked about what he had seen, he described it as being an old horizontal coal-gas retort man’s dream, as Mr. Lamson had asked visitors not to speak or write about what he so freely and courteously permitted them to see until he had written his own paper upon the subject. The design, execution, and operation of the retort-house named above reflect great credit upon the contracting firm—the Riter-Conley Company, especially the President of the same (Mr. Carpenter)—and upon Mr. Charles Dudley Lamson, the President of the Worcester Gaslight Company, and all who may have been associated with them in the conception and final results obtained, as so interestingly described in the paper under review.

But let us now consider these remarkable results a little closer, and try to understand if everybody in the practical class of gas engineers past and present really were so ignorant as to what could be obtained from a pound of coal until a Pittsburgh firm of gas apparatus manufacturers discovered the real facts, and, by means of the Worcester retort-house and Mr. Lamson’s excellent paper, convinced the world—if not all of us—that we actually all this time did not know what we were doing or talking about. The Worcester retorts are “throughs,” \square shape, and 15 feet long, with an ascension pipe at one end only—the charging end. The benches are heated by twin-producers, as described by Mr. Lamson in his paper. These producers appeared to the writer to be fitted with the “Doherty bench-fuel economizer,” though, while it looked remarkably like it, it may have been somebody else’s design. But the heats were very good and even; and the furnaces no doubt contributed much to the economic operations of the whole. In other respects the benches did not differ in any notable degree from other horizontal throughs seen by the writer, unless it may be in the kind of material of which they are said to have been constructed. This is called “Ricon” in Mr. Lamson’s description; and it is claimed to be a better conductor, and to have much greater resisting power to heat, than ordinary fire-clay. But while this is something new, it does not account for the yield of over 6 cubic feet of 17-candle power gas from (so it is said) the same kind of coal which formerly produced only 5 cubic feet of 15 to 16 candle power gas. That this coal is “Westmoreland,” or, in name, the same as coal previously used, is not convincing.

In my experience of 36 years in the gas business, I have always known that Westmoreland gas coal was of the very best quality of gas coals on the market. I remember, however, once upon a time having used a certain coal which produced considerably over 6 cubic feet of more than 30-candle power gas per pound, and was, in fact, so rich that, for a period of twenty-four hours, I made 22½-candle power water gas, using no oil in the operation, but only gas coke in the “Granger-Collins” water-gas generators, and the coal in ordinary free-firing old-fashioned retort-benches. To make the candle power of mixed gas mentioned, we used 43·6 per cent. of coal gas and 56·4 per cent. of blue water gas. This coal was supplied by the Log Mountain Coal Company, of Pineville (Ky.), which may now be no longer in existence. In appearance it could be mistaken for some of the best “Westmoreland” coal; and the coke from it was of good quality, as coke went in those days.

Other happenings of a somewhat similar nature could be given; but it requires no elaborate argument to convince gas men of experience that coal taken actually from the same mine will sometimes differ in quality to an astonishing degree. But that 6 cubic feet of a fair quality of gas may be produced from a pound of coal which yielded much less in ordinary working, is not to be denied. The Darius-Davison retort did this back in the early seventies. The gas and vapours produced were made to pass through a considerable distance of heated clay retort; and so the 6 cubic feet and more, from coal giving 4½ cubic feet, was demonstrated possible but not practicable. And, as the famous Battle Creek food reformer remarks in connection with something else, There’s a reason. Some of us tried the 6-cubic-foot stunt, too, and soon were rewarded with pitch in everything—from the hydraulic main to the holder inlet, but especially in the purifier connections. Mr. Lamson, in his paper, illustrates some of the earlier experiments in coal-gas production, but has not mentioned Samuel Clegg’s web retort, or his revolving disc retort, by each of which more than 6 cubic feet of a better quality of gas was said to have been obtained than by the same kind of coal carbonized in the now hoary with age, but still lively, horizontal retort system.

While on a trip to Worcester to view the new retort-house, the writer dropped in at Charlestown (Mass.), which works are under the able management of Mr. S. J. Fowler, and where quite remarkable results were being obtained, second only to those at the former city. The retorts were horizontal throughs, as at Worcester; but they were operated with a different kind of charging and discharging apparatus. Mr. Fowler demonstrated evidently what an able man could do to modernize a very old-fashioned retort-house at a reasonable cost. While admirably arranged, considering the old house in which the apparatus was placed, and, however creditable the whole must appear to all who have seen it, the Charlestown retort-house is outclassed by the splendid and smooth-working one at the other Massachusetts

city, which, being entirely new, and having had unlimited capital at the back of it (to expend in construction), was to be expected to shine, as it does, above its more ancient and smoky sister works.

In all that the writer has observed, however, he can see no good reason to recall anything he may have previously said or written relating to the superiority of either the inclined or the newer vertical retort system; and the same will appeal to any person (gas engineer or not) who, by a personal inspection and investigation, and unbiased by prior considerations and conditions, will compare them uninfluenced by the charming personality of a however much interested contractor. Mr. Lamson believes that he has done this; and no one can doubt or mistrust him. But even he, as previously mentioned in his own paper, remarks, in effect, that the last word has not yet been said on the subject—showing thereby his wisdom, for which he is celebrated. In the writer’s opinion, the new Worcester horizontal retort-house is a model which cannot be easily improved upon for this class of setting.

But let us now make a few comparisons which shall be true, even if, as proverbial, odious—let us hope not to everybody. Taking several large retort-houses to produce any given, but in each case equal, quantity of gas, be it a horizontal installation of the Worcester type, or inclines of the type to be seen in operation at Lynn (Mass.), or verticals, now in course of erection at Providence (R.I.), all must have a capacious elevated coal-bunker, and all do, may, or can, employ machinery to convey the coke away from the benches to the storage bins. Coal breakers, elevators, and such machinery will be employed in either of these plants, and, to handle a like amount of material, are likely to cost about the same in every instance—local advantages or otherwise excepted.

The fuel economizer system, as seen at Worcester, is not confined to horizontal settings, but is applicable to all; so that these advantages are common ones. But while an inclined-retort installation requires much less ground space than a horizontal one, the verticals need still less; and if the “Bolz” vertical system is adopted, the area of floor space is immensely reduced. While the inclined-retort system has all the advantages, if they be such, seen at the Worcester installation—viz., a small, free space above the charge of coals in the retort—and unless the “Ricon” material does the business, should give as much and as good gas per pound of coal as obtained at Worcester, no expensive machinery is required to discharge or charge the retorts, excepting that which is common to all, as stated above. As these machines cost a whole lot of money, and are rather expensive to maintain and require some skill to handle, while with either the vertical or inclined systems no skill at all is necessary to properly load and unload the retorts, it would appeal to one that the inclined system is considerably to be preferred to the horizontal retort system.

Figures submitted by well-known and highly respected gas engineers have fully substantiated the claims made for the inclined, as well as the only a few years later, but rapidly (in Europe) appreciated, vertical retort systems. The absolute fact that experienced gas men who have operated various sorts of machine-stoked horizontal retort-benches discarded these for the inclines, and now have, and are adopting, the vertical retorts in place of all others, would seem to be convincing; but it evidently is not to some men, who no doubt have reasons of their own which satisfy them. But after careful consideration of all facts, the writer cannot see any reason to regret having written the words quoted almost at the beginning of Mr. Lamson’s valuable paper, or to qualify or to retract one single word or sentiment contained therein.

Norfolk, Virginia, Oct. 26, 1909.

FREDERIC LIGNER.

German v. English Gas-Retorts.

We have received a letter from a firm of fire-brick makers in the North, growing out of the recent correspondence and comments in the “JOURNAL” on fire-clay and fire-brick material. Portions of the letter are not fitted for publication; and, of course, it would not be well to mention the names of the places and engineers indicated below by blanks. They are, however, given in the letter we have received.

Our correspondents write as follows: Five years ago we erected a large works at . . . to develop the . . . seam of clay; and though we have repeatedly tried to get Mr. . . . [a gas engineer in the near neighbourhood] to try the quality of our productions, we have not yet been successful.

The same thing applies to the corporation of . . . [also a neighbouring works]. We, after four years effort, got an order for four tons of bricks, which were condemned as quite unfit for gas-works purposes, and which condemnation is qualified by the fact that we had previously been graciously allowed to submit samples—six bricks or so at a time. These were invariably condemned; so invariably, in fact, that we doubted the fairness of the alleged trials, and procured some . . . bricks—the brand known to be used at the works in question. Having manipulated the brand, we sent these in to Mr. . . . [the engineer of the works] for test—only to find, as we expected, that they were no better than the many previous samples. All this time, the same . . . branded bricks were being held up to us as patterns of what fire-bricks ought to be; and lo! when the same bricks, minus the magic brand, are submitted by us, they are found to be useless. We, of course, wrote Mr. . . . explaining what we had done, and hoped that he would then have taken the subject up and thrashed it out. But, no; he pretended to be indignant that we had deceived him, and made that the excuse for keeping us outsiders. And yet we hear about the lack of enterprise, intelligence, and skill of British fire-clay manufacturers.

During the five years since we started our . . . works, we have trebled them. We can now produce 60,000 fire and silica bricks per day; while extensions in progress will bring this up to 100,000 per day. We have a large up-to-date retort plant under construction; but have no hope of orders from any but the smaller gas-works.

Mr. . . . [a contractor for gas apparatus in a large way of business] called on us recently; and, after seeing through our works at . . . he remarked that he had seen the best fire-brick works in America and on the Continent, and that we could beat anything

anywhere—Stettin included, which till that day he would have said was the best.

It is only fair to Mr. Carpenter, who raised the question of "German v. British Retorts," to say that he was good enough to order about 40,000 of our . . . brand of bricks this summer; and we cannot therefore complain that we have been boycotted there.

Our bricks built into the . . . gas-works four years ago, are still in use; and there are many small works where they are giving the utmost satisfaction—not to speak of the millions used by certain contractors named for gas-works all over the world.

It is twenty-two years since we began to make fire-bricks at . . . and the only orders we ever remember getting from the . . . gas-works [the principal ones in the neighbourhood] were for some Ganister bricks through one of our competitors, who could not make them at his own works. After supplying these for several years, we ventured (foolishly enough) to mention to the then officials at . . . that they were really using our bricks though coming through their other friend. This was fatal; and the inquiries from their friend ceased. This incident was before the time of Mr. . . . [the present engineer]; but the "permanent officials" are still there.

PARLIAMENTARY INTELLIGENCE.

THE PROPOSED NEW STANDARD BURNER.

Notices for Joint Bills next Session.

As the outcome of the recent action of the Gas Companies' Protection Association with the view of obtaining parliamentary sanction for the general adoption of the "Metropolitan" No. 2 burner for testing gas, certain Gas Companies decided to promote a Joint Bill for the purpose. In view, however, of the number of Companies concerned, the authorities of the House asked, as explained in our editorial columns to-day, that three Bills should be promoted, and that one of them should have attached to it the names of ten of the Companies. These were accordingly formed into the following groups, and last week the necessary statutory notices were given for three Bills, with the names as grouped appearing in a schedule in each case.

Bill No. 1.—Brentford, Croydon, Hastings and St. Leonards, Ilford, Liverpool, Maidenhead, Scarborough, Swansea, Torquay, and Wandsworth and Putney.

Bill No. 2.—Berkhampstead, Bournemouth, British, Cambridge, Chigwell and Loughton, Faversham, Harrow and Stanmore, Hatfield, Hemel Hempstead, Herne Bay, Newmarket, Ormskirk, Prescott, Radcliffe and Pilkington, Reading, Shrewsbury, Tunbridge Wells, Waltham Abbey and Cheshunt, West Kent, and Worthing.

Bill No. 3.—Aberdare and Aberaman, Bath, Exeter, Gloucester, Godalming, Guildford, Hampton Court, Ipswich, Mid-Kent, Newport (Mon.), Plymouth and Stonehouse, Richmond, Romford, Southampton, Walton-on-Thames and Weybridge, Weston-super-Mare, and Wolverhampton.

The objects of the Bill, the title of which is the "Gas Companies Standard Burner) Bill," are as follows:—

To make provision for the adoption of the "Metropolitan" argand burner No. 2, or any other burner which the Board of Trade may approve under the provisions of the intended Act, as a standard burner, in substitution for the various burners now in use for the official testing of the illuminating power of gas supplied by the several Companies whose titles are set forth in the first column of the schedule hereinafter appearing.

To define the conditions and method of testing with the said standard burner, and the regulations to be observed in order to correct the volume of the gas consumed therein to the standard atmospheric pressure and temperature.

To amend, so far as may be necessary in connection with the purposes aforesaid, all or any Acts or Orders relating to the said Companies, and in particular the Acts or Orders severally set forth in the schedule.

Fatal Accident at Sydenham.—At an inquest at Lewisham on the body of James C. Mason (aged 53), a daughter stated that her father was employed as a fireman by the South Suburban Gas Company. Last month, he told her that he had slipped and fallen on his knee while wheeling a barrow at the gas-works. He was compelled to keep his bed and was attended by a doctor; but as he got worse, he was removed to the infirmary. Mr. S. Y. Shoubridge, the Engineer, said he saw Mason in the infirmary; and he then said that as he was about to wheel away a barrow of ashes, he slipped on his shovel and struck his knee and elbow. He was on night shift at the time; and though his knee was rather stiff he worked next night. He came the third night; but the foreman thought he ought to have a rest, and sent him home. Dr. Wheeler O'Brien, the accident fund doctor in connection with the works, attended him for some time, and then advised him to enter the infirmary. Dr. F. S. Toogood, Medical Superintendent of the Infirmary, said that on admission Mason was suffering from acute inflammation of the right knee-joint, and a wound on the front of the limb. There was also a large abscess under the left arm-pit, and another on the right elbow. He subsequently died from exhaustion following blood poisoning from the injury to the knee. A verdict of "Accidental death" was returned. Mr. Shoubridge said the Directors of the Company desired to express sympathy with the relatives. By this unfortunate occurrence, they had lost an excellent servant.

LEGAL INTELLIGENCE.

CLAIM BY A FORMER GREENOCK GAS MANAGER.

COURT OF SESSION—OUTER HOUSE.

Tuesday, Nov. 16.

(Before LORD MACKENZIE.)

The hearing of evidence in the action by Mr. William Ewing, formerly Gas Manager to the Corporation of Greenock, now residing at Ardsheil, Stepps, near Glasgow, against the Greenock Corporation was begun to-day. Pursuer sues for £1645 8s. as due to him for services rendered to the Corporation outwith his duties as Gas Manager. The defenders say that the works charged for were included within the duties of the pursuer's office, and were covered by the salary paid to him; and that the claim is barred by delay.

The pursuer was represented by Mr. WATT, K.C., and Mr. J. B. YOUNG (instructed by Messrs. Gardner and Macfie, S.S.C.). Mr. M'LENNAN, K.C., and Mr. MACMILLAN (instructed by Messrs. Cumming and Duff, S.S.C.) appeared for the defenders.

Mr. James Donaldson, the Manager of the Tonbridge Gas-Works, said that when he applied for the situation he now occupied he considered it was for the post of Manager simply, and not that of Gas Engineer, although he possessed the qualifications of a gas engineer. The duties of a gas manager were the general supervision of the manufacture, purification, and distribution of gas, the public lighting, advising the directors as to the purchase of coal and the sales of residuals, and ordinary repairs to the works. The duties of a gas engineer were to prepare plans and specifications for extra plant or reconstruction, and the supervision of the erection of the plant. During the time he had been at Tonbridge, he had been instructed to prepare reports and to supervise the construction of new works. In every case he was paid for this extra work. The payment was a lump sum on the outlay. He had seen the advertisement upon which Mr. Ewing was appointed at Greenock. It was simply for a gas manager. If Mr. Ewing was asked to report upon, and to supervise, a scheme of reconstruction, this would be engineering and not managerial work. The remuneration of an engineer for such work varied. He had known it to be 5 per cent., and as much as 15 per cent.; but 5 per cent. was quite usual.

In cross-examination, witness said he himself had had remuneration from the Company he served, for extra work, at the rate of 5 per cent. He received £50 on one occasion, and £75 on another. These sums were not awarded as honoraria. He had no contract before the work was entered upon; but he knew that his Directors were honourable men. He could not say that he knew of any other instance of a gas manager being allowed by his own people a percentage upon the cost of works. If a manager had the use of the office staff, a very small reduction might be made. There were now a large number of gas managers throughout the country who possessed gas engineering qualifications, and who obtained fairly good remuneration in consequence. Such engineering qualifications were put forward by candidates for posts, and was a strong point in their favour. He himself put such a qualification forward. He had done such work in his former situation, and had always been voted a sum based approximately on the outlay. This was a common practice.

In re-examination, witness said that where a gas manager did not possess engineering qualifications, an outside engineer was employed. In such a case the gas manager had nothing to do with the preparation of plans and the like.

Mr. G. W. Anderson, of Westminster, next gave evidence. [Counsel agreed to accept Mr. Anderson as concurring with the previous witness as to the duties of a gas manager.] He held that the work which Mr. Ewing was called upon to do was engineering work. In the absence of agreement, he considered that any payment for extra services was subject to the goodwill of the employers. He thought the charge made by the pursuer was quite a fair one.

In cross-examination, witness said that gas managers were in the habit of doing engineering work of a minor nature for their employers. It made a great difference whether a man was appointed gas manager or engineer. A manager might not be qualified as an engineer.

Mr. Ewing (the pursuer) said he was carrying on business as a consulting engineer in St. Vincent Street, Glasgow. He was Gas Manager to the Corporation of Hamilton for eight years. His appointment was as Manager, and to look after extensions and alterations which were contemplated. He had no arrangement with the Corporation of Hamilton for payment for the alterations, because it was recognized as part of his duties. The Corporation were so satisfied with the work that they, unknown to, and unsolicited by, him, voted him an honorarium of £150 and increased his salary by £150. His salary in 1892 was £150; and when he went to Greenock, it was £225. The advertisement of the Greenock Corporation was for a Manager only. He applied for the position, and was appointed; the letter of the Town Clerk intimating his appointment stating that it was in terms of the advertisement. He entered upon his duties at Greenock on Nov. 15, 1901. Mr. Stewart had been Manager of the gas-works at Greenock. Before taking over his duties, pursuer saw Mr. Stewart, who told him that he had been retained as Consulting Engineer. He said to Mr. Stewart that he understood so, and that that was the reason why he had applied for the managership. Mr. Stewart told him that in previous years he had been paid for engineering work. He said that he had received £600, and that he anticipated payment for the work then in hand. In a minute of the Corporation, it was stated that the Gas Committee had before them the question of appointing Mr. Stewart as Gas Engineer or employing an outside engineer. Mr. Stewart told him he had resigned the position of Manager the previous March, and had been retained as Consulting Engineer, at a salary of £100 a year. Mr. Stewart told him that Mr. Chalmers was appointed Manager; but became ill, and was unable to take up the duties. Mr. Chalmers had been a collector, and had no experience of managing such work, and had no engineering qualification whatever. Mr. Stewart was, in consequence

of Mr. Chalmers' inability, in November, 1901, retained as Manager and Engineer, at a salary of £400, with £6 a month for a house. At the time he (pursuer) entered upon his duties, the retort-house was under extension, and new stoking machinery was being added. The general plans had been prepared by Mr. Stewart. The machines, being patented, were those of the Contractors. Mr. Stewart became ill, and the Convener—Bailie Campbell—instructed pursuer to generally supervise the erection of the machinery pending Mr. Stewart's recovery. He was called to a meeting of the Gas Committee which was held about the beginning of October, 1901, when the question of the extension of the gas-works was brought up. The matter was discussed as to whether he or an outsider should be appointed engineer. The Committee unanimously resolved that he should be appointed. Nothing was said at this meeting as to remuneration. About Dec. 1, 1901, he was asked to report on the best method of utilizing the works as they then were; and in September, 1902, he was asked to report on the installation of six purifiers. In February, 1903, he was instructed to report as to the scrubbing and purifying plant, and as to what he considered best to do, and to prepare plans and specifications. This report was presented in March; and he was instructed to have the purifiers reconstructed. In May, he was instructed with regard to offers for a proposed new scrubber and tar-extractor. In 1906, he was instructed to prepare plans for a new purifier-house. He received his instructions mostly verbally, but sometimes in writing from the Town Clerk. The preparation of such reports was the work of an engineer. He did these works after his managerial duties were complete. The preparation of the plans, for which he charged 2½ per cent. on the cost—the usual charge—was mostly his own work. A lad in the office (James Purves) traced some of the plans, and laid down some of the lines; he (Mr. Ewing) laid down the others. He signed the plans as Engineer. He supervised the whole of the work, and issued certificates to the Contractor as Engineer. This was the usual duty of an engineer. In 1901, there was stoking machinery in the works; but it was incomplete. The machinery was quite good; but the arrangement made it an absolute failure. In March, 1902, he was asked to attend meetings of the Gas Committee about the machinery. The results of the experiments by the Contractor were so unsatisfactory that the Contractor went back to England with a new contract in his pocket. He issued some certificates, but refused others in the interests of the department—the work, in his opinion, not being up to the guarantee. At the beginning of 1905, he said to the Town Clerk (Mr. McCulloch) that it was about time he was rendering his account for fees. The Town Clerk said that, in view of the larger extensions about to be made, it was better to defer it to the end. The extensions had lasted from the time he took over the duties; and when he left they were not completed. He also mentioned the matter to Bailie Steele, who was Convener of the Gas Committee. Bailie Steele left him suddenly that day, and made no reply. After speaking to the Town Clerk, he spoke to Treasurer Brown, and told him that the Town Clerk had advised him to delay rendering his account until the extensions were completed. Treasurer Brown did not give a reply, but shook his head, as if he assented. He seemed to agree with the statement. In 1908, disagreement arose between him and the Corporation. So far as he was aware, this was absolutely due to the stoking machinery, which he took the initiative in pointing out was defective and hindering good work being done. Ultimately, on Sept. 9, 1908, he resigned his office. In his letter of resignation, he reserved his claims for remuneration; and he did the same in his receipt to the Corporation. His claim was for fees for engineering work done. He did not think it necessary to make any arrangement with the Corporation—a professional fee ran without arrangement. So far as he knew, all gas managers who acted as consulting engineers were paid. There never was any intimation to him that he would not be paid. It was true that he employed the staff to assist him in the preparation of the plans; but he had allowed for that—to the extent of £13 10s. In all the plans and specifications he was described as Engineer, and not as Manager. On Oct. 2, 1908, defenders advertised for a Gas Manager, whose duties were to include all work in connection with the works and plant, or engineering details with which he might be entrusted. It was an engineer-manager they advertised for.

In cross-examination, pursuer said the conditions of his appointment at Greenock included sole charge of all repairs and extensions; but he did not remember whether the details of the conditions were communicated to him. He did not remember a single instance of a gas manager taking charge of repairs and extensions. He knew of more than one instance of a gas manager receiving a percentage from his own employers upon the cost of extension work which he supervised. Before he sent in his application for the Greenock post, he knew from the Technical Press that Mr. Stewart was ill; and this was the reason why he applied for the position of Manager. In his application, he stated that he had served an apprenticeship to gas engineering. This was in the Hamilton Gas-Works. He also stated that his experience qualified him for the carrying-on of all the departments of gas engineering and management. This was written because of the possibility that Mr. Stewart would some day retire as Engineer, and that pursuer might succeed him. He knew that at the time it was proposed to appoint Mr. Stewart as Consulting Engineer, at a salary of £100, there was a Manager with a salary of £300. The salary he (pursuer) got was £400 a year. Mr. Stewart did not retire from the post of Engineer when he (Mr. Ewing) went to Greenock. Mr. Stewart signed one or more certificates after he went. He could not say when he put "Engineer's Office" on the door of the office, or when he bought a rubber stamp with the same words. It must have been after he was appointed interim Manager. He was appointed Engineer at the meeting of the Gas Committee in October, 1901. If there was no reference in the minute to his appointment, he did not take the minute.

Lord MACKENZIE: The whole thing had been conducted in a most hopelessly unbusiness-like way, on both sides.

Asked if it was not an invariable practice that no charge was made for preliminary plans and reports when a percentage was got on the work ultimately done, pursuer replied in the affirmative. When, however, it was held over for a year, and other plans were made out, both were charged for. The whole of the plans here were made on the instructions of the Committee, and were his own design. The draughtsmanship was the work of the draughtsman in the office.

Wednesday, Nov. 17.

On the resumption of the proceedings to-day, Mr. Ewing, in further cross-examination, said he spoke to the Convener of the Committee about the advantage there would be in having a high-pressure main, and the Convener asked him to report on the subject. He prepared a report and submitted it; but the Committee held it over. He did not frequently and voluntarily, and without instructions, put forward recommendations. Probably there was one exception. He did not say to his Assistant (Mr. Purves) that he was entitled to dictate to the Gas Committee what schemes they should undertake. Mr. Purves did not superintend the erection of the works after he came. Mr. Purves was a distinguished student—after he came to him. He took the silver medal of the City and Guilds of London Technical Institute; but he had absolutely no experience before he went to Greenock. Taking the medal did not involve a knowledge of gas engineering. Mr. Purves was still in the service of the Greenock Corporation. Pursuer did not resign to avoid dismissal. He resigned of his own free will. In October, 1904, he received notice of a resolution by the Gas Committee, which included statements to the effect that the friction between him and the Committee must cease, and that after November his engagement should be during the pleasure of the Corporation, and should be terminable at one month's notice. There had been friction with regard to the stoking machinery. In that matter he was proved to be absolutely correct. The stoking machinery did good work, so far as wages were concerned. The two months' notice was withdrawn in 1906. There were complaints by two gentlemen about his frequent absences in Glasgow. In 1902, Messrs. Blake, Barclay, and Co. and himself were asked to submit designs for a scheme to make the best of the retort-house. But Mr. West said he would have nobody to compete with him, and he got the contract; and their designs for the machinery and retorts were never submitted. Messrs. West obtained the contract. He (pursuer) was instructed to proceed with the erection of the works and to supervise their completion. The instruction might be in the minutes, or it might have been verbal. He supervised the work to the finish, and issued and signed certificates to the Contractors. The total cost of £14,764 was taken from the accounts. It was he, and not Mr. Dewar, who, when the Contractors applied for part payment, examined the work to see how much had been completed. He was in the habit of receiving every year from the Town Clerk an official pocket book containing the standing orders of the Corporation, and with the words on the outside "W. Ewing, Gas Manager, Greenock." He made up an annual estimate of revenue and expenditure. He did not include in them any proportion of his engineering charges, because the Town Clerk had advised him to wait till the works were completed.

Re-examined: Mr. Stewart informed him that Mr. Chalmers had been appointed Manager at a salary of £300 a year, and that he (Mr. Stewart) had been appointed Consulting Engineer, at a salary of £100 a year, and that the Gas Committee had recommended that he be granted a retiring allowance of £150 a year. The recommendation was never submitted to the Council. He understood that Mr. Stewart was paid as Consulting Engineer down to February, 1901. After he set aside the machinery in the retort-house, he showed results which had never been equalled since. These results had enabled the price of gas to be reduced by 8d. per 1000 cubic feet. The work he did was an extension of the capacity of the works. It was a more difficult task to extend old works than to erect entirely new works.

Mr. Robert Grierson, Joint Town Clerk of Dumfries, was, for convenience, at this stage called for the defence. Witness said there were two Managers at the Dumfries Gas-Works. They were called Managers. Their predecessor—Mr. G. Malam—was designated Manager. During Mr. Malam's tenure of office, the gas-works were largely reconstructed. He never received any remuneration for this work. No trace could be found in the minutes of an outside engineer having been employed.

It having been pointed out, in cross-examination, that in the "Gas World Year Book" Mr. Malam was described as an "Engineer and Manager," witness said there was no trace in the minutes of any appointment of an Engineer. He did, however, work both as Engineer and Manager. So far as he knew, no claim was ever made by Mr. Malam in respect of engineering work. The largest extension at Dumfries during Mr. Malam's office cost £8000.

Resuming the pursuer's case,

Mr. Robert Philip, the Managing-Director of the Royal Hotel at Bridge of Allan, said he was Provost of the burgh from 1896 to 1906. He was also a Director of the Bridge of Allan Gas Company. About 1904, it was decided to erect new gas-works. The late Mr. Scott had been Manager for a great many years. He offered to undertake the engineering work. It was agreed that he should do the work, and should be paid £300 for it. Mr. Scott supervised the erection of the works. He thought the outlay on the new works was about £12,000.

Lord MACKENZIE: That is just 2½ per cent.

Mr. Thomas Wilson, the Manager of the Coatbridge Gas Company for about thirty years, said that, in addition to being Manager at Coatbridge, he was Consulting Engineer to a number of gas undertakings. The duties of a manager and an engineer were quite different. A manager had to take charge of the manufacture and distribution of gas; and an engineer had to prepare the plans for works. Repairs would fall under a manager's duties. From the terms of the advertisement when Mr. Ewing was appointed, he should expect that he was appointed to perform manager's duties solely. His experience was that managers did not prepare plans and issue certificates unless they were appointed engineer and manager. If Mr. Ewing prepared plans and specifications, and supervised the work and granted certificates, he was entitled to an engineer's fee. When he (Mr. Wilson) prepared plans and supervised the work, he was paid 5 per cent. If he prepared plans only, he charged 2½ per cent.; the other 2½ per cent. went to supervision. A man on the spot might do the work for less.

Cross-examined: The minute of his appointment was "Mr. Wilson, Gas Engineer, Saltcoats, has been unanimously appointed our Manager." He had carried through two extensions of works—one of £11,000 and the other of £26,000. He had done all the engineering work in these extensions. He was paid for this. He made no charge. He was on very friendly terms with his Directors; and they treated him in a

gentlemanly manner. They paid him honoraria for the engineering work. He thought the Company were morally bound to give him something. He made no arrangement with the Directors; he considered he was quite safe in their hands. The question of employing an outside engineer never came up at all. When he was employed by an outside body, he prepared all the plans himself. He supposed the Coatbridge Gas Company furnished the materials. It was a very small matter. If it were only a report which was wanted, he thought it was a manager's duty to prepare that. If plans were prepared, that was a different matter. Mr. Ewing would not have begun to prepare plans and specifications without the special instructions of his Corporation. If a man were described as engineer and manager, he had both duties to perform. If he were manager, he had only a manager's duties. He himself never called himself gas engineer, but only manager. He thought manager was a much nicer name than engineer. It was quite common for a gas manager to call himself engineer and manager. It did not depend upon names whether Mr. Ewing was to be paid for the work; his Committee were bound to give him something. Ordinary repairs in a retort-house were a manager's duty. Within the last twelve or fifteen years, open firing had given place to gaseous firing; and retort-benches had had to be altered in consequence. This was engineering work. Mr. Ewing's hand was tied; he never could get his improvements carried through.

Mr. Alex. Yuill, the Engineer and Manager of the Dundee Gas-Works, said he had had experience in connection with gas undertakings for thirty years. He had seen the advertisement upon which Mr. Ewing was appointed. The duties of a man appointed under the advertisement would be the duties of a manager, which were entirely different from those of a gas engineer. A manager's duty was to superintend the operations, both of the manufacturing and distributing of the gas, together with all the repairs required from time to time. A gas engineer's duties consisted principally in dealing with structural work—the preparation of plans and specifications, and superintendence of the work. The work he knew Mr. Ewing to be doing at Greenock was that of a gas engineer. Asked if it was reasonable of the Corporation to expect him to report on work of the kind, and of such an extent, without remuneration, witness said they could only do so from a consciousness of his capabilities as such. Remuneration was a different point. The preparation of plans and specifications was engineers' work. The Corporation asking Mr. Ewing to do the work was tantamount to their considering him their Engineer. The plans prepared by Mr. Ewing required engineering skill, such as they would not, as a rule, find in an ordinary gas manager. He himself prepared all his plans according to his own designs, and without any aid from contractors. Of course, contractors were not selected till after plans and specifications were prepared and offers received. In the case of special patents, no specification was required beyond the name of the patent. He had acted as Gas Engineer at Carlisle, Inverurie, Huntley, and Motherwell. At all these places there were Gas Managers.

Cross-examined: His appointment was as Engineer and Manager. He received an honorarium of 100 guineas on the completion of the carburetted water-gas plant contract. He did not see how it was possible for any man to designate himself engineer and manager if he had not the qualifications to act as such. A man appointed as manager would not be entitled to object to report upon the existing state of the works, if he were qualified to do so. It did not require engineering skill to advise on extra purifier or gasholder accommodation. Asked whether, supposing Messrs. West were carrying out a contract in the gas-works, Mr. Ewing would be entitled to charge for the supervision of the work by Messrs. West, witness said that would depend upon his position. It was a very uncommon occurrence for any company to place the whole engineering work, or new work which might be required, in the hands of a contractor. Counsel put it that Messrs. West were practically Consulting Gas Engineers themselves; but witness said he could never reconcile the position of a consulting and a contracting gas engineer as one. Asked whether, if pursuer occupied the position of Manager and supervised the work of Messrs. West, he would be entitled to charge 5 per cent. on the contract price, witness said he did not think he would. Counsel then asked witness if, in his opinion, it was a matter of degree whether a particular repair or renewal ceased to be a proper work for a manager and called for the intervention of an engineer. Witness said that, to his mind, the position was well defined. No outside engineer had been called in at Dundee since he went there. His predecessor was described as Engineer and Manager.

Thursday, Nov. 18.

Mr. John Sharp, formerly with Messrs. R. Laidlaw and Son, of Glasgow, said it was not usual for a manager to be asked to carry out large schemes of extensions. Where the manager was not possessed of engineering skill, it was necessary that an outside engineer should be called in to do such work. He had examined the plans and specifications produced; and they seemed to be the work of a skilled engineer. The draughtsmanship was one thing, and the engineering was another. These were quite reasonable for the purpose in view.

Cross-examined: He had known gas managers to do engineering work; but they were acting in the capacity of a gas engineer. He was not aware of any case where a man holding an appointment as gas manager, who had no engineering skill, carried out large extensions to works. If they did anything more than might be included in the work of a gas manager, that must be considered as the work of an engineer. He could not say he knew of any case where a claim by a gas manager upon his employers for commission on the cost of erection had been admitted; but he knew that it was not unusual for a man holding a permanent appointment as gas engineer and manager to receive recognition for special services, either by honorarium or increase of salary. He considered that skill was required in the selection of patented, or specially constructed or designed, machinery—to select the kind of machinery which would be suitable for the circumstances and the space. Where machinery was specially designed, there was no need for elaborate plans and specifications; and a gas manager who was capable of doing this was entitled to consider himself an engineer.

Re-examined: The fact of the pursuer mentioning his qualifications as an engineer did not imply that he was willing to place such qualifications at the disposal of his employers.

Mr. George Keillor, Manager of the Broughty Ferry Gas-Works for the past six years, said he was engaged as Engineer and Manager. He considered that under his appointment he was bound to carry out any extensions that were proposed. Since he went to Broughty Ferry, he had performed the usual reconstruction of works, at a total cost of £2500.

Mr. Ewing, recalled, made a correction in his evidence, to the effect that the report of January, 1902, meant a cost of £45,117, not £4517. The £4517 referred to a report for utilizing existing machinery.

Lord MACKENZIE: Is that report in process?

Mr. Ewing: No.

Lord MACKENZIE: There are no report, no plans, and no estimates applicable to this figure of £4517.

This closed the case for the pursuer.

The Defence.

Mr. John Hunter Campbell said he was elected a member of the Town Council of Greenock in 1895, and served on the Gas Committee till he retired from the Council in 1902. He was appointed Convener of the Committee in 1896. Mr. Stewart was Manager when he joined the Council. Mr. Stewart resigned in July, 1900; and the pursuer was appointed the same year. When they appointed him, they had regard to his engineering experience, as detailed in his application for the post. The appointment was that of Gas Manager and not an Engineer. There was work in progress when the pursuer was appointed. Mr. Stewart had no special appointment in respect of the supervision of this work; he was doing it as Manager. Mr. Stewart was kept on for two months after Mr. Ewing's appointment; but after that time he received no further remuneration from the Corporation. When Mr. Ewing was appointed, he just stepped into the shoes of Mr. Stewart with regard to the work then in progress, and continued the supervision of the work as General Manager. Mr. Ewing made no protest with regard to undertaking the work. He accepted the instructions to go on with the work in the ordinary course. The suggestion had been made that it was in consequence of Mr. Stewart's illness that the pursuer was called upon to act as Consulting Engineer; but they understood that this was included in his ordinary duties. Throughout the period when he was Convener, the instructions given to the pursuer were given to him as Gas Manager. There was never, at any time, a discussion implying that the pursuer was Consulting Engineer. In his opinion, and in the opinion of the Gas Committee, there was no necessity, at any time, for calling in the services of an outside consulting engineer. They considered that the pursuer, with the qualifications with which he had come to them, was competent to undertake the work. The question of employing an expert never came up at all. So far as instructions were given to the pursuer, there was no differentiation; they were all given to him as Manager. He never heard from the pursuer that he regarded himself as entitled to extra remuneration, over and above his salary, for anything he had done at any time. He first heard of the claim after the pursuer's resignation. The pursuer met him casually in the street, and said to him he would have a large claim for work which he considered outwith the scope of his duties. He was not surprised at what the pursuer said, as he seemed to have a feeling that he was aggrieved, and that he would try to get the most that he could out of the Corporation. The pursuer seemed to feel that they had caused him indignity, and that he would make them pay for it. He spoke in a resentful spirit. The pursuer never included in his yearly estimates any sum for remuneration to himself for extra work. The result of the present claim, if admitted, would be to put a burden on the present ratepayers of charges which should properly have been rendered to consumers of previous years. There was no such discussion in Committee as the pursuer said there was, as to whether an outside engineer or pursuer should be employed to prepare the plans and specifications for extensions and alterations. His recollection of what transpired at the time was that there had been considerable criticism and complaint as to the quality of the gas; and the Manager was asked to state what, in his opinion, was necessary to put the works in such a condition as would enable him to produce better gas and better financial results. In doing so, they considered that they were employing him, not in the capacity of a consulting engineer, but in his capacity as Manager. There was no idea of preparing plans and specifications. In the report which the pursuer presented, he proposed a most elaborate scheme of work, costing £45,117. They did not take the report seriously, because they had not asked for, nor expected, a report of such a character. It entirely emanated from the Manager himself. What they wanted was to obtain a general idea of what was best to be done in the circumstances. The pursuer did not demur to the preparing of the report, nor suggest any remuneration for furnishing it. West's second contract was in connection with the installation of supplementary stoking machinery, and for the supervision of this work, as well as of the installation of hot-coke conveyors. He thought all that was necessary was a clerk of works.

Cross-examined: He did not recall that on Feb. 12, 1901, there was a letter from Mr. Stewart, in which he desired to resign his position as Consulting Engineer. He did not remember that the Corporation considered the necessity for borrowing £100,000. Their borrowing powers were exhausted, and they required renewed powers. There was a discussion in the Committee as to whether they should advertise for a Gas Manager or a Gas Engineer and Acting Manager; and it was decided to advertise for a Gas Manager simply. When this discussion took place, there was no reference made to the alterations and extensions in contemplation; and he did not think that the extensions and alterations bore to any extent upon the question of whether they should advertise for a Gas Manager or for an Engineer and Manager. The alterations had not been decided upon; and it did not seem necessary to advertise that they were in contemplation. He did not believe there was a discussion as to whether they would appoint an outside engineer or Mr. Ewing. It would have been necessary to put that into the minutes, if it had taken place. There would probably have been a division on the matter; but even if they had been unanimous, it would have been entered in the minutes. At the discussion on Oct. 11, 1901, the increasing demand for gas did not enter into it—it was the quality of the gas and the complaints which were discussed. The pursuer exceeded his instructions in this respect, that he suggested the erection of

new works. They did not want anything like such an elaborate scheme. He could not say that they told the pursuer so. It did not appear in the minutes that the Committee took the view that the pursuer had gone outside his instructions.

Mr. John Morison, Accountant, of Greenock, said that he joined the Corporation in 1899. He became Convener of the Gas Committee in September, 1902, and left the Corporation in November, 1903. In October, 1901, a meeting of the Committee was held. There had been a deficiency in the previous accounts, and the management—he did not say the Gas Manager—was being criticized. The Committee asked Mr. Ewing his explanation; and he gave the condition of the works as his reason. There was no foundation for the statement that the Committee discussed whether they would employ the pursuer as Gas Engineer. The preparation of plans and specifications was not in contemplation at the time. They did not employ the pursuer for the work; they asked him to tell them what was necessary to get over his complaint as to the condition of the works. They were not in a financial position then to face anything like the expenditure suggested. In December, 1901, the stoppage of the stoking machinery was referred to at a meeting of the Corporation; and the Manager was instructed to report as to the best method of utilizing the works as they stood. He submitted a report which would have involved an outlay of £45,000. In his judgment, the report went far beyond anything they had any practical intention, or the means, of carrying out at the time. The pursuer was not, in connection with any of his reports, ordered to prepare plans and specifications. He never heard of the pursuer being appointed Consulting Engineer, or that he expected remuneration for extra work. The reports were asked from him as Manager. In 1902, he directed the pursuer's attention to the requirements of the Act of Parliament as to the preparation of the annual accounts, and told him that everything must be put in. The pursuer made no reference to any claim by himself for extra remuneration.

Cross-examined: When Mr. Ewing was appointed, a minority of the Committee, of which he was one, thought the man to be advertised for should be one possessing engineering qualifications. Mr. Ewing led them to understand that he had done this sort of work at Hamilton, and that he was prepared to do it at Greenock.

Mr. P. M. Kirkpatrick, the Town Clerk of Hamilton, produced documents relating to the appointment of Mr. Ewing as Gas Manager at Hamilton. The Gas Committee recommended, in terms of a minute adopted in June, 1892. This minute did not make any condition as to engineering work. The office to which Mr. Ewing was appointed was described as "the managership of the gas-works." After he went to Hamilton, the gas-works were practically reconstructed, at a cost of about £18,000. The engineering work in this remodelling was carried out by Mr. Ewing. In 1895, Mr. Ewing submitted a block plan of what he proposed. The Corporation considered that the opinion of a gas expert should be obtained; and Mr. W. Key, of Glasgow, was consulted. Mr. Key recommended on the same lines as Mr. Ewing. Mr. Ewing was instructed to have the work done; and he supervised it. The scheme of reconstruction took origin in the Gas Committee being convinced that the gas-works were inadequate, and asking Mr. Ewing to report on the matter. Mr. Ewing did not suggest that he should be paid extra, either before or after the work was done. The work of reconstruction took about two years to execute. In January, 1897, after discussion as to whether Mr. Ewing's salary should be increased, or that he should be granted an honorarium, the latter was agreed upon, and a sum of £150 was voted. In his application for the post at Greenock, the pursuer described himself as Gas Engineer and Manager at Hamilton. The minute bore that he was appointed as Manager. He could not say how the £150 was entered in the burgh accounts; but it could quite reasonably have been entered as capital.

Mr. A. Balfour Gray, the Town Clerk of Falkirk, said that Mr. Wilson, who was in charge of the gas-works there, was designated "Manager." He was under agreement, which required him to design and take charge of extensions to the works.

Cross-examined: Mr. Wilson had to do everything the Town Council required of him in connection with the gas-works. He (Mr. Gray) was instructed to put in the word "Manager," and not "Engineer" into the agreement.

Mr. John L. Jack, the Town Clerk of Wishaw, said that Mr. Peter B. Watson, who was in charge of their gas-works, was designated "Manager." He was under agreement to give his whole time and attention to "his duties as Engineer and Manager." He considered that Mr. Watson was bound to carry out any work which might be required in connection with extensions.

Mr. John Richardson, Town Clerk of Musselburgh and Secretary to the Musselburgh Gas Company, said the man in charge of the gas-works there was designated "Manager of the Gas Company." Since he was appointed, they had practically got new gas-works. The cost was about £8000. An outside engineer was not called in. All the work was done by the Manager.

Mr. John McOnie, Engineer, of Port Glasgow, said he was a member of the Town Council of Greenock from 1883 to 1893, and from 1902 to 1908. He was Convener of the Gas Committee when Mr. Stewart was Manager, and a year or two of Mr. Ewing's time. He never heard from Mr. Ewing of any claim he had in respect of extra work; and he never heard the subject mooted or discussed. He never understood that Mr. Ewing held a separate appointment as Consulting Engineer in gas matters, and he never recognized him as such. All the work he did was as Manager. He never knew of Mr. Ewing putting into his annual estimates any sum in respect of extra work.

Cross-examined: He was not aware that it was discussed in the Gas Committee whether they should advertise for a Manager or an Engineer. It would depend on the bargain whether, if a man were appointed as Manager, they could employ him to design and supervise the erection of works. Asked if, in his opinion, there was no difference between a gas manager and a gas engineer, witness said he thought that the one included the other.

Mr. John Forbes said he had been a member of the Corporation and of the Gas Committee since 1900. He was Convener till last week. When he was elected to the Town Council, Mr. Ewing had just been appointed. He did not understand that, in giving Mr. Ewing the

instructions they did, the work was outwith his duties as General Manager. Mr. Ewing did not protest against getting the work to do; the suggestion as to the improvement of the works emanated from himself. When they gave him the instructions in 1901, they never considered that they were appointing him Engineer. All the works Mr. Ewing recommended were not carried out. The work was not completed yet. They were erecting new sulphate plant.

Mr. Thomas M'Curich, the Town Chamberlain of Greenock, found from the books that Mr. S. Stewart received several payments, amounting in all to £600, as extra remuneration in connection with the inauguration of the new gas-works at Inchgreen. After this, between 1874 and 1900, he received nothing except his salary. The pursuer, in making up his annual estimates, never entered any claim for extra remuneration.

Friday, Nov. 19.

Mr. Colin M'Culloch, Solicitor and Town Clerk of Greenock since 1878, said that Mr. Stewart took charge of the erection of the new gas-works at Inchgreen, which cost £50,000; and he was voted £100 for his services. He got no further payments. After the works were built, there were other extensions, such as the erection of sulphate plant, oil-gas plant, and a new retort-bench, costing about £2000. Mr. Stewart prepared the plans and estimates for all these, and supervised the work. On Feb. 12, 1900, Mr. Stewart resigned his post. A Committee was appointed to consult him with reference to his resignation. The resignation was accepted, and Mr. John Chalmers, who was clerk and collector in the office of the Gas Department, was appointed Manager at a salary of £300 a year. The question of a retiring allowance to Mr. Stewart was considered; and it was agreed to recommend that Mr. Stewart be retained as Consulting Engineer during the work of extension which was in progress. Mr. Chalmers was taken ill, and died in July, 1900. On account of his illness, Mr. Stewart had been requested to continue as Manager; and the question of a retiring allowance to him was held over. Mr. Stewart intimated his willingness to continue to act until the extensions and alterations were concluded. These consisted of the contract with Messrs. West. It was resolved to advertise for a Manager at a salary of £300 a year, with free house. Mr. Stewart had made it a condition of his continuing to act that the Corporation should at once fix the amount they were prepared to pay him as a retiring allowance. The Police Board were not prepared to do this, but resolved that the question of a retiring allowance should be deferred, and that an immediate appointment should be made. Advertisements were accordingly placed; and on Oct. 11 pursuer was appointed by the Town Council at a special meeting. He intimated the appointment to the pursuer personally, by the letter produced. Pursuer wrote that he was prepared to take up the duties of Gas Manager on Nov. 15. He had a copy of all the minutes of the Corporation. He usually took his instructions through the printed minutes. He was invariably designated the Gas Manager. It was agreed to continue Mr. Stewart's full salary till the end of November. At the end of that month Mr. Ewing was introduced to the Gas Committee as the new Gas Manager. At the same meeting, it was resolved to continue Mr. Stewart till Dec. 31. This was to enable him to finish anything there might be remaining in connection with Messrs. West's contract. Mr. Stewart's services were continued till the end of February, after which no further payments were made to him. In October, 1902, a Sub-Committee considered an application by Mr. Stewart for a retiring allowance, and resolved that, in view of the large salary received by Mr. Stewart for many years, no allowance be granted to him. This resolution was confirmed by the Board. At the end of July, the attention of the Gas Committee was called by one of the members to a paper which Mr. Ewing had read, in which he dealt with the question of manual and machine labour, and showed that, in works similar in size to Greenock, machinery meant a loss of 12 per cent. It was resolved to adjourn discussion upon the subject until the Manager had lodged a reply to the statement made as to the management of the gas-works. In the Manager's reply, it was stated that Mr. West informed the Gas Committee that he alone would formulate a scheme for the working of the gas-works. This statement was not in accordance with his recollection. There was no such statement in the minutes. Several meetings were held in October, 1904; and these resulted in Mr. Ewing's engagement being made a monthly one. Considerable dissatisfaction with the pursuer was expressed. In Greenock, official appointments were made for a year. At each November a re-appointment was made, and the re-appointment was entered in the minutes, a copy of which was sent to the official, as well as a pocket-book containing the standing orders, with his name on the outside. In the case of pursuer, the name was "Wm. Ewing, Gas Manager." Mr. Ewing made a number of suggestions to the Committee which were too ambitious, and more than was necessary for the works, more especially seeing that there was at that time a large sum of money borrowed on account of the Electricity Department; and the two things would have added to the expenditure more than, as business men, they were prepared for. It was alleged at meetings that Mr. Ewing from time to time presented reports and schemes prepared by him without his having got antecedent instructions. In his opinion, these allegations were well founded to this extent, that Mr. Ewing brought in a large number of plans which were not requisite for the particular business in hand. He had not known of any claim by Mr. Ewing for extra remuneration prior to the letter he received from him, in which he stated that he reserved his claim. If Mr. Ewing had told him he had a claim, he must have brought it either before the Committee or the Convener. He gave no such advice as that the pursuer should keep over his claim for engineering fees until the completion of the existing contracts. No instructions were ever issued to the pursuer to act as Consulting Engineer; nor did he supervise the erection of the stoking machinery. He was, as Gas Manager, to take a general supervision over the machinery. The Gas Committee never considered the question of whether they would employ the pursuer as Engineer or have an outside engineer. In his opinion, the Committee did not instruct the pursuer to do all the work which was set forth in his report in October, 1901, but merely to report as to what he considered necessary to put the works into proper condition. In his opinion, the Committee did not contemplate such a report as pursuer submitted.

Cross-examined: When he received the pursuer's letter of resignation, he did not understand what was meant by the claim the pursuer

intimated, neither did the Gas Committee. In his opinion, to prepare and submit plans was scarcely a relevant answer to a proposal to do something to get better gas and increased pressure. The other details seemed to him to be beside the question. He could not say that Mr. Ewing was ever informed that any report of his was beyond the limits of his remit. The opening words of his reports were—"In accordance with your instructions, I beg to report as follows." Mr. Ewing proposed a large catalogue of improvements. Some of these had been carried out; but the majority had not.

Mr. James M'Leod, the Manager of the Greenock Gas-Works, said he was previously at Kirkintilloch. His appointment there was as Manager. When he went there, plans were prepared for the erection of new gas-works; and he supervised the erection of them. The cost, including the site, was £40,000. He received no extra remuneration for this work, and did not expect any, because in his application for the position he stated that he was qualified to look after the erection and renewal of works. His predecessor at Kirkintilloch received no extra remuneration. He was not aware that it was possible to distinguish so clearly as the pursuer had done between manager and engineer. A large number of gas managers possessed engineering qualifications; and they placed these qualifications at the disposal of their employers. He was not aware of any case in which a gas manager received extra remuneration from his employers for engineering work. He had known cases in which, after works were completed, the extra services of a manager were acknowledged in the shape of an honorarium. Since he went to Greenock, there had been new work, costing about £1500. The total cost of the new work done by Mr. Stewart after the transfer of the gas-works to Inchgreen would be, roughly, £15,000. The largest piece of work was a gasholder, costing £6000.

Cross-examined: When he applied for the post at Kirkintilloch, he mentioned his engineering qualifications. He had had an engineering training, and engineering experience for sixteen years. Before he went to Kirkintilloch, he was chemist in the Glasgow Gas-Works.

Mr. William Monteith, Assistant-Manager at Greenock, said that he was under Mr. Stewart for four years. During Mr. Ewing's tenure of office, he constantly came into contact with him. He never told him that he had received the appointment of Consulting Engineer, as distinct from that of Gas Manager. He told him when he sent in his resignation that he was going to claim for engineering work.

Mr. George Thomson Purves, Draughtsman and Assistant Manager at Greenock, said he was at Greenock under the pursuer for fully three years. He received his instructions from him as to the preparation of plans—sometimes rough sketches, and sometimes verbally. He did the work of supervision, subject to reporting constantly to the pursuer. It was not necessary to be constantly applying to the pursuer. He was not told by the pursuer that he was working for him, and not for the Corporation. If the pursuer had told him he was working for him, he would have expected to be remunerated. He understood that he was doing Corporation work. In a consulting engineer's office there would be a daily diary, containing notes of progress and the like; but there was nothing of this kind kept at Greenock, which would enable the pursuer to differentiate what he was going to charge separately for engineering work.

Mr. Henry O'Connor, of Edinburgh, said he was not aware that it was the custom to pay gas managers for extra work, though honoraria had been paid for such.

This closed the evidence; and the case was continued to Dec. 21 for the hearing of Counsel.

Receiver and Manager for the Rawcliffe Gas Company.

In the Chancery Division of the High Court of Justice last Friday, Mr. Justice Parker had before him a motion by a lady debenture holder in the Rawcliffe and District Gas and Coke Company, Limited, who sued on behalf of herself and all the others, for the appointment of a Receiver and Manager. Mr. Mackay, for the plaintiff, said the Company was incorporated in June, 1907, with a nominal capital of £10,000. In June, 1909, it was resolved to raise further capital by the issue of 200 debentures of £10 each. Only 42 were issued; and of these the plaintiff held 12. A creditor for a small amount had obtained judgment in the County Court, and put in an execution. The money was therefore due under the conditions of the debenture deed. Mr. Willis, on behalf of the Company, said he was instructed to consent to the appointment of Mr. Davies, the Secretary of the Company, as Receiver and Manager. His Lordship accordingly appointed Mr. Davies Receiver as asked; but not to act as Manager for more than three months without further leave of the Court.

The Welsbach Trade Mark Case.—At the Clerkenwell Police Court, last Saturday, the hearing of this case was resumed by Mr. Bros. Evidence having been given by Dr. Oberlander and Mr. Duncan Watson, the case was again adjourned. These proceedings will be more fully reported next week.

Wolverhampton Gas Supply.—At a meeting of the Wolverhampton Trades Council, Mr. C. Smith raised the question of the municipalization of the gas supply, pointing out that in many towns a large profit was available from this source for the reduction of the rates. He said the fact that the town was growing, and that this was a monopoly, only put more money into the pockets of the shareholders. The municipalization of the gas would result in better light and a cheaper price. Though the rates in Wolverhampton were high, it was one of the worst lighted and dirtiest towns in the country. It was a disgrace that the gas-works should still be in the hands of a private Company. He understood that a number of members of the Town Council were interested in the Gas Company; and this would probably make for opposition. Mr. Hicken said they could only make progress in these directions if they had more Labour members on the Council. He hoped that next November they would be ready with candidates and money to pay their expenses. The Chairman (Mr. J. Whittaker) promised to bring the matter up in the Council.

MISCELLANEOUS NEWS.

INCOME-TAX AND DEPRECIATION.

Two Appeals.

In connection with the letter which appears in our "Correspondence" columns to-day, it may be interesting to record two gas companies' appeals which were heard recently.

An appeal on behalf of the Whitchurch and District (Hants) Gas Company, Limited, for an allowance in respect of depreciation for decreased value of plant and machinery by reason of wear and tear was heard by the District Commissioners sitting at Whitchurch, on Friday, the 12th inst. An assessment had been made allowing for depreciation; and this had been subsequently amended by withdrawing the allowance. Mr. W. A. Schultz, of No. 50, Cannon Street, E.C., appeared on behalf of the Company, and argued the case on the question of principle.

In view of the importance attaching to their decision, the Commissioners decided to adjourn the consideration of the question for a month.

A similar appeal on behalf of the Hungerford Gas Company, Limited, was heard before the Commissioners sitting at Newbury last Thursday. Mr. W. A. Schultz appeared for the Company. Figures had been formally agreed with the Surveyor in May last on which depreciation had been allowed; and this had also been withdrawn in October by an amended assessment.

The circular issued by the Inland Revenue authorities to the Surveyors was referred to by Mr. Schultz, who contended, on the authority of various Acts, that the Commissioners had no option but to allow depreciation; the question for them to decide being solely what was a fair and reasonable amount to allow, although in this instance no money had been expended during the year on renewals.

The Commissioners decided that depreciation should be allowed on the same basis as last year—viz., 3 per cent. on the written-down value of the plant and machinery.

The Surveyor, on behalf of the Crown, reserved his right to further appeal.

CONTINENTAL UNION GAS COMPANY, LIMITED.

Effect of the Messina Earthquake.

In the report to be submitted by the Directors of the Company at the ordinary general meeting on the 7th prox., they state that the most notable event of the year covered by it (ended the 30th of June) was the terrible earthquake which visited the South of Italy and Sicily on the 28th of December last, and reduced the city of Messina to ruins. The Board have to deplore the death of their esteemed Manager, Mr. F. Ruggeri, who perished with all his family, of the cashier, and of other members of the staff. Fortunately, comparatively few of the workmen were killed or injured, owing to the fact that the majority of them lived outside the city. The gas-works, though badly damaged, were not wholly destroyed; but the mains in the city suffered severely, and at the present time lie buried under mountains of debris. Scarcely twelve months have elapsed since this appalling disaster overtook Messina, and very little progress has been made with the rebuilding of the city, which is still little more than a heap of ruins. Under these circumstances, it is impossible for the Directors to arrive at any final decision respecting the future of the Company's enterprise there. In the meantime, stocks of coal, coke, and other residuals, together with a considerable quantity of meters, fittings, &c., have been recovered from the ruins, and have been disposed of. Moreover, the Company's obligations towards all their employees, whether in the form of gratuities or of pensions, have been provided for. As it is quite clear that, whatever decision may be arrived at ultimately with regard to the future, the loss sustained by the partial destruction of the works and mains must be very great, the Directors have decided to write off this year from the Messina outlay account a first instalment of £22,000, of which a sum of £10,000 has been taken from the reserve fund and £12,000 from the undivided profits. As regards the Messina town debt, the Directors have sent in a statement of claim to the Royal Commissioner, and have instructed their legal representative in Italy to press for payment with all possible vigour. They assure the proprietors that no efforts will be wanting to secure the payment in full of the amount due to the Company.

The Union des Gaz, in which the Company are so largely interested, has obtained during the year under review the concession for lighting Montigny les-Corneilles, a commune adjoining Nanterre. The private consumers of the Union des Gaz have increased by 14,432, making a total of 258,381; and the public lamps have increased by 342. The total quantity of gas sold shows the very satisfactory increase of about 5 per cent. over the year 1907-8. Owing to the mildness of last winter, there was a falling off in the prices obtained for coke; but this was compensated for by the decrease in the cost of coal. The mains have been extended by 54 miles; making a total of 1181 miles.

The amount charged to capital account was £445,148, which includes the cost of new works and general offices at Milan, of new works at Genoa and Kehl, and of important extensions to the Nanterre and Strasbourg works. The Union des Gaz has made a further issue of debentures, in order to meet capital outlay due to the continued increase in the demand for gas in the various towns in which it has lighting contracts. After providing for debenture interest and redemption, the Union des Gaz has been able to maintain its dividend at the same rate as was paid last year, and carry forward £13,358 to the new account.

The net profit available for distribution by the Continental Union Company is £66,225, out of which the Directors recommend a dividend for the year of 7 per cent. on the preference stock, less income-tax, and 5 per cent. on the ordinary stock, free of income-tax; carrying forward £12,954 to the new account, against £11,126 last year.

ORIENTAL GAS COMPANY, LIMITED.

The Public Lighting Contract.

The Ordinary General Meeting of the Company was held last Wednesday, at the London Offices, Finsbury House, Blomfield Street—Mr. R. HESKETH JONES in the chair.

The SECRETARY (Mr. H. J. Luff) having read the notice convening the meeting, the report of the Directors and the statement of accounts were taken as read.

The CHAIRMAN, in moving the adoption of the Directors' report and the balance-sheet for the year ending June 30 last, said he had a few observations to make which need only be brief, as the report which had been before the proprietors for some days past succinctly gave the necessary information as to the present position of the Company. On this position he congratulated the proprietors; for, although it pointed out the necessity for large outlays in main-laying, and the steps which had been and would be taken to meet the requirements of the new public lighting contract, he might safely say that this expenditure must result in extending the Company's business, and add materially to its stability. As he pointed out at the meeting last year, the mains in Calcutta were laid in more than 300 miles of roads and streets, and covered an area of some 20 square miles; and until within the last three or four years, the delivery of gas at pressures sufficient for a supply during the day-time, or even between the hours of sunset and sunrise, had been embarrassed by leakage. The present Manager's attention and energies had been chiefly given to the improvement and development of the manufacture of gas at the works at Sealdah, which improvements had been successful; and he was to be congratulated thereon. Though much had been done since he became Manager in connection with the delivery of the gas to the public lamps and the private consumers, the special attention of the Board had, during the recent negotiations for a new public lighting contract, been called to the increased necessities of the future. In the past four months several new mains had been laid; and Mr. Watson, in the letter which reached the Board on the previous Saturday, reported that he was now able to considerably increase the pressures both at night and during the day. One could not give an approximate idea of the necessary outlay to attain the end in view—namely, the supply of gas to every public lamp at a minimum pressure of 2 inches (water gauge), and a sufficient pressure in the daytime for gas for cooking, heating, and manufacturing purposes. He recollected the time when the use of gas in England was practically *nil* during the daytime; now it was not unusual to find its consumption was as high during the hours of daylight as, and even higher than, in the evening and at night. The residents and industries in Calcutta were now prepared to use gas for domestic and industrial purposes; so that there was every encouragement to boldly take in hand the necessary steps and spend money to meet the increasing business waiting for the Company. After much consideration, the Directors had enlarged and re-arranged their English Staff in Calcutta. They had appointed Mr. Snelgrove, of Bradford, as the Chief Distributing Engineer, and Mr. Bone, of the Commercial Gas Company's works, as his principal assistant. These gentlemen left England by P. & O. steamer *Caledonia* on Oct. 14 and arrived at Calcutta on the 8th inst. Mr. Snelgrove was to be responsible for the distribution of the gas. He would first thoroughly examine the districts supplied, and report as to what was necessary to be done from time to time to meet the requirements of the Company's customers, whether public or private. The Directors had, under his advice, already ordered a complete compressing plant and other accessories for erection at the Sealdah Gas-Works. They might hope that these would be in action in the early part of 1910, and would considerably facilitate the investigation of the requirements for the enlargement and re-arrangement of the mains. Mr. Watson would, of course, remain the Company's representative in Calcutta—their Chief Engineer and Manager; but he would be relieved of the arduous duties connected with the distribution of the gas. When one considered that Calcutta was the second city of the British Empire, and that the Oriental Gas Company was the sole purveyor of gas there, it must be seen that the steps which had been, and would have to be, taken, prior to the commencement of the new public lighting contract, were such as would commend themselves to the proprietors and to the authorities and residents in Calcutta. Concluding his remarks, he might say that, humanly speaking, he saw no difficulty in anticipating that the present rate of dividend would not be reduced, but that in the future the Company's prosperity would be at least maintained, if not increased.

Mr. H. D. ELLIS seconded the motion.

Mr. J. H. MACKAY observed that the Chairman had made no allusion to the very vital question as regarded the future of the Company, and as to the contract with the Municipality of Calcutta. Reference had been made to the question in various ways; but the Chairman did not tell the proprietors whether any definite contract had been arrived at.

The CHAIRMAN replied that, if Mr. Mackay would kindly refer to the Directors' report, he would see the matter was fully dealt with there in the following terms:

At the last two meetings of the proprietors, allusion was made to the Corporation's request for tenders for the future lighting of the City of Calcutta. More than one tender has been submitted by the Company to meet the varying views of the Corporation. Ultimately, in the spring of this year, negotiations were carried on by the Board in London with Mr. Alfred Mansfield, the accredited Technical Adviser of the Corporation; and, after several protracted interviews, terms for a new contract for the supply of gas to the public lamps from the 1st of May, 1911, were agreed on, and were finally accepted by the Corporation on the 8th of September, subject to the sanction of the local (Bengal) Government. Under the new contract (which is to be for a period of twenty years), an improved supply of gas will be furnished to the city at increased pressures.

Mr. G. F. THOMPSON: Is it pretty sure it will be ratified?

The CHAIRMAN: We have every reasonable expectation it will be.

Mr. THOMPSON: We are making a large expenditure over it.

The CHAIRMAN: But we shall not require to raise any additional capital.

Mr. MACKAY: Are we to understand that no definite arrangement has been come to with the Corporation?

The CHAIRMAN: Our report says: "Finally accepted by the Corporation, subject to the sanction of the local (Bengal) Government."

Mr. MACKAY: The sanction has not been obtained yet.

The CHAIRMAN: It has not been given.

Mr. LOUIS PENNY: That is merely a matter of form.

The CHAIRMAN: We cannot approach the Bengal Government. It has been their holiday time; and there has been no session.

The motion was unanimously carried.

Proposed by the CHAIRMAN, and seconded by Mr. R. MILLER, a dividend was declared of 8 per cent. for the year (less 3½ per cent. already paid), free of income-tax.

Moved by Mr. ELLIS, and seconded by Mr. W. WILLIAMS, Mr. A. T. Eastman was re-elected a Director.

Mr. EASTMAN, in his reply, remarked that business men like the proprietors would realize that, owing to the negotiations which had been referred to, the life of a Director of the Company had been a strenuous one for some considerable time past; but whatever efforts were necessary, his colleagues and himself were always willing to make them in the furtherance of the proprietors' interests.

On the motion of Mr. R. B. FITZMAURICE, seconded by Dr. CHARLES SANGSTER, the Auditors (Messrs. S. W. Savage and F. Seel) were re-appointed.

Mr. T. W. FORMAN proposed a resolution according the best thanks of the proprietors to the Chairman and Directors for their services during the past year. He remarked that the Board must have had an anxious time; and he was glad to think it was all over.

Mr. W. C. ELLISON seconded the motion, which was unanimously carried.

The CHAIRMAN, having acknowledged the resolution on behalf of himself and his colleagues, moved a vote of thanks to the Manager, the Assistant-Manager, the Secretary, and the staff generally both in Calcutta and in London. He said the proprietors could all understand the anxiety that Mr. Watson had had during the past twelve months at the very least in connection with the public lighting contract. He was sure—seeing the different nationalities comprising the Municipality of Calcutta, and the different views existing in opposition to any concern which was not owned by the inhabitants—Mr. Watson must have had a great deal of trouble, and without great resolution and marked ability he would never have been able to have got through the difficulties himself on the spot. Several negotiations were conducted by him, which meant many cables. He also came home this time last year; and the Board discussed the matter with him, and gave him full authority to carry out their views. But by the time he again reached India, the views of the Corporation had changed. They set aside altogether what had theretofore been done, and went entirely upon new lines. Ultimately, after endeavouring to get a gentleman from England as Consulting Engineer to go out there to advise them, they arranged with Mr. Mansfield to undertake the duties, and to negotiate with the Board. Mr. Mansfield came over; and they had several negotiations with him of a protracted character and some difficulty. Eventually, however, they parted from Mr. Mansfield exceedingly good friends. The result of the negotiations had been confirmed by the Corporation. Mr. Mansfield was now in Calcutta. He arrived there a few days ago; and he would negotiate further upon the second contract—that was to say, whether the Company would on May 1, 1911, continue to light and extinguish the lamps, or whether the Corporation would undertake the work. So they had this second contract to consider between now and 1911. Meantime they had to get the mains arranged and enlarged, so as to meet the demands and requirements of the new contract. He had already spoken of Mr. Watson's difficulties and abilities; but he might say further in regard to him, that they hoped to have the pleasure of seeing him home next year, when he was due on furlough. He had had but little holiday the six years he had been their Manager; and he had had his hands thoroughly occupied both inside and outside the works, more especially inside. With reference to the staff in India, the members were all working very satisfactorily. They were not troubled as were, in Italy, a Company of which he was formerly a Director, with labour questions. Mr. Watson's great kindness to his men was fully appreciated, and they worked harmoniously with him. As to the London staff, their friend, Mr. Luff, had been most attentive during the year. He had had a great deal of extra work thrown upon him; and he had worked hard and most satisfactorily. He (the Chairman) believed that the Directors would have the pleasure of giving the proprietors, the next time they met, a very good report as to the condition and prospects of the Company.

Mr. ELLIS, in seconding, said he had much pleasure in confirming everything the Chairman had said with regard to the efficiency of the staff both in this country and in India. As the proprietors had been informed, the Indian staff had recently been augmented by sending out a Chief Distributing Engineer, and an Assistant. The Board had every confidence that the gentlemen appointed would prove valuable additions to the staff, and quite equal in ability and zeal to those who were already giving their services to the Company out in India. The Board took a great deal of pains to obtain the services of two thoroughly efficient men; and he thought they had succeeded. Mr. Snelgrove came from an excellent school in the North (Bradford), where he put in many years of good service under the Municipality. He had also had experience of gas-works abroad. As to Mr. Bone, he had been with the Commercial Gas Company for the last four years or so. He was most highly appreciated; and they were very sorry to lose him. At the same time the Directors of the Commercial Company would not like to stand in the way of his advancement in life, and promotion to greater things. He (Mr. Ellis) also wished to say a few words with regard to the point raised by one proprietor as to the sanction of the Bengal Government not having yet been given to the contract. The Board had no misgivings whatever about that; and the proprietor might also dismiss any misgivings he might have in his mind. Things moved very slowly in the East. It was 21 months from the date of the lodging of the tenders before the agreement was finally accepted by the Corporation, on Sept. 8. Between then and the beginning of November was the holiday season; and he did not suppose any

matters had been before the Government. In due time, however, this contract business would be reached; and though it might take some weeks, they had good reason to anticipate that the sanction would be granted.

The motion was cordially agreed to.

Mr. LUFF thanked the proprietors on behalf of his colleagues and himself. Their and his own exertions had been heavy during the past twelve months. They knew they had the full appreciation of the Chairman and Directors; and he was glad indeed that their opinion was endorsed by the proprietors. He would communicate the resolution to Mr. Watson.

TICEHURST WATER AND GAS COMPANY'S AFFAIRS.

Another Stormy Meeting with Little Result.

The Adjourned Meeting of the Ticehurst and District Gas and Water Company was held last Tuesday, at the Institute of Chartered Accountants, Moorgate Street Place, E.C.—Mr. W. B. MARTIN (the Chairman of the Company) presiding. It will doubtless be remembered that at the previous meeting, held on the 27th ult. (*ante*, p. 336), an adjournment was resolved upon in order that the accounts might be properly audited by Messrs. Saker and Davis, the Company's Auditors.

The CHAIRMAN opened the meeting with the announcement that the intended audit had not been made; Messrs. Saker and Davis having refused to proceed without some satisfactory guarantee for the payment of their charges. The Receiver recently appointed on behalf of the debenture holders declined to give the required guarantee; and the Company were without either funds or income. The Chairman read the correspondence which had taken place on the subject between Messrs. Saker and Davis and the Company, and between the same firm and the Receiver; and he concluded by expressing his regrets and those of his fellow-Directors that the meeting should be confronted with a disappointment. He added, however, that no blame attached to Messrs. Saker and Davis, who were merely looking after their own interests in a perfectly regular manner. Personally, he was of the opinion that, even if proceeded with energetically, a full audit could not have been made in the time allotted.

Mr. HOOPER inquired if the meeting was to understand from the Chairman that the Company were making no disbursements whatever, and if there were literally no funds to meet small disbursements. He said his own impression, received at the previous meeting, was that the Company were still collecting some rental from the small business remaining.

The CHAIRMAN stated that all receipts were regularly turned over to the Receiver, and literally no funds, even to meet petty expenses, remained in the Company's treasury.

Mr. HOOPER adverted to the £8265 stated at the previous meeting to be due on shares held by Mr. Eaton, a former Managing-Director, and a corporation of which that gentleman was the guiding spirit; and he asked the Chairman if since the last meeting either he or his colleagues on the Board had taken any steps to recover this money.

The CHAIRMAN said nothing had been done in the matter, and explained that this inaction on their part was owing to his colleagues and himself having placed their resignations at the disposal of the previous meeting.

Mr. HOOPER suggested that perhaps the Chairman would not mind furnishing some equally satisfactory explanation of the reason why neither he nor his co-Directors had endeavoured to collect this money for the Company during the two years they were in office (from 1907), in which period it had been stated by the Chairman it was found necessary to borrow money to keep the concern afloat.

This explanation was not forthcoming, though the request was made several times, and in many different forms.

Mr. HOOPER thereupon abandoned the point, and asked for an explanation of the discrepancy between the Chairman's statement that this money—or rather £3000 of it—was personally due by Mr. Eaton, and the balance by his corporation (the exact name of which nobody seemed able to give), and the point-blank denial by Mr. Eaton that he owed the Company any money.

The CHAIRMAN replied that he was not prepared to furnish the requested explanation, but suggested that perhaps the meeting might be not unwilling to have the matter explained by Mr. Capes, of Messrs. Archer and Capes, the Accountants who furnished the report read at the previous meeting, which, by resolution, was placed in the custody of the Receiver.

This suggestion was met with loud expressions of disapproval. After a time, however, Mr. CAPES was heard to say that the books showed that £8265 was due to the Company by Mr. Eaton and by his corporation.

Mr. HOOPER said he had no doubt that the statement of Mr. Capes was made in all sincerity; but his information came solely from an examination of the books, and he could have no knowledge of the conditions under which these shares were issued to Mr. Eaton and his corporation. What the meeting was trying to arrive at was the genesis of the business, and he (Mr. Hooper) hoped the Chairman would not consider him to be pressing the point unduly if he again asked for an explanation direct from the chair.

The CHAIRMAN again protested his utter inability to comply with the request.

Mr. Hooper then proceeded to demand the minute-book containing the record of the transaction. This, however, was not forthcoming; and amid a volley of questions, the Chairman was heard to ask Mr. Eaton to give his explanation of the matter. Mr. Hooper protested against this as an evasion by the Chairman of his manifest duty to the meeting; and a scene of considerable disorder ensued. When quiet was restored,

Mr. EATON was found to be making an explicit denial that he owed the Company any money. He stated most emphatically that the shares for which it is alleged the money was due were given to him as collateral security for money lent to the Company. Furthermore, he said the loan had been repaid; and he had returned the scrip for the shares.

The CHAIRMAN (interrupting) stated that he had no knowledge of the shares having been returned.

Mr. EATON, however, insisted that they had been.

Thereupon the record book was demanded, but in vain; and, after a time, it was decided that the return or non-return of the shares was of less moment than the conditions under which the Company had issued them. After a discussion which was acrimonious throughout, and threatened to become heated, a minute-book was seen to be in the hands of the Chairman, and quiet ensued. The reading of the minutes of a meeting held on Jan. 18, 1905, disclosed the issue of 1400 shares of the Company to the Gas and Water Works Supply and Construction Company; the consideration stated as being for 2½ miles of gas and water mains.

Mr. HOOPER followed up this disclosure by some sarcastic references to the condition of the memory of the Chairman, who, though, as the record showed, he actually presided at the meeting in question, had until the present moment been unable to state in what circumstances a large number of shares had been issued. But, continued Mr. Hooper, this was not all. Though it would have been perfectly simple to have verified the issue by a reference to the minute-book, no such precaution was taken. As a consequence, such meagre statement of assets as had been vouchsafed to the shareholders of the Company contained an item for a large amount which that day's evidence had shown was not, and had never been, owing. To put the matter in the mildest form, the affair was most discreditable to the Directors.

At this point, Messrs. Saker and Davis were questioned as to whether it would not be possible for them, after a cursory examination of the books, to furnish some idea as to the condition matters were in; and the answer was in the affirmative.

Mr. GLOVER thereupon moved that the meeting be adjourned for four weeks pending the preparation of their statement. He characterized the report read by the Chairman at the previous meeting as "disgraceful and fraudulent."

These remarks were followed by a noisy hubbub; Mr. Capes and the Chairman protesting strongly against Mr. Glover's observations. Eventually Mr. Glover's Solicitor withdrew the word "fraudulent."

Mr. HOOPER thereupon seconded Mr. Glover's motion as amended; and the meeting then stood adjourned for four weeks, at the same place—Mr. Glover's Solicitor undertaking to give notice to all the shareholders.

A PROPOSED ELECTRICAL COMPANY FOR CARMARTHEN.

In the "Welshman," there has appeared a lengthy article pointing out the advantages of gas and some unfortunate experiences in connection with municipal electrical concerns. In putting his facts forward, the writer (who signs himself "A Gas Consumer") has in mind a suggested development in Carmarthen, as the following quotations will show: "Various rumours are afloat in the town as to the progress of the Carmarthen Electric Light Company, which has so long been in embryo, and which now, it would appear, threatens to blossom forth into actual existence. Recently a paragraph appeared in the newspapers that the Company had been formed, and that the subscribers were several lady clerks, whose names were given. Now, however, it is stated that certain local gentlemen have at last been induced to join the subscribers, and have taken parcels of shares varying in number from 250 to 50 each. Several of them are even named as prospective Directors; and these gentlemen, at any rate, are to be congratulated, for they at least, by the receipt of Directors' fees, will be sure of receiving something in return for their capital. Can it be for a moment thought that an Electric Light Company has any real prospect of success in a small town like Carmarthen, without any industries, and without any really great shops whose proprietors might even for a time be induced to take a supply of the current? As to the private consumer, the number of individual gas consumers is not so very great; and it is certain that only a very small proportion of them would be converted to electric lighting. The mere contract price for street lighting—£680—though it has been secured for fourteen years, can never pay the promised interest of 5 per cent. on a capital of £10,000, as it must not be forgotten that out of this working expenses have to be met. That the streets will not be better lighted than with incandescent gas is indisputable; and though I am not in favour of any lengthened contract with any Company, it is much to the discredit of the Town Council that, as they were entering into such a contract, they did not accept the offer of the Gas Company. The accepted tender at £680 per annum for electric light is for 51 lamps of 48-candle power, and 181 of 28-candle power—making a total of 7516 candles, which is less light than is at present supplied; while the Gas Company offered to supply all the 232 lamps, of at least 70-candle power each, making a total of 16,240 candles, for £667."

Carmarthen Employees' Bonus Scheme.—We learn that an interesting ceremony was quietly carried out at the Carmarthen Gas-Works on the 16th inst., when two of the Directors attended for the purpose of signing the agreements with those employees who had been accepted to participate in the benefits of the bonus scheme. The principles of the scheme, which will date from July 1 last, were explained to the men some few months ago. It has been adopted in order to encourage the employees to take an interest in their work, and make them feel that they will have some tangible result for their efforts. The manner in which they will participate in the profits is by a percentage on their wages, calculated upon the price of gas. A standard price is fixed at which no bonus is paid; and when the price is reduced, a percentage is added for every 1d. per 1000 cubic feet reduction. This scheme will not affect the shareholders in so far as the maximum dividend is concerned—that being definitely fixed; but it was considered that the general welfare of the Company would be improved, the consumers benefited by a reduced price, and the employees have the satisfaction of feeling a personal interest in getting the price as low as possible.

VIENNA GAS-WORKS.

Extraordinary Speech by Dr. Burgomaster Lueger—British Capital Given Notice to Quit.

The following article, with the above heading, appeared in last Thursday's "Financial Times."

A somewhat extraordinary speech was delivered last week in Vienna by Dr. Lueger, Burgomaster of the city, on the occasion of the tenth anniversary of the Municipal Gas-Works. Vienna's gas supply had for many years previous been entirely due to British capital; and the suburban supply is still being undertaken by the well-known English Company, with head office in London. As the main tenour of the speech, when unravelled from the various eccentricities which disfigure it as a business address to business men, seems to be that British capital is not wanted in Vienna—at least, by the party Dr. Lueger represents—we reproduce it for the British investor's consideration from the columns of the "Neue Freie Presse."

It was always an item in our party's programme, said Dr. Lueger, to construct our own city gas-works; and when we came into power in the Corporation, it was our first thought to make this point of our programme a reality. But you will pardon me when I say that it was a difficult task. Our opponents knew how to keep us from getting money, whenever it was possible. Wherever we went, we found doors closed against us; and it was a long time before we could finally get hold of money to carry the gas-works through. All things have an end, and this trouble had an end too. On a certain day the protocol with the Deutsche Bank for the City of Vienna gas loan was signed. On the afternoon of the same day, the evening papers reported that the action brought by the Municipality of Vienna against the English Company was lost on the first hearing. The shot was well aimed; but, thank God, it was fired off two hours too late. You know that the second hearing confirmed the judgment of the first. Previously two eminent Austrian Counsel had declared the opposite standpoint to be the correct one. I shall not argue the point with the Judges; they will have settled the matter, I suppose, with their own consciences. One thing, however, is certain. Our opponents raised a shout of triumph over the victory of the English view of the law; they thought we were annihilated. But it did not turn out that way. Our trust in God held us erect; the Lord Our God did not abandon us. He sent us a mild winter; and we built away with energy, so it was a pleasure to look at. For this, we have chiefly to thank two men—Director Rosner and Oberbaurat Kapaun. At the right time, at the given hour, the city gas-works were completed. At the right time, Viennese light was in all the streets of our city; and I believe that at that time the city gas was received with universal acclamation. . . . We find ourselves now at the commencement of an important extension of the city gas-works, which is to supply what was once the suburbs and now the 21st ward with city gas, to establish the sole supremacy of Viennese work in Vienna. This will see its accomplishment; and I can say that, not I, but many of those who are here to-day, will see the day on which it will be definitely true to say, "In Vienna there is no longer an Englishman; only more Viennese." That I wish to-day with my whole heart.

These remarks, made by the first Municipal Authority in Austria-Hungary, are all the more notable as we have on various occasions recently been led to believe that English capital was wished for to assist, as in the past, in the development of the Dual Monarchy. Dr. Lueger describes the difficulties he encountered before being able to secure the loan he required from the Deutsche Bank, and that, apparently, owing to the fortunate accident of certain news being published two hours late, when the loan had just been signed. Whether Vienna will find the European loan market more amenable in the near future, may be open to doubt, in view of political possibilities when the State is once deprived of the controlling influence exerted by its present venerated ruler. In any case, it is not particularly encouraging to find such language indulged in by one who in his own country occupies a similar responsible position to that held by the Lord Mayor of London in ours.

FINCHLEY PUBLIC LIGHTING.

Local Government Board and the Proposed Electric Lighting Loan.

At the last Meeting of the Finchley Urban District Council, a letter was read from the Assistant-Secretary of the Local Government Board with further reference to the application of the Council for authority to raise £2200 for the provision of electric arc lamps in Ballard's Lane, Regent's Park Road, and the Great North Road, Finchley. The writer said he was instructed to explain that the Board's view was that before sanctioning a loan in this case they ought to satisfy themselves that the precise object for which it was to be granted was one which would be in harmony with the interests of the ratepayers throughout the currency of the loan. In considering this question, the Board must necessarily have regard to the relative advantages of other alternative systems of lighting available; and it was for the purposes of this consideration that they had requested further information from the Council. This information had not been forthcoming; and, in the circumstances, the Board's decision could only be that, in the absence of it, they did not feel justified in sanctioning the proposed loan. The Highways Committee recommended that no further action be taken in the matter at present. Mr. Boggan argued that the Local Government Board had no right to attempt to force the Council to use gas instead of electricity. This was, in his opinion, a distinct attempt on the part of the Board to force them into the hands of a Company who, when they had no competition in the form of electricity, were in a position to charge excessively high prices for a poor commodity. Mr. Rabbidge thought the letter of the Local Government Board was only what might have been expected from custodians of the public purse. It must be remembered that the Council had refused to make inquiries

as to the cost of gas. Mr. Coltman reminded the Council that they had given an evasive answer to the Local Government Board, and therefore they could not expect any other reply than a refusal. In the result, the following motion was carried: "That a letter be sent to the Local Government Board to the effect that all available information asked for by the Board was supplied during the very lengthy and exhaustive inquiry held by the Board's Inspector; that the whole question of public lighting was thoroughly gone into at the time Finchley applied for, and obtained, electric lighting powers; that the decision then arrived at had been justified by the considerable reduction made in the price of gas; and that any prices offered by the Gas Company could only be regarded as competitive prices quoted for the purpose of undercutting the Council's undertaking, with an ulterior motive which it would not be in the interests of the ratepayers to entertain." The Chairman said it would be as well to announce now that they did not intend to take gas. They had their own electricity undertaking, and it would be madness on their part, under these circumstances, to employ gas for lighting the streets. It was not altogether a matter of price; it suited the Council to light the streets, as current was thereby used at a time when it was not required for other purposes.

MARYLEBONE BOROUGH COUNCIL.

Proposed Extension of Electric Lighting in the Streets—A Loan of £24,000 Needed.

At a Meeting of the St. Marylebone Borough Council on Thursday last, the following report was brought forward by the Electric Supply Committee.

We have had under consideration the resolution of the Council passed at their meeting on the 21st ult., instructing the Standing Committees to report as to any works that might be put in hand calculated to lessen the unemployment in the borough. In this connection, we have considered as to an extension of the work, now proceeding, of converting the public lamps from gas lighting to electricity.

The Council will recollect that when it was decided we should light the streets electrically, where our mains exist, there was considerable controversy, and that the London County Council refused our application for a loan of £8000 for the purpose, on the following grounds: (a) That the streets would not be better lighted if the change were adopted. (b) That we were not justified in adding to our heavy capital commitments, in view of the money that would undoubtedly be required for extensions in order to comply with our statutory requirements. (c) That they were not satisfied that the scheme would benefit the borough financially. (d) That the scheme would involve the destroying of a large part of the asset acquired by the borough at a cost of £11,000 when it provided incandescent gas-burners in the lamps some years ago. We dealt with these grounds of objection at the time; and in view of the experience gained since the date in question (March last), we have every reason to know that the case we then presented was sound in all respects.

The scheme adopted by the Council affected 1964 lamps; and up to date 1886 of the 1964 lamps have been changed over, at a cost of £523. The remaining 78 are estimated to cost £265. The capital cost will thus be £5788, as against the original estimate of £8336, and the final estimate of £6886. The annual charge to the Lighting Committee will be £7350, made up as follows: Current at 1.42d. per unit, £3950; and maintenance, renewals, and capital charges £3400. Of the £3400, £2500 covers cost of repairs, renewals, maintenance, &c., the balance (with the profit on sale of current) going towards repayment of capital cost. The Lighting Committee paid for these 1964 posts £8818 per annum for gas and maintenance, and are paying £7350 for electricity and maintenance.

If we obtain a ten-year loan for the expenditure of £5788, our estimated profit of £2500 per annum would have been increased by £200, representing the charges on the substantial reduction in capital outlay. As it had been decided to regard the expenditure (the money for which has been borrowed from our net revenue account balance) as spread over a term of three years, the estimated profit of £2700 per annum is reduced by £1360 during the first three years, but increased for the remaining seven years by £700 per annum.

After taking over 165 more lamps, near which we have cables laid, there still remain 1385 lamps in streets where at present we have no mains. The price paid by the Lighting Committee to the Gas Company and to Messrs. Pontifex (the Contractors) for running these lamps is £5600. The Gas Company having now reduced their price for gas by 1d. (from 2s. 5d. to 2s. 4d.) per 1000 feet, this cost will now be £5500. If we were to lay the necessary ducts and put in mains of sufficient size for the lighting of these remaining lamps (1385), the capital cost of the mains and ducts would be (a) with ordinary labour £19,965, and (b) with "unemployed" labour £23,042. The cost of altering the lamps themselves, for the purpose of electric lighting, would be £1385. The above includes the full cost of the ducts, which we would here point out would be available for supply to private consumers along the route, and the laying of which at this juncture would open up fresh fields for the development of the business of the department. In presenting the following figures, we have assumed that the Council will elect to carry out the work by means of "unemployed" labour—notwithstanding the heavier cost.

It is proposed that we should spread the cost of alterations to lanterns, &c., as before, over three years, and that we should make application to the County Council for sanction to, and the advance of, a 25-year loan of £24,000 for the purpose of extending the mains (being the amount of the Engineer's estimate (B) and £1000 for contingencies). Having regard to the greater expense involved in taking over these lamps compared with the cost in streets where our mains were already laid, we think the Lighting Committee should agree the total charge (if the Council agree to the scheme in principle) at the amount of the present gas lighting—viz., £5500 per annum. Upon this point, we should hope to have an opportunity of conferring with the Lighting Committee.

The cost of alterations to lanterns spread over the three years would

be about £500 per annum. The annual interest and repayment charges of a 25-year loan for the mains and ducts would be £1490; and maintenance and renewal charges would absorb £1870 per annum, making a total for these services of £3360 per annum. Assuming the Lighting Committee agree the charge at £5500, this would leave £1640 per annum for the electricity, equivalent to 0.9d. per unit for the first three years, and 1.17d. per unit thereafter, instead of 1.42d. per unit, the price allowed us for the existing lamps. Although these prices are lower than the present street lighting charges, they would yield a profit, and we should have the advantage of paying off, earlier than we otherwise could do, the cost of laying the mains in the remaining portion of the streets—about 24 miles—where at present no mains exist. This, as the Council are well aware, it is very desirable to do, as we are anxious to push the sale of electricity in all parts of the borough. At the present moment, it is impracticable to supply applicants in the undeveloped areas, as the cost of laying the mains for individual supplies is prohibitive. It is estimated that, of the cost of laying these mains and ducts, £10,650 represents materials, £3110 the cost of skilled labour, and £10,667 will be unskilled labour. Unskilled labour would be in the nature of the navvy's work, and would employ about 400 men for sixteen weeks.

With regard to the contention of the County Council in refusing the loan—viz., the lighting by electricity is not as satisfactory as lighting by gas—there is no question that, in actual measured candle power, the streets have much more light than they had before, and that with regard to the general effect this is in every way satisfactory, the lighting being very equally distributed, and giving more efficient results in case of fog.

Briefly, the advantages of giving effect to the foregoing proposals are that, while the present suggestion will not be disadvantageous to the undertaking, it will be beneficial for the future in that a considerable amount of capital will be laid down in the form of mains from which future revenue will be derived as consumers come in; that electricity will be brought to the poorer parts of the borough and made available both for lighting and power in streets in which we cannot comply with applications at present, on account of the absence of mains; and that unskilled labour to the extent of 400 men would be employed for sixteen weeks. Benefit to the unemployed question would thus be given not only as to the actual employment but, at the end of the sixteen weeks, the men employed, if working throughout the period, ought no longer to be described as unskilled.

We commend the scheme to the Council; and as the matter is one of urgency—if any benefit is to accrue to the unemployed—we have asked the Lighting Committee to give it their prompt consideration, and the Finance Committee to bring up the necessary recommendation for application being made to the London County Council for sanction of the proposed loan of £24,000 for this purpose.

We recommend that we be authorized to carry out the completion of street lighting by electricity throughout the borough in accordance with the details of the scheme set forth above, subject to the Lighting Committee concurring therewith and to the London County Council sanctioning the loan.

Alderman DEBENHAM (the Chairman of the Committee), in moving the adoption of the report, pointed out that work would be found for 400 men for sixteen weeks at 25s. per week.

Mr. GARROLD seconded the motion. There were, he said, 24 miles of streets in which the main and ducts were not down; and to put them in would be a great advantage to the electric light undertaking, because then they would be able to connect up a number of consumers.

Colonel MAUDE criticized the figures given in the report, and asked how it was that some members of the Council objected to discussion taking place on proposals put forward by the Committee. Why should not these proposals be discussed? He objected altogether to adding to the capital of the concern. He had prophesied that when the £8000 was asked for, that was only the thin end of the wedge; and his statement had been justified. He believed that the Committee and the Council required advice, and recommended them to go to the Local Government Board. They had had rosy accounts of profits; but he did not feel that these accounts were justified. In view of the enormous debt, he hoped the Council would hesitate before adding another £24,000 to it.

Mr. RUSSELL said they had had a great deal of "expert opinion"—too much, in fact. He thought, however, that the Supply Committee should not be hampered. The poor streets should be as well lighted as the others; they paid as much in proportion. The Chairman of the Committee had been very courageous throughout; and it was remarkable that the borough electrical undertaking had been so successful as it had been.

Alderman DENNIS moved as an amendment that the Council should decline to give a decision until the report of the Lighting Committee had been presented to them. If the Council had this report, they would be prepared to vote, but not otherwise.

Alderman MARTIN MORRIS seconded the amendment, and said that the Gaslight and Coke Company had never been given a chance to see what they could do in the way of illumination at the same cost. He believed in healthy competition. The Company should be enabled to show what they could do at anything like the same figure as electricity cost.

Mr. NONWEILER gave the views of the Lighting Committee, of which he is Chairman. The Committee, he said, had considered the present scheme, and had decided to concur in it—making, however, several stipulations, one of the latter being that the Committee considered that they ought not at any time to pay more for the electricity than for a corresponding supply of gas. Recently the Committee noticed the Gas Company had reduced their prices for public lighting; and this had affected them in making the stipulations referred to.

Councillor DUNN said if there was any competition in regard to the electric lighting, it should be carried on in a fair way. It was curious that the unskilled labour question should be dragged in.

Mr. FETTES said there could be no misunderstanding in the matter. The Council knew perfectly well that the subject was brought up by the Electricity Committee with the object of carrying out the special instructions of the Council to help the unemployed. In his opinion, the matter should not be postponed. If it was delayed, the Council

would have to give up all hope of doing anything for the unemployed during the winter.

Mr. J. LEWIS spoke in support of the amendment. After the information Mr. Nonweiler had given them, he really thought it would be well to have further opportunity of inquiring into the matter. It seemed that even the figures put forward in the report were not accurate.

Alderman ANGLIM said that if there was one thing advocated at the recent elections, it was that useful work should be found for the unemployed.

The amendment was decisively defeated; and the MAYOR declared that the motion had been carried *nem. con.*

AN EX-COUNCILLOR ON MUNICIPAL TRADING.

In opening a discussion on "Municipal Trading," in the County Forum, Manchester, a few days ago, Mr. J. W. J. Cremlin, an ex-councillor, declared emphatically that he was "against municipal trading out and out." He objected to it because, in his opinion, it was entirely foreign to the original intention of Parliament in conferring on municipalities the very large and very wide powers of local government. The function of municipal government ought, he said, to be strictly confined to matters which were the subjects of government rather than to those that appertained to trade, business, or industry. Sanitation, the public health, the administration of the highways, and so forth, were the original functions directly conferred on local government; and since then Parliament had, by a specific Statute, enlarged the boundary of what he might call strict municipal function by charging corporations with the duties of administering the Education Act and the Old Age Pensions Act. He considered that the municipalities of this country had a sufficiently onerous duty to discharge in carrying out the great Acts of Parliament appertaining to public health, education, and old age pensions, without including in it the domain of private enterprise. He was a stern opponent of municipal trading, because he believed that, in the attempt to engage in all kinds of speculative enterprises, corporations had failed to discharge to the best advantage those functions of government which were originally entrusted to them.

Forty years ago, when the governing bodies of towns concentrated their minds on matters of government rather than of trade, the entire cost of municipal government throughout the country was £36,000,000. This amount had increased five times, and at the end of last year the total cost of municipal government was £162,000,000. This great advance coincided with the rapid increase in municipal trading activity; and he believed that a vast amount of the debt was due to bad management. He did not say bad intentionally, but due to the fact that the heterogeneous body of men in the Councils—men with wide sympathies and large views, no doubt—were absolutely incapable of managing the various commercial businesses entrusted to them. The result was that these were expensively and extravagantly managed, and public money was thrown away in a fashion that it would not have been if private companies had carried on the businesses.

The debt of the Corporation of Manchester to-day stood at approximately £23,000,000; and the paper value of their assets was returned at £30,000,000. But any commercial man knew perfectly well that the paper value which a corporation, or, indeed, a private individual, might place on his available assets was not by any means the sum which these assets would realize if put up for sale, especially a forced sale. He did not believe they were getting value for the expenditure that was taking place, and that the vast amount of the expenditure was due to the leakage and bad management which were the result of endeavouring to do too much. However able the representatives on any council might be, they were not experts in the various municipal undertakings that a corporation now carried on. The result was that corporations, generally speaking, left more and more in the hands and under the control of the highly-paid official in the Town Hall; and the result was that gradually there was growing up throughout the length and breadth of the country a dictation, a will, a tyranny by a class of officials, instead of government by the representatives of the people themselves.

An Evening at the Chichester Gas Workers' Club.

The "Chichester Observer" for last Wednesday contains an appreciative article, by an old resident of Chichester, on the Gas Workers' Club, at which he spent the previous Friday evening. After describing the room and the various kinds of amusements to be found therein, not only for the employees, but also for their wives and children, he says: "The management of the Gas Company, to whose initiative this splendid work is wholly due, are to be highly congratulated, not only upon the remarkable success and vitality of the movement, but also upon the enterprising and broad-minded policy towards their working staff which the provision of the beautiful room and all its appointments indicate." He regards the success of the movement as largely attributable to the genial personality of the Company's Engineer and Manager (Mr. T. E. Pye), who is ably seconded by his wife. Mrs. Pye has for some years past conducted a weekly meeting of the women-folk attached to the club, where sewing, savings bank, and other business is conducted for the benefit of the homes represented; and both Mrs. Pye and the family have associated themselves in the work necessarily incident to the weekly and fortnightly entertainments. The writer considers that the inhabitants of Chichester have in their midst a movement the like of which, if adopted by all the large undertakings, would very "quickly dispose of our labour troubles, and could not fail to promote the well-being of the two great parties concerned—Capital and Labour—and be of an unbounded benefit to the whole of the community."

Extensions at the Abertillery Gas-Works.—At Abertillery last Tuesday, Mr. H. R. Hooper, M.Inst.C.E., one of the Local Government Board Inspectors, held an inquiry into the District Council's application for a Provisional Order, and for sanction to borrow £8800 for the extension of their gas-works. There was no opposition.

LIVERPOOL CORPORATION WATER SUPPLY.

Important Works Approaching Completion.

At the Meeting of the Water Committee of the Liverpool Corporation last Tuesday, Colonel Porter was elected Chairman for the current year. After expressing his thanks to his colleagues for the honour they had conferred upon him, and bespeaking their whole-hearted sympathy and assistance in discharging the duties of a position which had been so ably filled by his predecessors, he offered a few remarks on the work of the Committee. He said, though the most important of the new works on which they had been engaged during recent years had now been completed, or were approaching completion, there were several matters which would occupy attention in the course of the municipal year now beginning. The extent of the ordinary work of administration and maintenance in the department would be realized when it was remembered that the population now supplied with water by the Corporation was 1,120,000, and that it was increasing every year at the rate of about 12,000. For these new consumers new distributing mains had to be laid, and other arrangements and extensions made to provide the additional volume of water required. The diversion of the River Mersey into Lake Vyrnwy, which was nearly finished, was an event of considerable importance, because it marked the completion of the Vyrnwy scheme so far as regarded the works required at the Vyrnwy end of the system for the full utilization of the gathering-grounds from which the Corporation were empowered to collect water. They propose to invite the whole Council early next year to celebrate this important event by a visit to the lake to witness the ceremony of turning on this valuable and final addition to their magnificent reserve. Any new works that might be required hereafter to bring more water from Lake Vyrnwy to Liverpool would be in the nature of aqueducts, and not works at the source of supply. On the aqueduct itself there still remained to be carried out some of the works designed as part of the second instalment of Vyrnwy water. The first of these in order of importance was a balancing reservoir at Malpas, the construction of which had been postponed while more urgent works had been receiving attention. Then there were strainers at the head of the pipe-line at Hirnant which had also been postponed; and, as the demand for water increased, more filter-beds would be required at Oswestry. In connection with the control over the distribution of water in and around Liverpool, the revision of the plumbing regulations had for some time engaged the attention of the Engineer (Mr. Joseph Parry, M.Inst.C.E.), and a new code would soon be ready for submission to the Committee. These were the chief matters that occurred to him as likely to demand the early attention of the Committee outside of the ordinary routine duties, and of the many, and often very important, matters that constantly arose in the course of administering an undertaking of the vast magnitude and complexity of the water-works required for the wants of the people of Liverpool.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

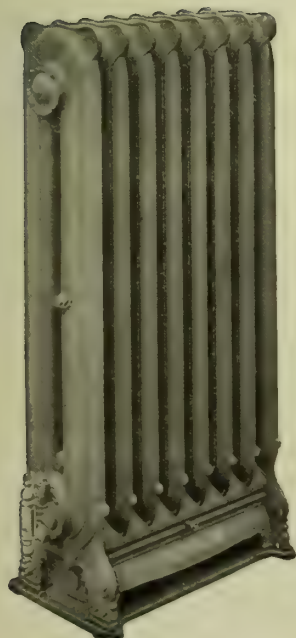
Saturday.

The visit of the Western District of the Scottish Junior Gas Association to the Greenock Corporation Gas-Works this afternoon was interesting in view of the fact that only three years ago Mr. J. M'Leod, the Engineer and Manager at Greenock, was President of the Association. Mr. M'Leod is the first in Scotland that has risen from the ranks of the Association who has had the privilege of showing his works to his former colleagues. The visit would have been a pleasant one in any event, because of the cordiality with which the Association were received, both by Mr. M'Leod and members of the Corporation; but the sense of former comradeship must have heightened the feeling of respect on both sides. Mr. M'Leod has the charge of an important works—works which will give scope for his energies for some time before they are in what may be called a state of completeness. Given time and favourable conditions, however, there is every reason to believe that the work of betterment will proceed steadily; the Corporation being at present in a mood to go forward, and the Engineer being capable of advising them in their movements.

The Corporation of Glasgow have this week published intimation of their intention to apply for a Provisional Order for the consolidation of the statutes under which the Gas Department is administered. The first clause seeks the repeal of all or any of the Glasgow Gas Acts, 1869 to 1909, and the re-enactment and consolidation of all or some of them. Then follow in detail some of the powers which are to be asked for. These include a definition of the area of supply, which is defined as the city and the suburbs and adjoining places, which are enumerated, "and any other villages and places in the vicinity of the city, suburbs, places, and parishes before referred to, and other places intermediate and adjacent." The limits of supply it is proposed to divide into two districts—the city supply district and the supplementary supply district, in the latter of which authority is to be asked to charge higher prices for gas. Power is also sought to charge differential prices for gas for all purposes and in both districts. Authority to require anti-fluctuators on gas-engines is another power asked, as is also authority to pay superannuation allowances to employees. In the financial arrangements, it is proposed to make provision for the application of the revenue of the gas undertaking, and to authorize the Corporation to apply any surplus revenues for the benefit of the undertaking, or to pay the same to the credit of the Common Good fund of the city, or to apply them in the extinction of debt. The measure is a large one, and will entail a great deal of labour upon those who may be called upon to consider it.

This has been a week of prolonged and dense fog in the west of Scotland; daylight having been all but unknown in some places from Monday till Friday afternoon. In the "Glasgow Herald" of Thursday, in an article on the subject, the following statement was made: "A striking illustration of the effect which a spell of fog has upon the

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The "St. Andrew" is earning more golden opinions than ever!

The "St. Andrew" led the way from the first and still leads.

JOHN WRIGHT & CO.,
The Radiator Experts,
Essex Works, BIRMINGHAM

resources of the Glasgow Corporation Gas Department, and the expenditure which it involves upon the citizens, is furnished by the remarkable demand experienced for gas for lighting and heating purposes since the fog set in. During the 24 hours which ended at six a.m. on Tuesday, 32,720,000 cubic feet of gas were sent out from the works; but even this enormous quantity was exceeded during the 24 hours which ended at six a.m. yesterday morning, when a total of 37,245,000 cubic feet was delivered. This is the largest quantity ever sent out during the same period of time in the history of the Glasgow Gas Department. The previous highest records were: Dec. 23, 1904, 37,135,000 cubic feet; Dec. 25, 1905, 34,259,000; Dec. 21, 1906, 36,179,000; Nov. 25, 1907, 34,569,000; and Dec. 29, 1908, 34,830,000. The normal consumption of gas at this season of the year is about 27 or 28 million cubic feet; so that this was exceeded on Tuesday to the extent of 10 million cubic feet. The demand yesterday seemed to be equally great. Yesterday it was intimated, in the same newspaper, that the consumption of gas during the 24 hours which ended at six o'clock on Thursday morning was 35,119,000 cubic feet. To-day it is announced that there was again an exceptionally large consumption; but the pressure was reduced, to conserve the supply. The total quantity sent out in the 24 hours which ended at six o'clock on Friday morning—32,651,000 cubic feet—was below that of the preceding day.

It is announced that in Paisley, as compared with the same period of last year, there had been an increased consumption of gas to the extent of 49·2 per cent., though the increase on Tuesday was 86·2 per cent. The great demand for gas taxed to the utmost the producing power of the gas-works; but all demands, with the minimum of inconvenience, were successfully met by the Gas Manager, Mr. G. R. Hislop.

The inhabitants of the village of Ceres, in Fifeshire, at a public meeting on Tuesday evening, rejected a proposal for the lighting of the village. It was explained to them that, as the result of inquiries, it had been ascertained that the proposed scheme would entail an outlay of £50 to inaugurate, and a yearly charge of £25, which would mean a tax of 4½d. in the pound on the ratepayers; and that one half of them were unable to pay, and the other half were unwilling. It was consequently resolved to take no further action in the matter. There will, it is safe to say, be one house in the village which will be efficiently lighted, notwithstanding this resolution—that of Mr. W. Key, late Manager of the Tradeston Gas-Works in Glasgow, who is the owner of a system of lighting by means of petrol gas.

Mr. A. Milne has been appointed Convener of the Gas Committee of the Corporation of Aberdeen, in succession to Mr. W. A. Stewart.

The Town Council of Kirkcaldy held their second meeting last Monday evening for the purpose of considering the adoption of the Burghs Gas Supply (Scotland) Act, 1876; and they unanimously affirmed the previous resolution in favour of adoption.

At the sixth annual social gathering in connection with the Sick Benefit Society of the Edinburgh and Leith Gas Commission employees, held in Edinburgh last night, Mr. W. R. Herring, who presided, stated that the Society was in a prosperous condition. During the past year the income amounted to £290, while the expenditure totalled £188,

which had been paid out to 87 members. It would, therefore, be seen that the fund was well established; and when it was remembered that in their last Provisional Order the Gas Commissioners obtained sanction to contribute to the fund when it was found necessary, this should be an additional incentive to join the Society. While they had an actual membership of 308, representing only 40 per cent. of the total number of employees, it might be reasonably expected that many more would join it. Even if a contributor did enjoy the best of health for a number of years, he would have the gratification of knowing that he had helped others.

Mr. H. Richardson, the Electrical Engineer to the Corporation of Dundee, on Tuesday evening asked the Electricity Committee for the appointment of a Sub-Committee to consider as to the lighting of common stairs by electricity automatically managed from the station. He stated that several tenements in the vicinity of the Dudhope Power Station had been fitted up with the necessary appliances. He wished a Sub-Committee to go into the whole question. This was unanimously agreed to.

The Corporation of Aberdeen have this week given notice of application for a Provisional Order, in which they are to seek powers to proceed with the procuring of a new water supply from the River Avon, a tributary of the River Spey. The measure is likely to be fiercely opposed by the proprietors of lands affected.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, Nov. 20.

So far as fresh orders for near delivery are concerned, the market has been dull and uninteresting; but dealers apparently still have sufficient uncovered sales on their books to enable them to make use of all the present output, and values have been sustained at £11 1s. 3d. to £11 2s. 6d. per ton f.o.b. Hull, £11 2s. 6d. to £11 3s. 9d. per ton f.o.b. Liverpool, and £11 3s. 9d. to £11 5s. per ton f.o.b. Leith. Makers continue to quote £11 7s. 6d. to £11 10s. per ton for forward delivery, according to the period required and the port of shipment; but there is speculative offering abroad at considerably less money.

Nitrate of Soda.

The position of this article has not improved, and values are barely maintained at 9s. 3d. per cwt. for 95 per cent. quality, and 9s. 6d. for 96 per cent., on spot.

Tar Products.

LONDON, Nov. 22.

Markets for tar products have been quiet throughout the past week. Pitch is steady without very much change in price. Business has been done on the east coast at prices varying from 25s. to 26s. per ton; and on the west coast at equivalent figures. There has not been very much demand from the Continent, and buyers still appear to be holding off



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PURE HEATED AIR.

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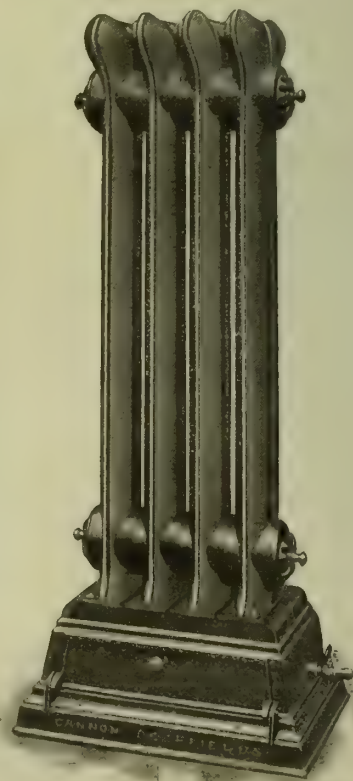
The Doors, Front and Back, can be opened, and form convenient Trivets, and at the same time, when opened, the Copper Reflector which is fitted inside becomes visible and produces a very pleasing appearance.

CANNON IRON FOUNDRIES, LTD.,

DEEPFIELDS, Near Bilston, Staffs., Eng.

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in the hope of lower prices. Creosote is quiet. Business is reported to have been done in London at 2½d.; but the large makers are evidently well sold, and prefer to wait for the present. In the North, oil is quiet, and business is reported at 2d. Benzol is steady at existing prices. There is a good demand for toluol. Solvent naphtha is firm, and there appears to be a shortage in this article in some districts. Carbolie acid is very quiet; but the Continental consumers are evidently very well stocked with crude. Crystals are very dull, and are reported to be selling at very low prices. Tar maintains its value.

The average values during the week were: Tar, 13s. to 17s., ex works. Pitch, London, 26s. to 26s. 3d.; east coast, 25s. 3d. to 25s. 9d.; west coast, 24s. to 25s. f.a.s. Mersey ports, 25s. f.o.b. other ports. Benzol, 90 per cent., casks included, London, 6½d. to 6¾d.; North, 5¾d.; 50-90 per cent., casks included, London, 7½d.; North, 6½d. to 7d. Toluol, casks included, London, 9½d. to 9¾d.; North, 9d. Crude naphtha, in bulk, London, 3½d. to 4d.; North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 1s. to 1s. 1d.; North, 11½d. to 11¾d.; heavy naphtha, casks included, London, 10½d. to 11½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. Carbolie acid, 60 per cent., casks included, east coast, 10½d. to 10¾d.; west coast, 10½d. to 11d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been quiet throughout the past week, and there has not been very much business doing, though in some instances a fair price has been paid for spot lots, seeing that dealers have probably some quantity to cover. In London, the principal Gas Companies quote £11 5s. for prompt, and £11 8s. 9d. for January-June. Outside makes are selling upon Beckton terms at £10 18s. 9d. to £11, and London terms are about the same. In Hull, the market is £10 18s. 9d. to £11. In Liverpool, the price is about £11 1s. 3d.; and £11 3s. 9d. is reported to have been paid for immediate shipment. In Leith, business has been done at £11 5s. for prompt, and £11 7s. 6d. for January-June.

Regulating the Size of Gas-Pipes at Nottingham.—The Nottingham and District Master Plumbers' Association welcomed the Mayor (Mr. A. Ball, J.P.) to their rooms on Monday night last week. The Mayor addressed a few remarks to his fellow-members, giving them advice beneficial to themselves and the city generally. He said he intended advocating to his colleagues on the Gas Committee, of which he is the Chairman, the issue of a code of regulations governing the sizes of pipes to be fixed in all buildings receiving their supply of gas from the Corporation. It is stated that master plumbers are confident that, in the event of this progressive measure coming into force, and being made compulsory, very little will be heard in the future of the delinquencies of the Gas Department.

COAL TRADE REPORTS.

Northern Coal Trade.

Except where lack of steamers interferes with the shipment, the coal trade is rather more active in both the chief classes of fuel. In the steam coal trade, the demand is fair; and for best Northumbrian steams, the quotation is from 10s. 6d. to 10s. 9d. per ton f.o.b., second-class steams are from 9s. to 9s. 3d., and steam smalls from 5s. to 6s. There is now a fuller demand setting in for next month, which is a period of short work through holidays. In the gas coal trade, the inquiry grows rather more pressing, as the great users desire to accumulate stocks for the heavy consumption at the turn of the year; and the exports are also heavy. Durham gas coals vary from 9s. 9d. to 11s. per ton f.o.b. for the usual classes, according to quality; while for "Wear specials," the quotation is up to about 11s. 6d. A contract for second-class gas coals for shipment to the Mediterranean over next year is reported. It is for about 100,000 tons; and the accepted price is expected to leave about 10s. 6d. per ton f.o.b. Some other contracts are in the market; but with the unsettled condition of labour under the Eight Hours Act coming into operation here at the end of December, there is some uncertainty as to the prices that may rule. Coke is firmer; and gas coke, despite the larger output, seems to be strongly held. Good gas coke is from 13s. to 13s. 6d. per ton f.o.b.

Scotch Coal Trade.

The market has been more active, there being a better foreign demand. The cold weather has improved the position of the home market for household purposes. Steam coal is not in any greater request. The prices now quoted are: Ell 9s. to 10s. 6d. per ton f.o.b. Glasgow, splint 10s. to 10s. 3d., and steam 9s. to 9s. 3d. The shipments for the week amounted to 314,291 tons—a decrease of 9130 tons upon the previous week, but an increase of 4387 tons upon the corresponding week of last year. For the year to date, the total shipments have been 13,401,571 tons—an increase of 516,473 tons upon the corresponding period.

The annual social gathering of the officials connected with the engineering departments of the different stations of the Manchester Corporation gas undertaking was held last Saturday evening, at the Albion Hotel, Piccadilly, in the city. There were about 60 present, including the President, Mr. J. G. Newbigging, the Chief Engineer. There was a whist drive, and four prizes were offered; the first being given by Mrs. Newbigging, and the others by the Managers of the different stations. Following the whist drive, and after refreshments had been partaken of, the room was cleared for dancing; Mr. C. E. Woodhead officiating as master of the ceremonies. The programme included several songs; and a very pleasant evening was spent. The prizes won in the whist drive were presented to the successful players by Mr. Newbigging; and he was accorded a hearty vote of thanks for his services.

Richmond's "A.B.C." Gas Fires.

LARGEST SALES ON RECORD!

1. BECAUSE they give the greatest amount of radiant heat for the lowest possible consumption of gas.
2. BECAUSE of their interchangeability of parts: **14** sizes, **5** designs, and only two sets of parts required for renewals.
3. BECAUSE of their scientific superiority in construction.
4. BECAUSE every fire is tested by **EXPERT MEN** before despatch.



A RABIAN.



B AVARIAN.



C ASTILIAN.

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.

London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington.

New Joint-Stock Companies.

The Liphook Gas Company, Limited, has been registered with a capital of £5000, in £10 shares, to carry on the business of a gas and water company in all its branches. The Tilley High-Pressure Gas Syndicate, Limited, registered with a capital of £50, in 1s. shares, has been formed to carry on the business of lighting and heating engineers, gas-fitters, sanitary engineers, &c.; also to enter into an agreement with Messrs. T. W. Brown, R. Riches, and W. H. & F. C. Tilley. The Hercules Incandescent Mantle Company, Limited, has been registered with a capital of £20,000, in £1 shares, to purchase or otherwise acquire interests in any patents, &c., conferring an exclusive or non-exclusive right to use, or any secret or other information as to any invention in relation to, incandescent mantles, and apparatus therefor; and in particular to acquire from E. Seymour, of 24, Whitcomb Street, Pall Mall East, S.W., the benefit of certain existing inventions in relation to improvements in the manufacture of incandescent bodies; and also to enter into an agreement with him.

Progress of the Island Barn Reservoir at Molesey.

Our readers may remember that about this time last year a commencement was made with a storage reservoir, having a water area of about 120 acres and a holding capacity of 1000 million gallons, for the Metropolitan Water Board, at Island Barn, Molesey. It was put in hand rather sooner than was originally intended, at the suggestion of the President of the Local Government Board (the Right Hon. John Burns), with the view of giving employment. In the twelve months which have elapsed since the first turf was cut, the puddle trench has been completed, and the embankment formed around the entire reservoir for heights varying from 3 to 20 feet. A 54-inch pipe-line, more than 1½ miles long, partly in cast-iron and partly in steel, has been laid from the pumping-station which is now being erected in connection with the Walton reservoir; and junctions are being made with two other lines of pipes, 54 and 36 inches diameter respectively, from the Molesey intakes. These connections consist of two 36-inch pipes from the 54-inch, and one 36-inch from the 36-inch. These pipes will be carried to the top of the embankment, where they will discharge into a brick-lined chamber having a sill at the level of the high-water mark of the reservoir. The new 54-inch pipe branches near the base of the embankment into two 36-inch mains, which will also be carried into the chamber referred to; thus making five 36-inch discharge pipes in all. These intake works are well in hand, and will probably be finished throughout during the coming year. The work has been designed by Mr. W. B. Bryan, M.Inst.C.E., the Chief Engineer of the Board.

Early History of the Stretford Gas Undertaking.

Alderman Sir Bosdin Leech, J.P., in a series of articles he has written on "Old Stretford," supplies some interesting facts concerning the early history of the Stretford gas undertaking. Up to 1852, the people of Stretford had to depend for light on "penny dips," sperm candles, or oil-lamps, which were trimmed with antiquated snuffers. In January of that year, a Provisional Committee was appointed to negotiate for the purchase of a suitable plot of land on which to erect gas-works. A site was secured near Langford Bridge, and a Company formed with a modest capital of £2861 10s.; the first Chairman being Mr. George Bannister. In June, 1862, an Act of Incorporation was obtained; the capital being £30,000. Mr. Benjamin Barber was the Company's first Secretary; and on his election to the Board he was succeeded by Mr. James Moore, who retained the position till 1867, when the present Secretary, Mr. Benjamin Haynes, was appointed. About the year 1880, the action of the Directors in voting a bonus to the shareholders instead of applying in reducing the price of gas profits not required for the statutory dividend was challenged, and litigation followed. In the result, the Court held that the Directors had acted wrongly; and the shareholders had to return to the gas funds the money they had received as bonuses. In 1854, the output of gas was 1,752,000 cubic feet; in 1881, it was 36,113,600 cubic feet; and in 1908, the figures were 353,942,000 cubic feet. In 1852, the price of gas was 7s. 6d.; in 1862, 5s.; and now it is 2s. 3d.

Gas Exhibition at Chester.

On Monday last week, a comprehensive exhibition of gas appliances was opened in the Music Hall, Chester. It was initiated by the Directors of the Chester Gas Company, and carried out by the Secretary and General Manager (Mr. F. A. Pye). Messrs. John Wright and Co. had a large display of their specialities, including their patent "Thermo" front gas-fire, and their gas-heated hot-water circulator. Messrs. Fletcher, Russell, and Co., Limited, had an attractive stand, on which were displayed their latest designs in gas fires and cookers and their water-heating appliances. The lighting arrangements of the hall were carried out by the Welsbach Incandescent Gaslight Company, Limited. In the entrance were two Welsbach inverted lamps of 400 and 550 candle power respectively; and the hall was lighted by 600-candle Welsbach-Kern self-intensifying lamps. The Company had a stand at which lamps and fittings in great variety were shown, as well as Kern gas-radiators. An interesting exhibit consisted of two street-lamps, one fitted with a self-intensifying burner giving a light of 300-candle power, with a consumption of 10 cubic feet of gas per hour, and the other containing the No. 3 Kern burner generally employed for public lighting. Among the other exhibitors were Messrs. Sawyer and Purves, who showed gas-meter testing apparatus, models of retort-house governors, and gas-fittings of all kinds. On Wednesday, in the presence of the Mayor (Alderman Hewitt), who presided, Mr. J. G. Frost (the Chairman of the Company), Mr. Pye, and Mr. J. C. Belton (the Engineer), Mr. E. Allen, the Engineer of the Liverpool Gas Company, gave an interesting lecture on "Coal Gas." In introducing Mr. Allen, the Mayor said several people had remarked to him that the Corporation ought to own the gas undertaking; but he was not of that way of thinking, because it was far better for the householder that there should be a competitor to the electric light. Mr. Allen then delivered his lecture, and was accorded a vote of thanks, as was also the Mayor for presiding. The exhibition closed on Saturday.

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More **BLAND** Light Testimony

ST MARY'S HOUSE.

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6th Nov 1909

Sir,
You will be pleased to hear that the 55 "Bland" gas burners fixed in Ross Parish Church 3 years ago. Continue to give more than satisfaction. The total Gas bill for the past 12 Months amounted to £8. 2. 2 only. with Gas at 4/- per 1000.

The upkeep of mantles is very little + I consider the "Bland Light" is the best and most economical gas burner in the market.

Yours faithfully,
Wm. Watkin

Churchwarden
St Mary's Ross.

Gas supplied to Ross Church for Year ending Sept. 30th, 1906, with naked Burners	£32 13 3
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THE BLAND LIGHT SYNDICATE, LIMITED,

63, Queen Victoria Street, LONDON, E.C.; and
20, Fennel Street, off Corporation Street, MANCHESTER.

Sales of Stocks and Shares.—There was very keen competition for the new issue of £21,500 of "B" stock of the Southend Gas Company which Messrs. A. & W. Richards made at the Mart, Tokenhouse Yard, last Tuesday, under instructions from the Directors; and it was all sold at from £108 2s. 6d. to £110 per £100. The £3500 of 4 per cent. perpetual debenture stock of the Company, which they offered at the same time, was sold at par. They also placed a new issue of 400 £10 "B" shares of the Tendring Hundred Water Company, ranking for 8 per cent. dividend, and carrying 4½ per cent. from the 1st prox., at £11 2s. 6d. to £11 7s. 6d. per share.

Water Charges at Haverhill.—At the meeting of the Haverhill Urban District Council on Monday last week, the Water-Works, Sanitary, and Sewage Committee reported that they had considered the present charges made for water supplied by the Council, and recommended—"That, the special loan for the water-works having now been paid off, the charge be put back from 1s. 2d. to 1s. in the pound, and that the charge of 1s. 2d. per 1000 gallons be reduced to 1s.; the reductions to come into force for water supplied after Jan. 1, 1910." In moving the adoption of this report, Mr. J. B. Coster explained that about five years ago, when it became necessary to replace one of the old pumping sets at the water-works, the Council contracted a loan for the purpose; and this had now been repaid. At the time the loan was entered into, the price of water was raised from 1s. to 1s. 2d. per 1000 gallons; but the Committee thought that it should now go back to the former figure. The report was adopted.

Ballymena Water Supply.—Last Wednesday, Mr. P. C. Cowan, an Inspector of the Local Government Board for Ireland, attended at the Town Hall, Ballymena, and held an inquiry regarding the Urban District Council's application for a loan of £9000 for the purpose of improving the water supply to the town. The Clerk and Surveyor (Mr. H. O'Hara) said the amount on outstanding loans on water, sewers, gas, abattoir, and fire-engine, was £40,403, which did not include the loan of £1200 for technical purposes. The valuation of the urban district on houses, lands, half annual rents and Government property, was £34,236, and the rateable value of the buildings and land was £34,057. The rate was 5s. 8d. in the pound. The town was supplied by an 8-inch main from the filter-beds; and though this had been scraped several times, it was not adequate, so far as the requirements of the town were concerned, for a proper water supply. Mr. S. Bonnar, the Convener of the Water Committee, said there had existed a great grievance for many years owing to an insufficient supply of water both for domestic and sanitary purposes. There was no opposition to the application; and the Inspector will report in due course.

Creswell Water Supply.—Two schemes have lately been before the Creswell Parish Council for the supply of the parish with water. One was the Welbeck scheme, under which the Duke of Portland would supply the water at 9d. per 1000 gallons, and lay the mains to the reservoir and build it; the parish having to provide the distributing mains. The Bolsover Colliery Company promised the parish the gift of their mains, which would save about £3250. The Duke provided for a minimum supply of not less value than £200 per annum. The other scheme was the Manton; and according to the Engineer's report upon it, the capital charges would be £2335, and the annual charge for water, repayment of loan and interest, maintenance, and wages would amount to £2823 for the district. This would be very favourable, and less than the cost of any scheme that could be carried out now or in the future. It was stated that at the end of the first thirty years the parish would save £8370, and at the end of the second thirty years £20,000. When sanction for the loan had been obtained, the water would be ready in nine months. It was unanimously resolved to support the Manton scheme.

Difficulty Respecting a Gasholder Site.—In connection with the scheme prepared by Mr. J. A. Gray for the extension and improvement of the Ashburton Gas-Works, application is to be made to the Local Government Board for a loan of £2000. At the last meeting of the District Council, a letter was received from the Local Government Board asking if the consent of the owners and occupiers of property within 300 yards of the proposed site of the gasholder had been obtained, as required by the Ashburton Gas Order, 1899. The Board intimated that they would require to be satisfied on this point before they granted their sanction to a loan for the erection of a holder, &c., on other land than under the schedule. It was stated that this had not been done, as the Gas Committee had not had this condition of the Order before them. The Chairman (Mr. J. P. Tucker) said they had been informed by the Clerk that very few people had given their consent to the erection of the holder on the suggested site; and he thought the Committee should consider an alternative scheme. Mr. Lamason, Chairman of the Gas Committee, remarked that the Committee and Mr. Gray considered all alternatives. They were ignorant that the consent of every owner and occupier within 300 yards had to be obtained. It was decided that the Council should consider the opposition to the present scheme before deciding upon an alternative plan.

Water Supply of Exmouth.—The Exmouth Urban District Council held another meeting on Wednesday last with reference to the water scheme. A letter was received from Lord Clinton, the owner of the land, offering to present to the town the fee simple of the land on which the boring has been made at Dotton, with the right to take an unlimited supply of water. The conditions attaching to the gift are that the Council shall provide a supply of water for the farm on which the boring has been made, make good such supplies of water as may be affected by the boring or pumping operations, and supply from their mains any premises or places on his estate for which Lord Clinton may require water, on payment of the same rates as those charged within the Council's district, subject to the proviso that the Council shall not be required to supply water above the level of their reservoir, nor unless there is sufficient water available after the requirements of Exmouth have been furnished. His lordship also offered to grant the necessary easements for pipes in perpetuity at an annual rent of £1. The Chairman (Mr. W. C. Creedy) moved a vote of thanks to Lord Clinton, who, he said, could not have met them on better terms. The Rev. O. J. Reichel, and other opponents of the scheme, declined to support the motion, on the ground that it would commit them to the scheme. The motion was carried by eleven votes to five.

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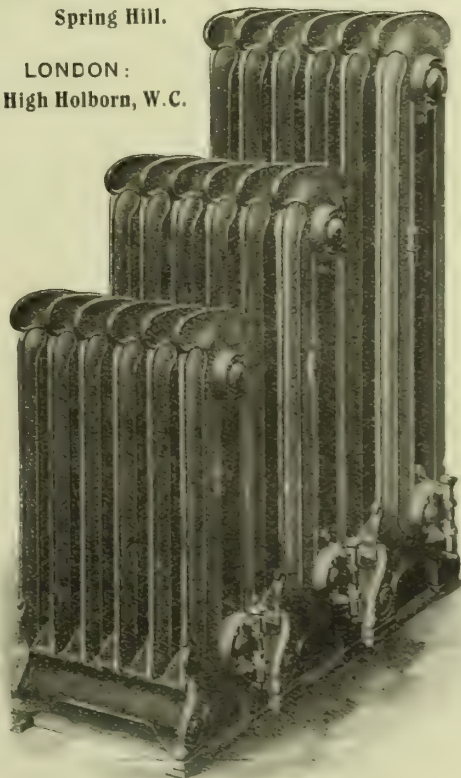
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LONDON:

129, High Holborn, W.C.



Right of a Private Owner to a Water Supply.—At the meeting of the Lostwithiel Town Council last Tuesday, a letter was read from the Local Government Board, asking for the Council's observations upon a letter they had received from Mr. N. B. Littleton, complaining of the Council's action in refusing to take the water-mains to his property at Tanhouse. Upon the same matter a letter was read from Messrs. Sharpe and Co., the Solicitors to the Association of Municipal Corporations, giving the opinion that section 35 of the Water-Works Clauses Act, 1847, does not apply to corporations who supply water under the Public Health Act, and that the owner of premises to which no mains had been laid cannot compel a corporation to furnish him with a supply of water. It was decided to reply to the Local Government Board in the terms embodied in the Solicitors' letter. Mr. Littleton said he had received legal advice as well, and was prepared to go to law on the matter. He considered the Council were getting money from his tenant under false pretences. The Mayor (Mr. H. C. Wheeler) pointed out that the Council were only dealing with the letter from the Local Government Board, and not deciding whether or not Mr. Littleton should have the water.

The Ilfracombe Urban District Council had under consideration at their last meeting the question of treating the streets with tar. Reports were received from other towns, and various schemes were considered, with the result that it was decided to purchase a tar-spraying machine, and to make provision in the estimates for the cost of the work.

At Sunderland, last Tuesday, Thomas Smith and Thomas Wilson were sentenced to eight and six months' imprisonment respectively for obtaining money by false pretences. The prisoners asked for, and received, subscriptions for a dinner which they stated was to be given to the lamplighters in the employ of the South Shields Gas Company. Among those on whom they called was Mr. James Readhead, a county Magistrate, who, doubting their statements, summoned the police and had the men arrested. It was stated that the prisoners had no connection with the Gas Company, and that there was no intention to give the lamplighters a dinner.

Lord Ellesmere is having extensive plant put down at his coke-ovens at the Brackley Collieries, Walkden, Manchester, for the manufacture of motor spirit (benzol) on a large scale. It is claimed that it is cheaper than petrol.

Regarding a paragraph that appeared last week (p. 492), Metropolitan Gas-Meters Limited (Nottingham and London) ask us to announce that their arrangement to sell the "Rapid" light controllers having come to an end, they are placing upon the market another clock controller, which will be known as the "Simplex," of which they are sole licensees and manufacturers.

The Parkinson Stove Company, Limited, of Birmingham, have designed a special floor-stand and a new wall-bracket for use with Maughan geysers. They are supplied in various sizes, and finished either in black enamel or in green porcelain enamel. The wall-bracket can, as a rule, be placed where required without removing the bath, owing to the position of the screws for fixing it to the wall.

Messrs. A. E. Podmore and Co., of No. 34, Charles Street, Hatton Garden, E.C., have issued a new illustrated catalogue of their high-power inverted and upright lamps for outdoor lighting and large interiors, shops, &c. In the wide range shown, something should be found to suit any conceivable requirement in these directions. There are also numerous designs of lamps suitable for factories, workshops, and ordinary domestic purposes, together with adaptors, mantles, and a varied selection of glassware.

The "Hastings and St. Leonards Pictorial Advertiser and Visitors' List" are to be congratulated upon an excellent series of illustrations of the interior and exterior of the Glyne Gap Gas-Works, reproduced from photographs taken by them, which appeared in the issues for the 4th and 11th inst. The pictures, of which there were some dozen in all, were accompanied by an article explaining, in non-technical language, the process of gas manufacture. This peep into the working of a flourishing local industry—indebtedness for which is expressed to the Engineer and Manager (Mr. C. E. Botley) and his Assistant (Mr. C. F. Botley)—should prove of great interest both to the consumers and to the inhabitants generally.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

draughtsman. No. 5155.
draughtsman. W. J. Jenkins and Co.

Situations Wanted.

SECRETARY, MANAGER, AND ACCOUNTANT. No. 5115.
ENGINEER'S ASSISTANT. No. 5151.
HOUSEKEEPER (Daughter of a Gas Engineer). No. 5156.

Plant, &c. (Second-Hand), for Sale.

AIR COMPRESSORS, DRILL CARRIAGES, ROCK DRILLS,
AIR PIPES. Sheffield Water Department.

Stocks and Shares.

BRENTFORD GAS COMPANY. Dec. 15.
HARROW AND STANNORE GAS COMPANY. Dec. 7.
LOWESTOFT WATER AND GAS COMPANY. Dec. 7.
MITCHAM AND WIMLETON GAS COMPANY. Dec. 6.
SOUTHEND WATER COMPANY. Dec. 7.

TENDERS FOR

Fire-Clay Goods.

LEEK GAS DEPARTMENT. Tenders by Dec. 4.

Pipes.

PONTYPOOL GAS AND WATER COMPANY. Tenders by Dec. 3.

Sulphate of Ammonia.

DEAL AND WALMER GAS COMPANY. Tenders by Nov. 30.

Sulphur (Recovered). No. 5154.

Sulphuric Acid.

SALFORD GAS DEPARTMENT. Tenders by Dec. 2.

Tar and Liquor.

GAINSBOROUGH GAS DEPARTMENT. Tenders by Nov. 30.
SHOTLEY BRIDGE AND CONSETT GAS COMPANY. Tenders by Dec. 9.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 521.

Issue	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
500,000	10	Oct. 14	10	Alliance & Dublin 10 p.c.	17-18	..	5 11 1	195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
298,955	10	"	"	Do. 7 p.c.	124-13	..	5 7 8	561,000	Stk.	"	10	Liverpool United A.	223-225	..	4 8 11
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	718,100	"	"	7	Do. B.	166-168	..	4 3 4
200,000	5	Oct. 28	6½	Bombay, Ltd.	53-6	..	5 8 4	306 083	"	June 25	4	Do. Deb. Stk.	104-106	..	3 15 6
40,000	5	"	6½	Do. New, £4 paid.	43-43	..	5 9 1	75,000	5	June 11	6	Malta & Mediterranean.	44-54	..	5 17 1
50,000	15	Aug. 26	15	Bourne 10 p.c.	28-28½	..	5 5 3	560,000	100	Oct. 1	5	Met of 15 p.c. Deb.	59-102	..	4 18 0
311,810	12	"	7	mouth Gas B 7 p.c.	161-163	..	4 3 7	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
75,000	10	"	6	and Water) Pref. 6 p.c.	151-153	..	3 16 2	541,920	20	Nov. 11	3½	Monte Video, Ltd.	124-131	..	5 7 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	253-256	-1	4 17 8	1,775,892	Stk.	July 29	4½	Newcastle & Gt. Sh. d. Con	106-108	..	4 3 4
300,000	"	"	9½	Do. New	190-192	..	4 19 0	518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	93-94	..	3 14 6
50,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13-13½	..	5 3 8
206,250	"	June 11	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	300,000	Stk.	Aug. 26	11	Oriental, Ltd.	140-142	..	5 12 8
220,000	Stk.	Sep. 10	11	Brighton & Hove Orig.	208-213	..	5 3 3	60,000	5	Sep. 10	8	Ottoman, Ltd.	68-68½	..	6 5 6
246,320	"	"	8	Do. A Ord. Stk.	150-152	..	5 5 3	31,800	53	Aug. 26	13	Portsea Island A.	137-139	..	4 19 0
460,000	23	Oct. 14	10	British	42-43	..	4 13 0	60,000	50	"	13	Do. B.	129-131	..	4 19 3
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c.	118-120	..	5 0 0	100,000	50	"	12	Do. C.	120-123	..	4 17 7
165,700	"	"	4½	Do. B 3½ p.c.	88-90	..	5 0 0	114,800	50	"	10	Do. D and E.	101-103	..	4 17 1
82,278	"	"	5½	Do. C 5 p.c.	106-108	..	5 1 10	398,490	5	Oct. 28	7	Primitiva Ord.	7-7½	..	4 16 7
55,000	"	June 25	3½	Do. 3½ p.c. Deb.	88-90	..	3 17 9	796,83	5	July 29	5	Do. 5 p.c. Pref.	51-52	..	4 10 11
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	131-14	..	5 0 0	488,903	100	June 1	4	Do. 4 p.c. Deb.	95-97	..	4 2 6
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	98-98	..	4 1 8	1,00,000	10	Oct. 14	8	River Plate Ord.	162-163	..	4 15 7
100,000	10	"	—	Cape Town & Dis., Ltd.	23-33	-1½	—	312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	96-98	..	4 1 8
100,000	13	"	—	Do. 4½ p.c. Pref.	52-53	..	—	250,000	10	Sep. 29	8	San Paulo, Ltd.	142-15	+½	5 6 8
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	474-484	..	6 3 9	62,500	50	"	6	Do. 6 p.c. Pref.	112-124	..	4 18 0
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82-84	..	5 7 2	125,030	50	July 1	5	Do. 5 p.c. Deb.	51-52	..	4 16 2
157 151	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	108½-110½	..	4 10 6	135,000	Stk.	Sep. 10	10	Sheffield A.	230-232	..	4 6 2
1,493,280	Stk.	Aug. 26	5½	Commercial 4 p.c. Stk.	109-111	..	4 13 8	20,981	"	"	10	Do. B.	230-232	..	4 6 2
560,000	"	"	5	Do. 3½ p.c. do.	104-105	..	4 14 4	583,500	"	"	10	Do. C.	232-232	..	4 6 2
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	70,000	10	Oct. 14	10	South African	124-124½	..	7 16 11
800,000	Stk.	"	7	Continental Union, Ltd.	97-99	..	5 1 0	6,439,895	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	120-122	..	4 7 4
200,000	"	"	7	Do. 7 p.c. Pref.	138-140	..	5 0 0	1,895,445	Stk.	July 14	3	Do. 3 p.c. Deb.	82-84	..	3 11 5
492,270	Stk.	"	4	Derby Con. Stk.	121-123	..	4 1 4	209,82	Stk.	Aug. 26	8	South Shields Con. Stk.	156-158	+2	5 1 3
55,000	"	"	4	Do. Deb. Stk.	103-105	..	3 16 2	605,000	Stk.	Aug. 12	5½	S'th Suburb'n Ord. 5 p.c.	119-121	..	4 10 11
143,995	"	Oct. 2	5	East Hull 5 p.c. Ord.	97-99	..	5 1 0	60,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
486,09	10	July 14	12	European, Ltd.	243-25	..	4 16 0	117,058	Stk.	July 14	5	Do. 5 p.c. Deb. Stk.	122-124	..	4 0 8
354,063	10	"	12	Do. £7 ros. paid.	81-9	..	4 14 0	502,310	Stk.	Nov. 11	5	Southampton Ord.	99-111	..	4 10 1
15,141,545	Stk.	Aug. 12	4½	Gas 4 p.c. Ord.	102-104	..	4 9 8	120,000	Stk.	Aug. 12	6½	Tottenham A 5 p.c.	131-135	..	5 1 9
2,630,000	"	"	3½	light 3½ p.c. max.	87-89	..	3 18 8	453,940	"	"	5½	and B 3½ p.c.	111-113	..	4 15 3
3,799,735	"	"	3	and 4 p.c. Con. Pref.	103-105	..	3 16 2	149,470	"	June 25	4	Edmonton 4 p.c. Deb.	100-102	..	3 18 5
4,193,975	Stk.	June 11	3	Coke 3 p.c. Con. Deb.	92-94	..	3 11 5	182,380	10	June 11	8	Tuscan, Ltd.	9-99	..	8 8 6
258,740	Stk.	Sep 10	5	Hastings & St. L. 3½ p.c.	92-94	..	5 6 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	10-102	..	4 18 0
62,500	"	"	6½	Do. do. 5 p.c.	117-119	..	5 9 3	236,676	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	110-112	..	4 9 3
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	174-175	..	6 4 0	255,6 6	Stk.	Aug. 26	68	Wands B 3½ p.c.	139-141	..	4 14 0
131,070	Stk.	Sep. 10	6	Ilford A and C	144-146	..	4 9 0	79,416	"	June 25	3	worth 3 p.c. Deb. Stk.	73-75	..	4 0 0
65,781	"	"	5	Do. B	108-110	..	4 10 11	895,872	"	Aug. 12	58	West Ham 5 p.c. Ord.	123-125	..	4 6 0
65,500	"	June 25	4	Do. 4 p.c. Deb.	102-104	..	3 16 11	210,000	"	"	5	Do. 5 p.c. Pref.	126-128	..	3 18 2
4,940,000	Stk.	Nov. 11	8	Imperial Continental	176-178	..	4 9 11	253,300	"	June 25	8	Do. 4 p.c. Deb. Stk.	108-110	..	3 12 9
1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	95-97	..	3 12 2								

Prices marked * are "Ex div."

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YOUNG man just completed Indenture
at a large Provincial Gas-Works desires Position
as ASSISTANT. Good Draughtsman and Chemist.
Highest References.
Address No. 5151, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

WANTED, immediately, in London, an
Experienced DRAUGHTSMAN used to pre-
paring Plans and Estimates for Coal-Handling Plant.
One who has served in the Shops Preferred.
Apply, stating Salary required, with Details of Ex-
perience, to No. 5155, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

DRAUGHTSMAN wanted well up in
Coal and Coke Handling Plants, and Structural
Work in Connection with Gas-Works.
Apply, stating Age, Experience, and Wages required,
to W. J. JENKINS AND COMPANY, LIMITED, Engineers,
RETFORD.

WANTED, regular Supply of Recovered
SULPHUR packed into Bags.
State Quantity available and percentage, with Lowest
Price on Rails, to No. 5154, care of Mr. King, 11, Bolt
Court, FLEET STREET, E.C.

GASHOLDERS—Splendid, 45 feet dia-
meter, and New STEEL TANK fixed complete,
to Plan and Specification. Also 50 feet Single-Lift
and 50 feet Double-Lift. Cheap, with STEEL TANKS.
Can be seen temporarily erected.
FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

SHEFFIELD CORPORATION WATER-WORKS.

COMPLETION OF RIVELIN TUNNEL.
FOR SALE—
Two AIR COMPRESSORS, by Thos. Larmuth
and Co., Ltd., Type No. 1, Class "D," 12-
inch Cylinders.
Two McCulloch DRILL-CARRIAGES, by Thos.
Larmuth and Co., Ltd.
Seven 3½ inch ROCK DRILLS, by Thos. Larmuth
and Co., Ltd., and about 16 cwt. of Drills.
About 7000 Yards of SHEET-IRON AIR PIPES,
20 inches diameter, 9 feet long, 16 W.G. Thick.
Offers invited.
For further Particulars, Apply to the GENERAL
MANAGER, Sheffield Corporation Water-Works, Town
Hall, SHEFFIELD.
Nov. 11, 1909.

DEAL AND WALMER GAS COMPANY.

THE Directors invite Tenders for the
Purchase of about 20 Tons of SULPHATE OF
AMMONIA, delivered f.o.r. Deal Station, in Purchasers'
Bags.
The Purchaser to take delivery previous to the 31st
of December 1909.
Sample will be sent on Application.
Tenders to be sent in not later than Tuesday, the
30th inst., addressed to the Chairman, Gas Offices,
Cannon Street, Deal.
The Directors do not bind themselves to accept the
highest or any Tender.
Gas Offices, Deal,
Nov. 17, 1909.

SHOTLEY BRIDGE AND CONSETT DISTRICT
GAS COMPANY.

TENDERS FOR TAR.

THE Directors of this Company invite
TENDERS for the Purchase of the TAR pro-
duced at their Works from the 1st of January to the
31st of December, 1910. Quantity about 80,000 Gallons.
Contractor to find his own Casks, and to accept Del-
ivery at Blackhill Station.
Tenders to be sent to the undersigned, not later than
Thursday, Dec. 9, 1909.

M. RICHLEY,
Secretary.
Gas Offices, Front Street,
Shotley Bridge.

LEEK URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

FIRE-CLAY GOODS.

THE Gas Committee invite Tenders for
the Supply of FIRE-CLAY GOODS for the Year
1910.

Specification and Form of Tender and all Particulars
may be obtained from the undersigned.
Tenders, endorsed "Fire-Clay Goods," and addressed
to the Chairman of the Gas Committee, Town Hall,
Leek, to be delivered by the 4th of December, 1909.

The Committee do not bind themselves to accept the
lowest or any Tender.

S. TROW SMITH,
Engineer and Manager.
Gas-Works, Leek,
Nov. 17, 1909.

GAINSBOROUGH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR AMMONIACAL LIQUOR.

THE Gas Committee of the above Council
are prepared to receive TENDERS for the Pur-
chase of the AMMONIACAL LIQUOR produced at
their Gas-Works for a period of Twelve Months from
the 1st of January, 1910.

Further Particulars may be obtained on Application
to the undersigned.

Sealed and endorsed Tenders, addressed to the Chair-
man of the Gas Committee, must be delivered at the
Gas-Works, Gainsborough, not later than Tuesday,
Nov. 30, 1909.

The Committee do not bind themselves to accept the
highest or any Tender.

JOHN BALDWIN,
Manager.
Gas-Works, Gainsborough,
Nov. 20, 1909.

BRENTFORD GAS COMPANY.

SALE BY TENDER OF £30,000 NEW STOCK, 1881.

IN pursuance of the Brentford Gas
Order, 1881, Notice is Hereby Given, that it is the
intention of the Directors of this Company to SELL
BY TENDER £30,000 of NEW STOCK, 1881, of the
Company, to be paid up in full on or before the 15th day
of January, 1910; such Stock being a portion of Addi-
tional Capital Authorized to be raised by Resolutions
passed at an Ordinary Meeting of the Proprietors held
on the 11th day of February, 1898, under the powers of
the above-mentioned Order.

Particulars and Conditions of Tender may be ob-
tained on Application at this Office; and Sealed Tenders
must be sent in not later than Ten o'clock on the
Morning of Wednesday, the 15th day of December next.

By order,
WILLIAM MANN,
Secretary.

Office: Brentford Gas Company,
Brentford, Nov. 1, 1909.

Issued under the powers and subject to the provisions
of "The Mitcham and Wimbledon Gas Act, 1907."

MITCHAM AND WIMBLEDON DISTRICT
GASLIGHT COMPANY.

NOTICE OF SALE BY TENDER OF £12,000
CONSOLIDATED ORDINARY STOCK.

MINIMUM PRICE OF ISSUE £108 PER £100 OF STOCK.

THE Directors of the Mitcham and
Wimbledon District Gaslight Company Hereby
Give Notice that they will be prepared to receive, not
later than Five o'clock p.m. on Monday, the 6th day of
December, 1909, Sealed Tenders for £12,000 CON-
SOLIDATED ORDINARY STOCK of the Company,
in lots of the nominal amount of £50, or Multiples
thereof.

No Tender for any less nominal amount than £50, or
at a less price than £108 per £100 of Stock, will be
entertained.

The Balance of the Purchase Money is to be paid on
or before Monday, the 3rd day of January, 1910. Divi-
dend will accrue from the 1st day of January, 1910.

Tenders must be made on Forms provided by the
Company, which, with Particulars and Conditions of
Sale, can be obtained on Application to the under-
signed.

BENJAMIN GREEN,
Secretary.

Offices and Works, Western Road,
Mitcham, Surrey.

COUNTY BOROUGH OF SALFORD
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for
the Supply of about 1800 Tons of SULPHURIC
ACID, to be delivered during the Year 1910.
Full Particulars may be obtained on Application to
Mr. William W. Woodward, Engineer, Gas Offices,
Bloom Street, Salford.
Sealed Tenders, endorsed "Tender for Acid," to be
delivered to me not later than Three p.m. on Thursday,
the 2nd of December, 1909.

L. C. EVANS,
Town Clerk.

PONTYPOOL WATER-WORKS.
CONTRACT No. 5.

THE Directors of the Pontypool Gas
and Water Company are desirous to receive
TENDERS for the Laying of about Two Miles of CAST-
IRON SOCKET PIPES (chiefly 10 inches in Diameter).
The Drawings and Specification may be inspected,
and Form of Tender may be obtained (on payment of
Two Guineas, returnable if a bona-fide Tender be made)
on Application at the Office of the Company at Ponty-
pool, or at the Office of Messrs. T. & C. Hawksley,
Civil Engineers, Caxton House (West Block), West-
minster, S.W., on and after Friday, the 19th day of
November instant, and Tenders must be delivered at
the Office of the Company, Clarence Street, Pontypool,
at or before Twelve o'clock noon on Friday, the 3rd
day of December, 1909.

The Company do not pledge themselves to accept the
lowest or other Tender.

(Signed) T. B. PEARSON,
Secretary.

Pontypool, November, 1909.

SALES BY AUCTION OF GAS AND WATER
STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to
notify that their SALES BY AUCTION OF NEW
CAPITAL ISSUED UNDER PARLIAMENTARY
POWERS, and of STOCKS and SHARES belonging to
EXECUTORS and other PRIVATE OWNERS in LON-
DON, SUBURBAN, and PROVINCIAL GAS and
WATER COMPANIES, take place PERIODICALLY
at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including
other Gas and Water Stocks and Shares in these Periodi-
cal Sales, will be forwarded on Application to Messrs.
A. & W. RICHARDS, at 18, FINSBURY CIRCUIS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 500 NEW ORDINARY FIVE PER
CENT. MAXIMUM £10 SHARES
AND
£5000 FOUR PER CENT. PERPETUAL
DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Dec. 7, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
HARROW AND STANMORE GAS COMPANY.

NEW ISSUE OF 500 £10 "C" SHARES.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Dec. 7, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

LOWESTOFT WATER AND GAS COMPANY.

45 £10 ORDINARY TEN PER CENT. SHARES
AND
47 £10 ADDITIONAL ORDINARY SEVEN
PER CENT. SHARES.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Dec. 7, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

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**A Practical Treatise on the Keeping of Gas
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JOHN HENRY BREARLEY, and
BENJAMIN TAYLOR.

THE VOLUME CONTAINS TWO WORKS:

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WESTMINSTER.

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Sole Agents and Licensees for Great Britain
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NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

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NEWTONGRANGE, MIDLOTHIAN.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
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Manufacture and keep in Stock at their Works
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PIPES and CONNECTIONS, $1\frac{1}{2}$ to 48 inches
in diameter, and make and erect to order
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GIRDERS, SPECIAL CASTINGS, &c., re-
quired by Gas, Water, Railway, Telegraph,
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NOTE.—Makers of HORSLEY SYPHONS.
These are cast in one piece, without Chap-
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Owners of the Birtley Iron Works and
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GENERAL ENGINEERS & IRONFOUNDERS.

Makers of Cast-Iron PIPES and CONNEC-
TIONS for Gas, Water, Steam, Electrical,
Sanitary, and other purposes; also TANKS,
COLUMNS of every description, Hydraulic,
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Illustrated Catalogue, giving complete list of
our manufactures, on application.

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ALL the BOYS CALORIMETERS

which have been in daily use in
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WERE MADE BY

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Those desiring to obtain Gas Calorimeters
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Descriptive Catalogue on Application.

HEATHCOTE GAS COAL

from the

GRASSMOOR COLLIERIES,
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Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality
of Coke.

Maintains a High Standard in Residuals.

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Special Lumps, Tiles, and Bricks for Regenerative
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Gas Engineers' Agents and Contractors for
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Sperm Value 878.85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

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Special Pressure and
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For RETORT-HOUSE GOVERNORS.
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LARGEST MANUFACTURERS in the UNITED KINGDOM
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Retorts of all Sections.

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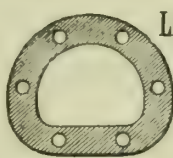
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A Few Recommendations for this System:-

Simplicity of Design.
No Machinery to get out of order.

Carbonizing charges 40 per cent. less than with Horizontals.
No skilled Stokers necessary.

Yield of Gas per ton guaranteed about 1000 cubic feet more than under present conditions, of guaranteed candle power.

Heats under absolute control throughout the whole length of the Retorts.

Saleable value of Coke greatly increased.

25 per cent. greater yield of Ammonia.

More liquid Tar.

Stopped Pipes unknown.

Naphthalene always in solution.
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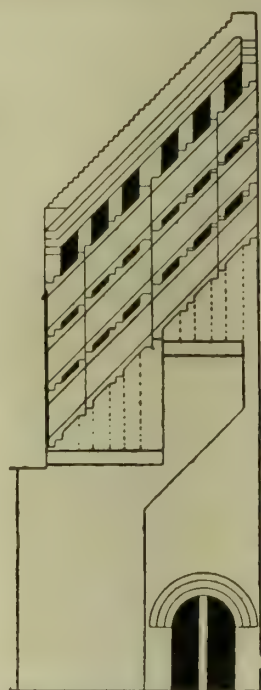
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Several Installations in course of construction or completed.

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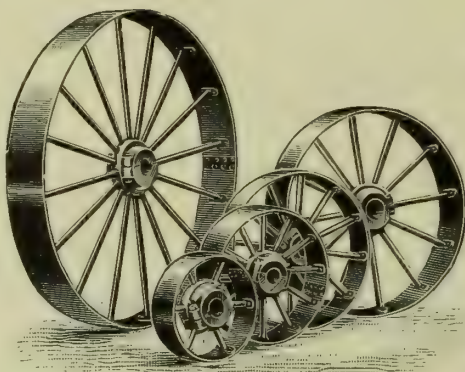
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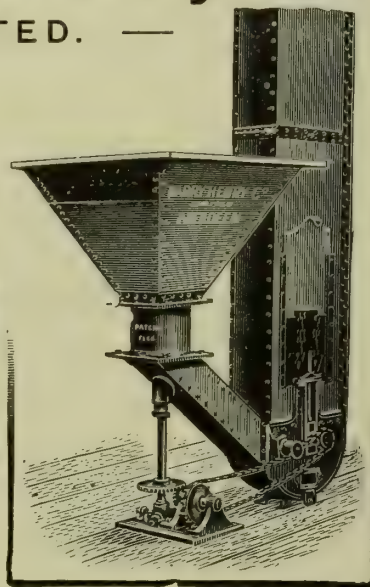
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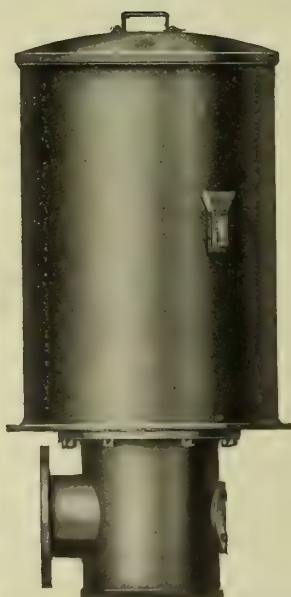
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THESE Governors are made to prevent fluctuation in the Pressure of Exhaust in the Hydraulic Main by controlling the Gas entering the Governor, notwithstanding the constant varying quantity of Gas coming from the Retorts. This enables the Seal of the Dip Pipes to be reduced to a minimum with perfect safety, and an increase in the make of Gas per Ton of Coal is thereby assured.

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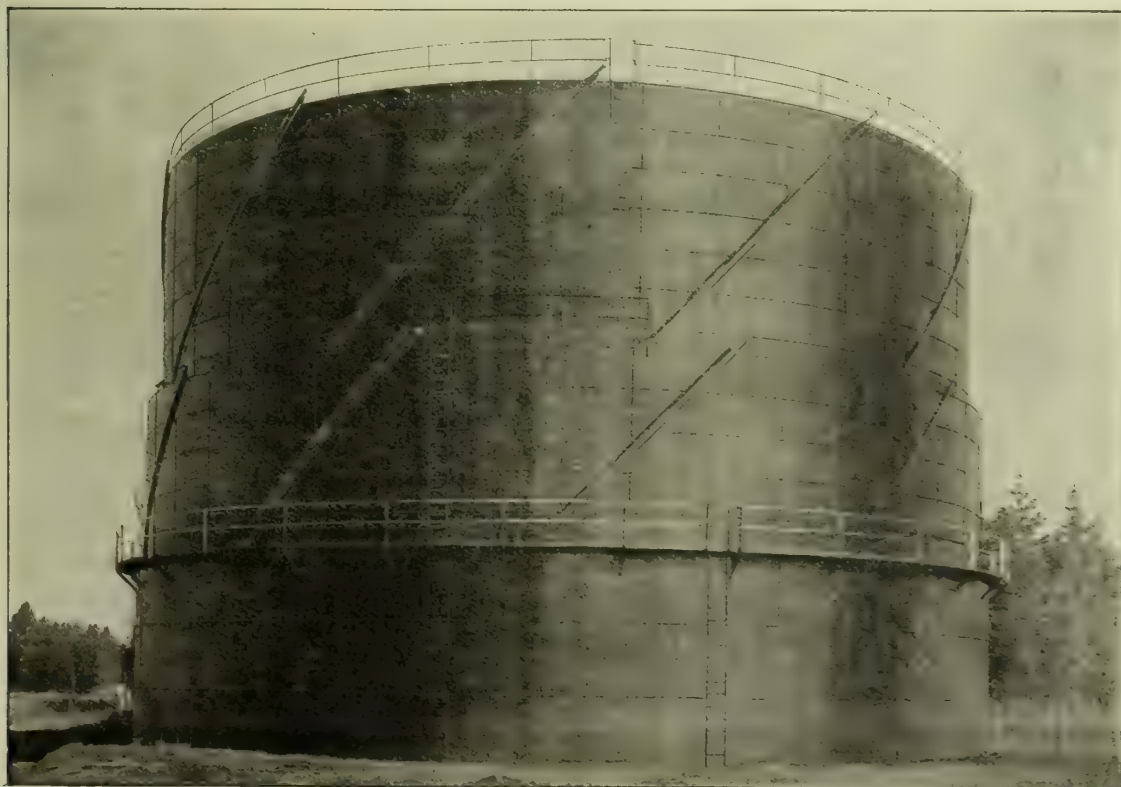
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From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

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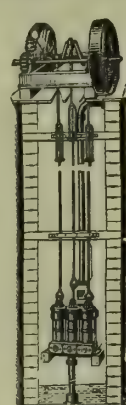
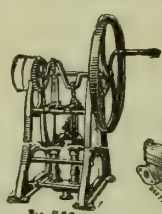
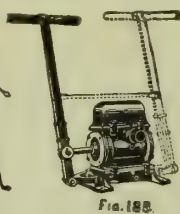
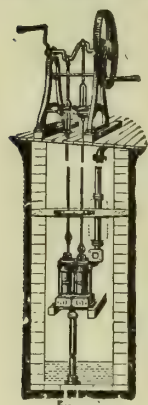
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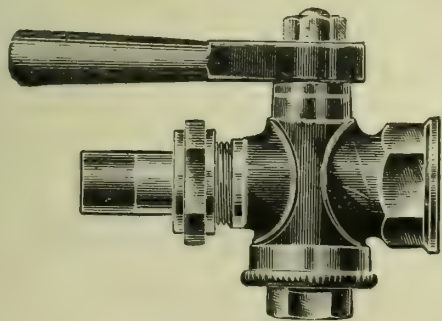
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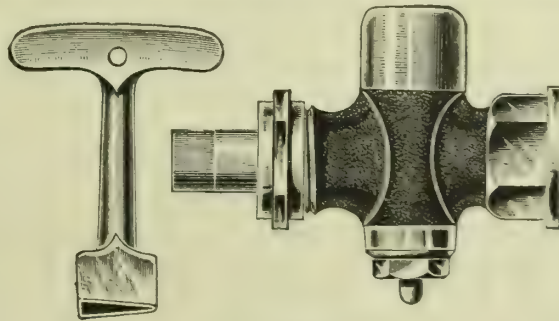
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TAR-FOG EXTRACTOR
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HORIZONTAL, VERTICAL, INCLINED
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ENQUIRIES AT ONCE ATTENDED TO.

MAIN LAYING.

Paper by PERCY GRIFFITH, M.Inst.C.E., and BRUCE MCGREGOR
GRAY, Assoc.M.Inst.C.E., before the Association of Water Engineers.

A. The Authors used *Flanged Pipes* for the Rising Main up the Steep side of the Barff, and their experience proved that this was not an advantage, as the rigidity of the Joints involved considerable difficulty in regard to the depth of the Trench, and a good deal of Cutting to make the final Connections at each end of the Pipe-Line.

B. In the case of the Delivery Main, the Joints were *Ordinary Socket Joints*, but made with Lead only. The only difficulty met with here was the necessity for pouring the Lead in at a suitable temperature to prevent it melting the Solid Lead Fillet, and running through into the Pipe.

C. In some of the Smaller Branch Connections, Lead Wool was used, and proved highly successful.

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These figures speak for themselves.

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LIGHT

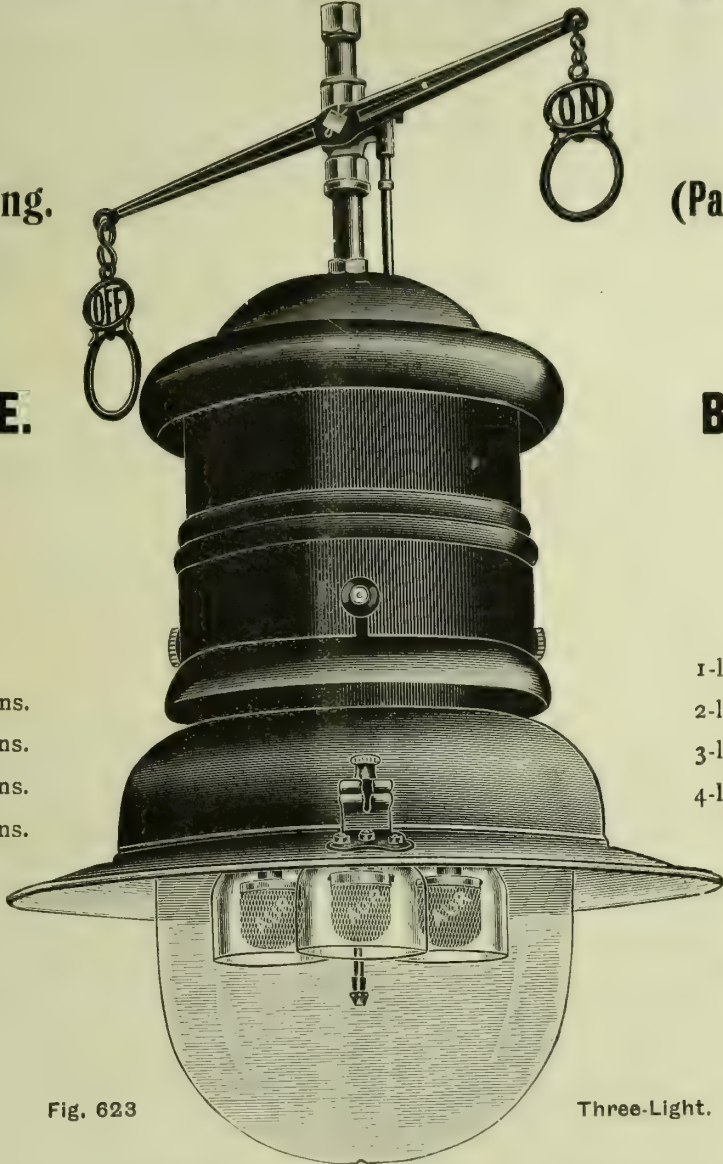
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

Fig. 623

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52 6	6/- extra.
2-light	8 feet	260	47 6	6/- extra.	4-light	16 feet	550	72 6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3 6 per Lamp extra.

RENEWALS.

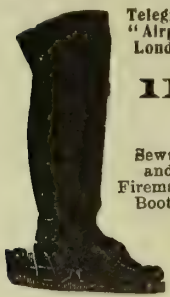
Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	29 3 6
" " " " In Case lots per dozen.	19 6	57 9	57 9	93/-	Parabolic Reflector, extra	"	3 6	6/-	7 6
Case contains . . .	80	18	18	12	Welsbach Mantles, each		6d.	subject as usual.	Not made

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

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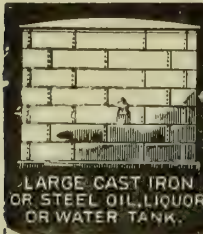
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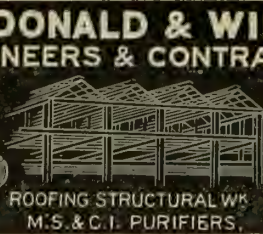
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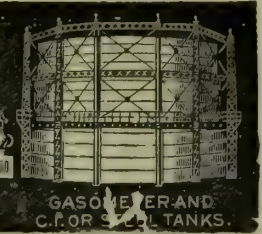
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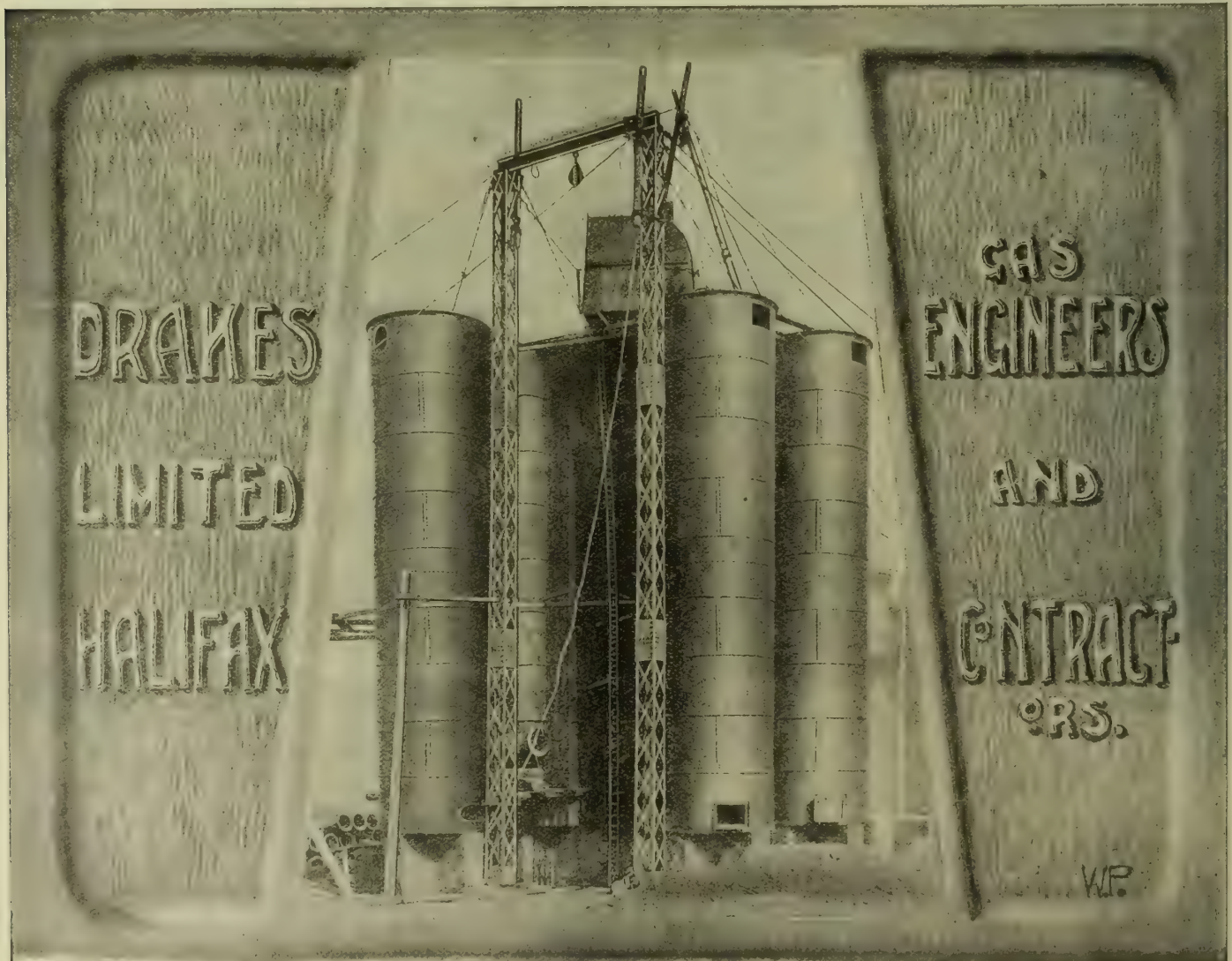
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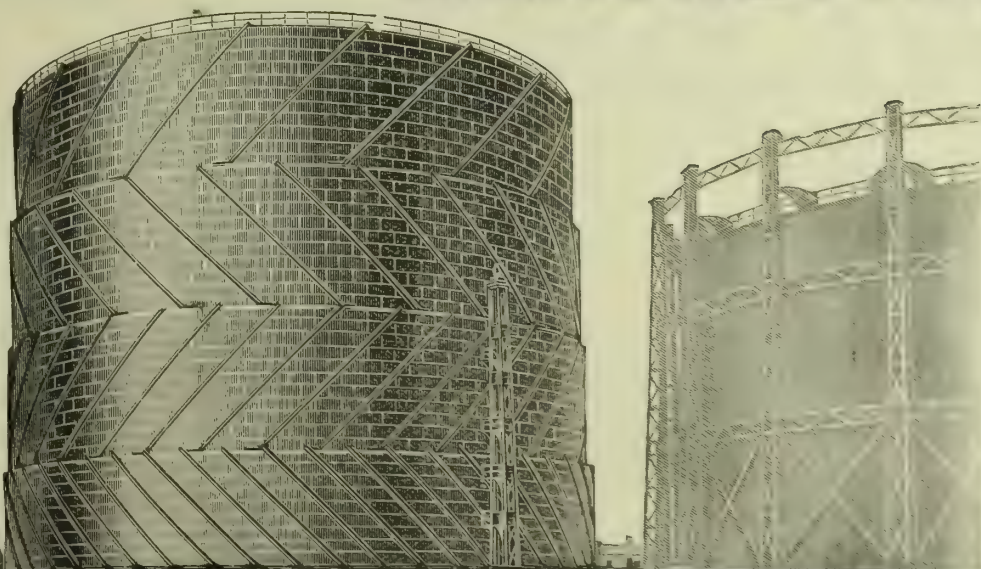
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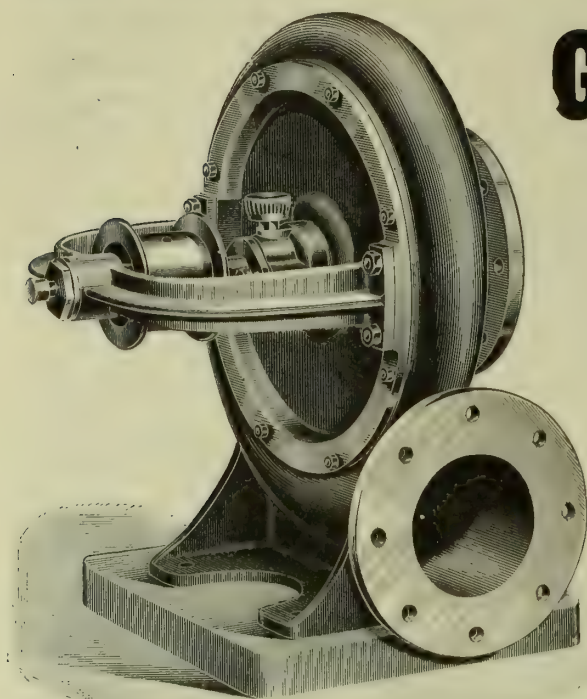
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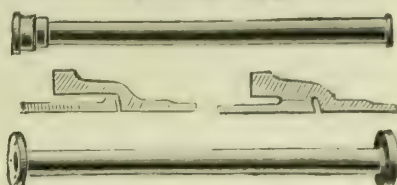
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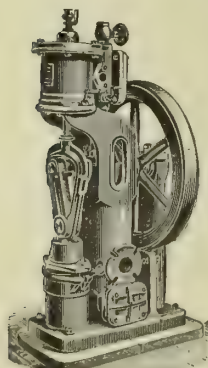


Fig. 705. "SINGLE RAM" STEAM-PUMP.

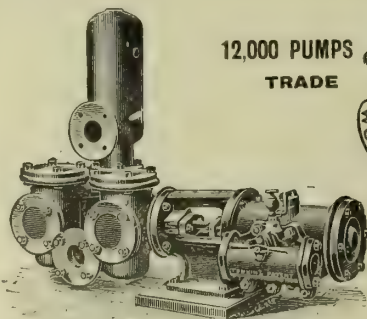


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

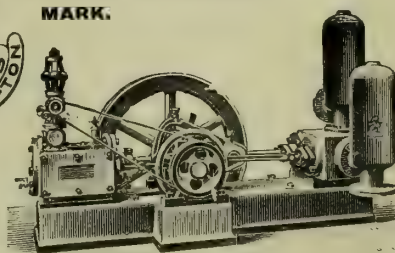


Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

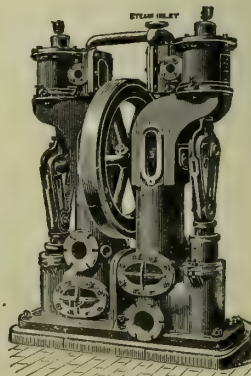


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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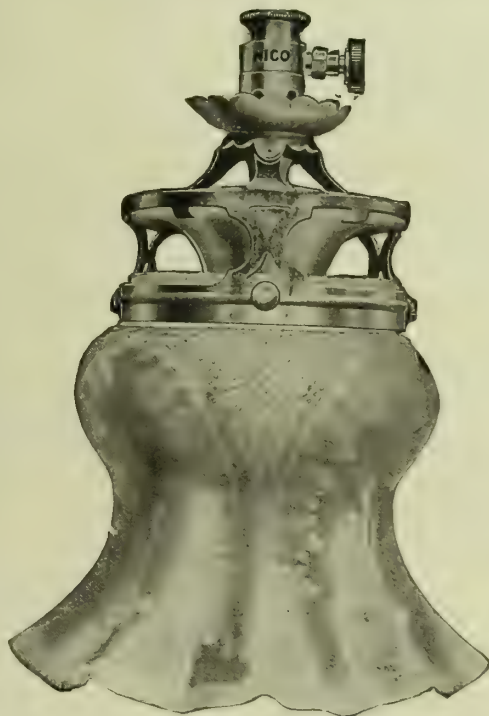
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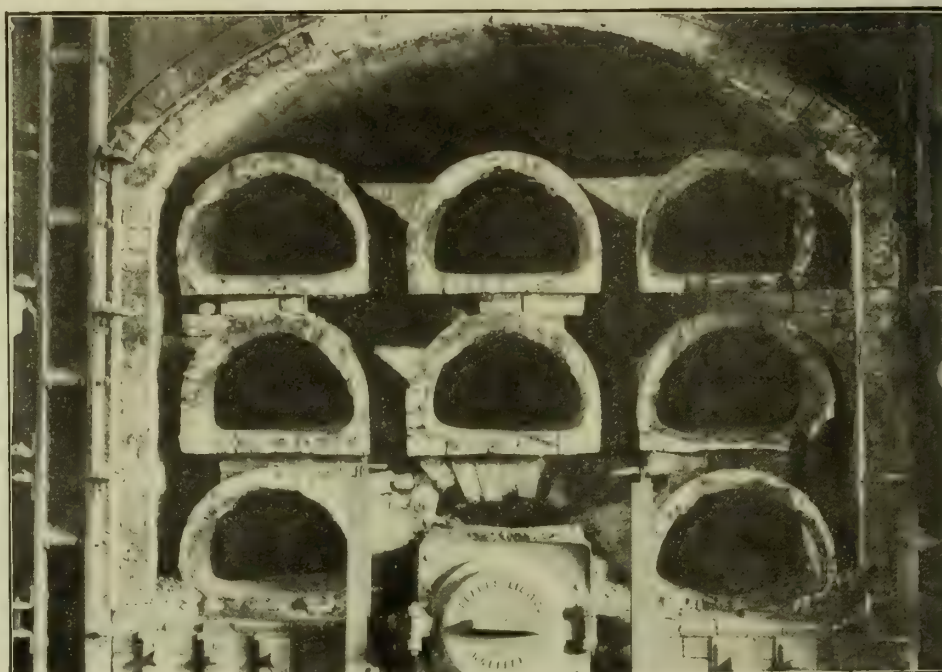
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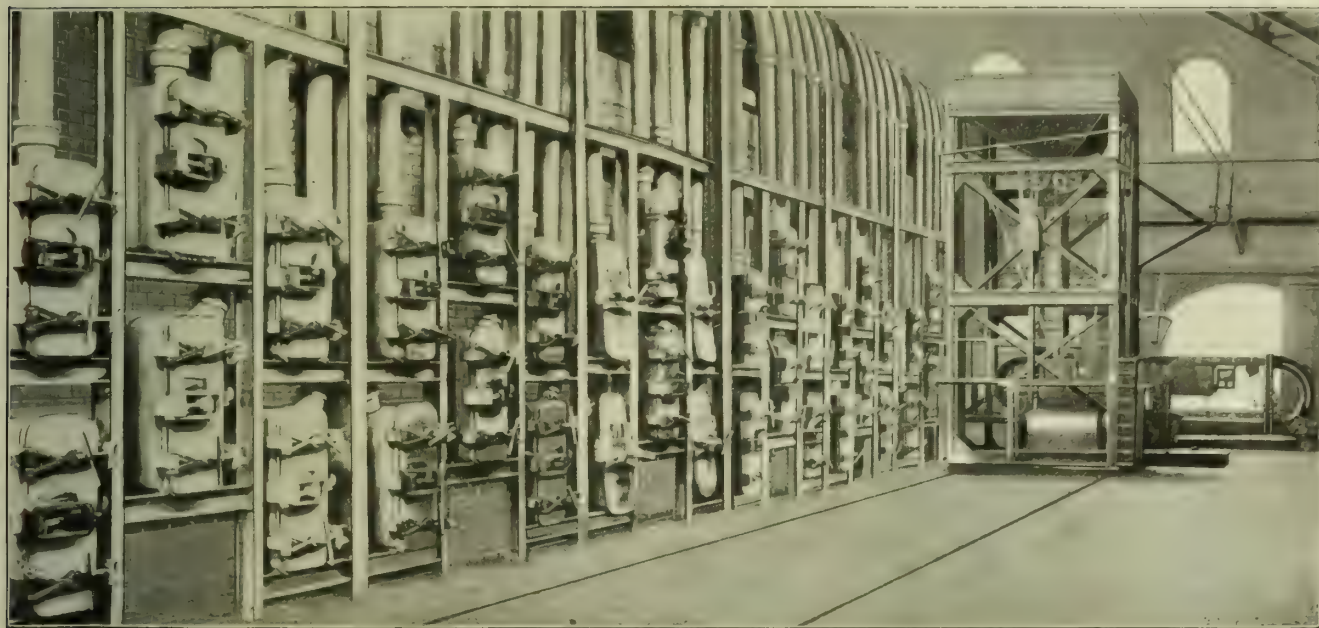
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Fig. I.586.

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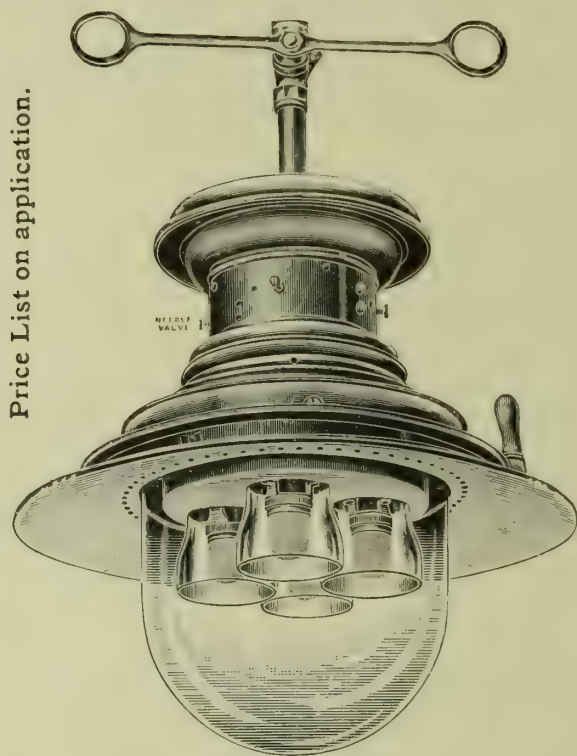
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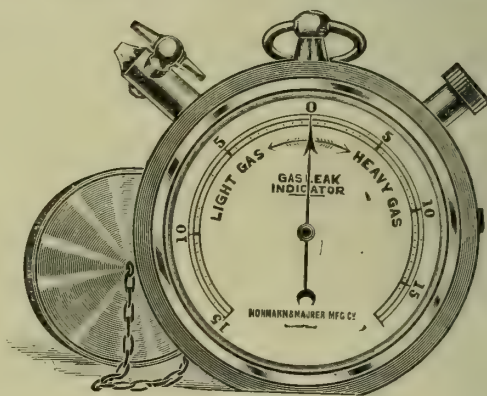
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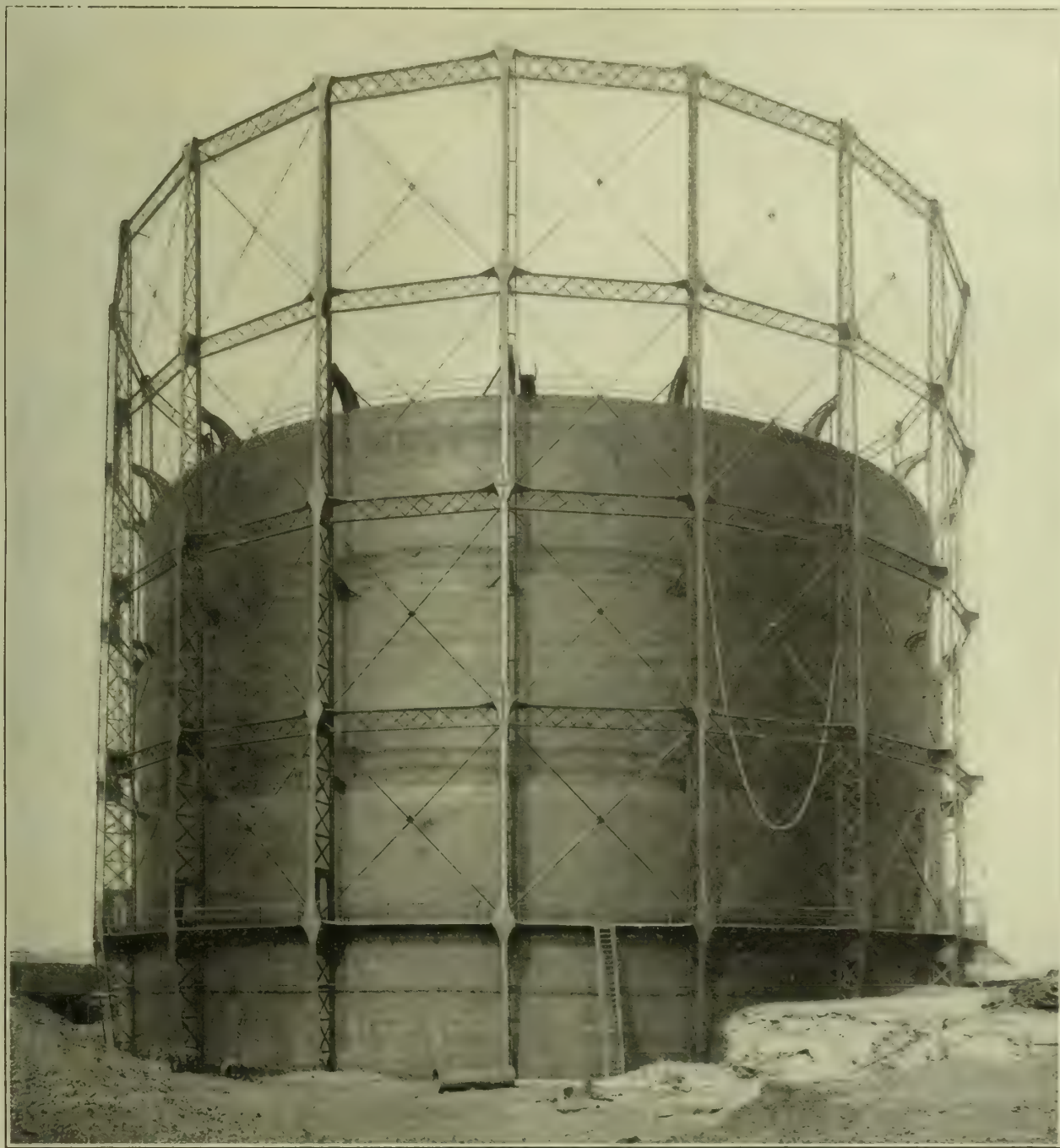
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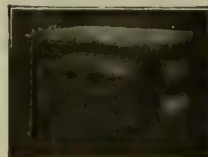


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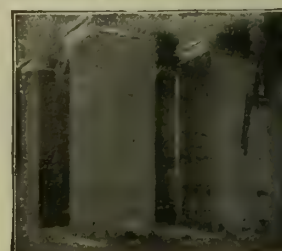
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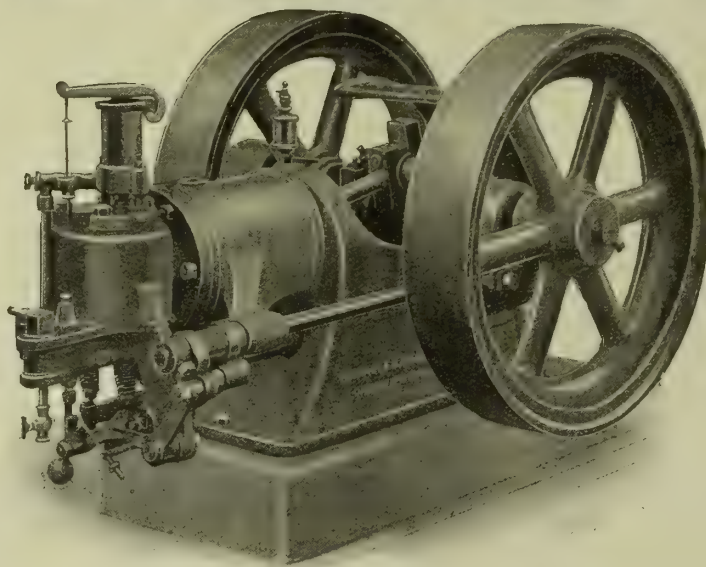


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EDITORIAL NOTES—GAS, &c.

Gas Legislation in the Next Session.

THERE will be keen inspection in many quarters of the epitome of the notices which we publish this week, foreshadowing the plans in the matter of gas legislation in the next session of Parliament. Neither in number nor in quality (save in three or four instances) do the promised Bills and Orders present any variation from the almost monotonous tale of recent sessions. Dealing first of all with the notices of Bills, there are 29 that treat wholly or in part of gas—eighteen emanating from companies and eleven from local authorities; but certain of the latter will merely contain customary and uncontroversial clauses. In both company and local authority notices, illuminating power and testing are frequently mentioned; and a good proportion of the announcements portend that modern power investiture is the sole object of application. Outstanding from all others in interest will be the Gas Companies' Standard Burner Bills, which were remarked upon in last week's issue. The most substantial Companies to be before Parliament with Bills will be the Brighton and the Bristol. Both cases, in addition to financial matters, will deal with the questions of illuminating power and testing. The Bristol Company will also request relief from the sulphur compounds absurdity—a request that Parliament has never refused since the sitting of Lord Rayleigh's Committee. Protection will also be asked by them in regard to stand-by provision where there is an independent supply of gas or an electric service. It is rather a matter for surprise that the notices do not indicate a larger application for this form of protection in view of the success of applications in the present session. But so far as the advertisements make disclosure, we only notice, in addition to the Bristol Company, a few indications of a desire to be allowed to make a minimum charge for stand-bys where a private service obtains.

Schemes for a fair amount of district development are shadowed in the notices. In some instances, these extensions will involve the purchase of small concerns or parts of distribution systems; and there will probably be in certain cases some difficulty in regard to existing rights. For example, there is the Shirebrook and District Gas Company, seeking to take in part of the uncultivated territory of the Mansfield Corporation and the Bolsover Gas Company. Warsop is one of the places sought to be empaled by the Shirebrook Company; and the Mansfield Corporation have unexercised powers of supply there. A little complexity is introduced by the Warsop District Council applying to the Local Government Board for powers to themselves supply gas that they have purchased in bulk. There are also companies with histories in Parliament, and companies which recall events. The Ammanford Gas Company are applying for powers for the extension of the limits of supply; and power is wanted to pay the purchase price of the Amman Valley Gas Company's property in debentures, preference shares, or other securities, as well as authority to take proceedings to ascertain the validity of the debentures of the Amman Valley Company, and to declare invalid all debentures or shares issued without payment in money. There is the Chipping Norton Gas and Electricity Company, who want to purchase part of the Mid-Oxfordshire Gas Company's plant, as well as the Chipping Norton electric light undertaking. The mention of the Mid-Oxfordshire Company takes the memory back a few sessions. Then there is the Gowerton Gas Company in Parliament—a concern the promotion of which did not strike the gas industry or ourselves at all favourably. Reminiscent, too, is the title of the Whitland Water and Gas Company. The experience in the current session of gas companies applying direct to Parliament for electricity powers is to be repeated in the coming one. Chipping Norton has already been mentioned; Farnham and Havant are others; and there is another immediately

following. A pretty big—big for Essex—scheme of consolidation of interests is found in the notice of the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company. This provides for the amalgamation of the Bishop's Stortford, Harlow and Sawbridgeworth, and Epping Companies; and the purchase of the Ongar, Newport (Essex), Much Hadlow, and Dunmow Companies. That will make a concern with a broad acreage for its district.

Turning to the Local Authority Bills, the outside authorities of Salford who were successful last year in inducing Parliament to put some control on the gas profits transferred by the Corporation to the relief of the borough rates, have not carried out their intention of applying for powers to give effect to the intention of Parliament, from which intention the Corporation beat a precipitate retreat. But the Corporation themselves are bringing forward their proposed gas powers again; and one may construe an intimation in the notice—to the effect that provisions are to be included with respect to the application of the revenue arising from the gas undertaking, and to the allocation of the profits—to mean that negotiations with the outside authorities have been successful in arranging matters. There will be no small interest to see what information the Bill itself will contain in respect of this particular affair. The Bradford Corporation are again seeking to purchase the private gas-works which their Bill rejected *in toto* by the ratepayers early this year provided for. The Egremont, the Hoyland Nether, and the Mallow District Councils are all casting eyes on the property of the local gas companies. In the case of the Mallow concern, the Company have also come forward with a notice for a Bill. The Little Hulton District Council have an interesting proposal in hand. They contemplate purchasing the distribution plant in their district belonging to the Salford Corporation and the Farnworth and Kearsley Gas Company, and to distribute coke-oven gas produced at the Earl of Ellesmere's collieries.

There are only twelve applications for Gas Provisional Orders; the largest applicants being the Sheffield and the Swansea Gas Companies. The former are seeking a reduction of the standard illuminating power, and the application of the "Metropolitan" No. 2 burner to the testing; and the latter are asking for an extension of area. There is only a single gas application to the Local Government Board; and that is the one from Warsop to which reference has been previously made. Among the notices under the Private Legislation Procedure (Scotland) Act, four applications are being made in connection with gas supply—Dunblane, Falkirk, Glasgow, and Kirkcaldy. There is notification in the three last-named concerning the illuminating power and testing of gas. It is a many-featured application that the Glasgow Corporation will make. Among other things, they will seek to supply gas for non-illuminating purposes.

Collapse of the Italian Strike.

THE hope entertained last week that the strike of gas workers in Italy was nearing a termination, and that the strain and waste occasioned by the disturbance were about to cease, unhappily was not fulfilled in the way anticipated; but it has ended by the process of a complete collapse, and the submission of the strikers to the Company's terms. The men rejected the new conditions offered to them; and on Thursday a ballot was taken, which resulted in 600 voting for continuing the strike, 300 against, and 800 did not record their vote. The figures—300 against, and 800 declining to vote—are significant. It may well be taken that a majority of the 800 were deterred from casting their vote in with the 300 more from fear than anything else. When the result was announced, the Company continued the firm attitude they have all along shown on this occasion, and gave the men to understand that, unless they signed the new conditions without delay, they would be permanently dismissed. Most of the men were no doubt originally willing, at the instance of their leaders (who, as a certain "order" in another column

indicates, are past-masters in the art of working upon the passions of these men), to try to extort further advantages from their employers. But a month's strike with much shortened income, and a precarious outlook, are, in such a case, chastening influences, together with the experience of the new spirit of firmness on the part of the Company. There was soon manifest an unwillingness on the side of the men to permanently lose their employment. And consequently on Friday and Saturday they were returning to work in large numbers—glad enough to be re-established on the Company's own conditions, which are not those under which the men were working when they ill-advisedly threw up their employment in the vain desire to create impossible—and, being impossible, unprecedented—conditions of labour. We deplore the loss, the waste, the anxiety that have ensued; but things had come to such a pass at the works that it was necessary the men should be shown, on the ground selected by themselves, that the Company intended to firmly and yet fairly manage their own affairs without dictation. The men have been deceived by their leaders; they have been deceived as to their own power; they have been deceived as to the length they could go in making demands on the Company. There will be many a regret among the men, if they are not less than human, when they have finally sobered down, and work is once more on a normal footing, that they rashly took the step they did. When, too, in the calmer moments they survey the acts of the past few weeks, it is to be hoped that at all events some of them—surrounded as they are by the evidences of consideration and goodwill on the part of their employers—will see, whether they confess it or not, how silly has been the position of themselves and their leaders. It is reported in another column that there has been temporary trouble from the coke men since their return to work; but this, it is believed, is merely transient. One bright feature of the strike has been the ready response from all quarters to requests for assistance, together with the wholesale application on the part of gas workers in this country and abroad for work on the excellent conditions offered by the Company. One other acknowledgment. During this period of stress and storm, the executive and staff officers of the Company have laboured and faced much danger in a self-sacrificing and fearless manner that cannot be too highly applauded and remembered.

Society of British Gas Industries—Words of Counsel.

ANOTHER excellent meeting—excellent both in interest and in the extent taken of the social opportunity—was recorded on Thursday last by the Society of British Gas Industries, which, year by year, as the President (Mr. Thomas Newbigging) tells us, progresses numerically, and which, as the President of the Institution of Gas Engineers (Mr. James W. Helps) readily acknowledges, has an inestimable value, apart from its own internal contribution to the work for the advancement of the gas industry's welfare, in the matter of co-operative relations with the central professional organization. The testimony from two such distinguished figures in the gas industry is gratifying. There is also another palpable fact that offers extreme interest to the observer; and it is the growing advantage that is taken for fraternization and meeting on common ground by the principals of the great firms constituting the side of the industry engaged, competitively, in manufacturing the plant and appliances needed by the producers and users of gas. Every year points to a strengthening that augurs well for the continued success of the Society. Composed as the Society is, it is preferable to have in the presidential chair men who are absolutely independent of the private commercial interest of members; and it is a satisfaction to find that men of distinguished position deem it an honour to occupy the office. Mr. Dugald Clerk, F.R.S., Sir George Livesey, and Mr. Thomas Newbigging, have so far tenanted the chair; and next year will witness the addition to this worthy opening of the presidential roll of the celebrated name of Mr. J. H. Balfour-Browne, K.C. His acceptance of the position is an honour to the Society; and the invitation that he should become the Society's President is a recognition of the high place that he occupies in relation to the gas industry at the Parliamentary Bar and in the Law Courts. His brilliant forensic abilities have been exercised—in a measure perhaps greater than can be claimed by any other legal luminary—in the advancement and defence of the interests of the gas industry in the places where the laws controlling and directing it are made and

interpreted. Hearty greetings are in store for his appearance in the chair at the next meeting of the Society.

The Inaugural Address of Mr. Thomas Newbigging as President was delivered at the meeting of the Society early in the year; and there was a supplementary address on the present occasion. His holding of the office, no one will be more ready to admit than himself, has been a means to educational expansion for him personally. In no walk of life can we know much of our fellow-men pursuing other walks, though, maybe, diverging never so little from our own, without actual contact, and more particularly without actual contact collectively, so as to learn from a fairly representative whole. Broad as were a year ago Mr. Newbigging's sympathies with the manufacturers of, and contractors for, gas plant and appliances, these sympathies have been further broadened by the year of his presidency among them. He has, as it were, put himself in their shoes, and has scrutinized things from their point of view. It is an exercise that might well be followed by others, and especially by that "special variety of the genus engineer to whom" the President has "often yearned to offer a word of advice." He has now taken a very appropriate opportunity; and the source of the advice—a source that has become filled with the wisdom of experience through a long succession of years spent mainly in the service of the gas industry—is one that commands respect, and the emanating advice is such that it will have effect. There are engineers and engineers; and it is for each engineer to judge whether or not the spoken word is addressed to himself. In fine, the advice is, Let mutuality and justice preside over all dealings between engineer and contractors.

The engineer who makes mountains out of easily effaceable molehills, who on reparable trifles seeks to build personal aggrandisement before Committee or Directors, or who, with deliberate intention, buoys up his professional claims by the specifications, drawings, and estimates obtained, without open acknowledgment and recompense, from contractors—he is the engineer to whom Mr. Newbigging has addressed timely counsel. He asks, too, for fair and adequate consideration for the poor inventor; and the suppression of that despicable habit of those clever enough to practise it of picking other men's brains without suitable reward. The owner of the intellect that produces something new for the use and convenience of man, or that which improves the use, convenience, or product of something already existing, deserves full and material acknowledgment. And further in regard to invention, in his travels in America recently, Mr. Newbigging has kept the affairs of the gas industry under observation; and he has unhesitatingly come to the conclusion that, in comparison, our home gas plant manufacturers are maintaining the lead in the race. This is well; but if we are to continue to hold our own, there must be no slackening of alertness or of enterprise, and new ideas must be adopted, and old ones discarded. One respect in which Mr. Newbigging is especially satisfied to know that British inventors are not lagging behind in the race is in the development of carbonizing practice; and, in his opinion, the new system of carbonization in vertical retorts will have a steady and continuous growth in application. Of such subjects was the address composed; and no one will be sacrificing time by pausing awhile over them.

The Smoke Evil and the Gas Industry.

THOSE engaged in manufacture, and therefore possessing factories, and the factories having chimneys, and those engaged in the manufacture and sale of articles designed for the use of gaseous fuel, must be one and all interested in the great smoke problem, quite apart from concern in the matter from the social and personal aspects. There is a perennial fascination about the subject, which fascination becomes deeper when one is put to individual inconvenience and discomfort by a miasmatic environment. There was fog in London last Thursday afternoon and evening, when Mr. C. E. Brackenbury, Barrister-at-Law, was reading an edifying paper before the Society of British Gas Industries, on "Some Legal Aspects of the Smoke Nuisance." With the author those present travelled through legal space from the year 1190 to the present time; but all enactment and all legal decision, and all the remedial contribution made by the use of gaseous and smokeless fuels, have not relieved us of the nuisance. Which shows us that we have outgrown the ameliorating effects of existing legal enactment, and that something additional is now wanted.

Industries have greatly expanded; and with the expansion the number and magnitude of factories. The population has grown greatly; and with it the number of domestic chimneys. The factory chimney is now fairly well under control—not more, perhaps, through legal checks than from the persuasive motive of economy. The domestic chimney, however, is expressly exempt from legal supervision. And as Sir George Livesey would have it some years ago, at one of the Smoke Conferences in London, and as many students of the subject will have it now, it is the domestic chimney that is the greater sinner in contributing to the uncomfortable and dirty atmospheric conditions particularly in the winter time. It is not what a single chimney emits that is a nuisance; it is the aggregate emission that causes the mischief. Then what is to be done?

On these matters, as Mr. Brackenbury points out, public inertia is such a ponderous thing that there is no stirring it without taking some drastic steps; and he is not sure that one way of effectively doing it would not be by the legislative imposition of a tax on every chimney used for carrying off visible smoke from houses above a certain annual rental. There is, however, an unpreparedness for any satisfactory campaign; and facts and figures on lines suggested by the author are the precursive *desiderata* to action. Educational work among the people and in the nation's schools in the matters of atmospheric sanitation and the use of smokeless fuels would, Mr. Brackenbury and some of the speakers in the discussion believe, do much to enlighten, foster antagonism to the existing evil, and create a desire for some less crude method than the burning of coal in open grates with all the accompanying contaminating influences. But above all is the question of cost, asserts the author; and the President of the Institution of Gas Engineers (Mr. J. W. Helps) says it is not the slightest good trying to represent that the gas-fire over a period's continuous use is, from the bare cost standpoint, as economical as a coal fire. That is quite true, with the qualification affixed that the gas-fire can be used intermittently as desired, whereas a coal fire once lit the consumption of fuel must continue if the trouble of relighting is to be avoided. The economy of the gas-fire rests largely in its availability for use, and in the ease of lighting, extinction, and relighting; and other recognized considerations have to be added. The gas-fire of to-day, too, is a vastly more economical thing than the gas-fire of the past. In lessening the great evil of atmospheric impurity, the gas industry—true, it may be selfishly—has done a considerable part. The hundreds of thousands of cooking-stoves and gas-fires in London alone cannot have displaced all the raw fuel that their use represents without having produced some relief. This work has been quietly going on under the old conditions of gas supply; and the industry is devoting itself assiduously to seeing how best to put itself in the position to sell more British thermal units than before for a given sum. Their success in this direction will be of substantial advantage in the campaign against atmospheric pollution. As an aside, it may be mentioned that Mr. D. Milne Watson, the General Manager of the Gaslight and Coke Company, tells us they have never been so busy fixing gas-fires as now. However, by educational work, and by the provision of cheap gaseous and solid smokeless fuel, perhaps greater good can be done than by invoking the aid of the law. It is no use ordering that people shall not do this or shall not do that if, from the point of view of cost, there is not something of superior merit at hand; and, what is more, the British public will not be driven.

The Explosion at the Geneva Gas-Works.

In another part of the "JOURNAL" will be found a few particulars in regard to the disastrous explosion which occurred at the Geneva Gas-Works on the 23rd of August, some of the effects of which have already been shown in our pages. The information furnished elsewhere does not throw any light upon the cause of this terrible accident, which is, we believe, still under investigation by competent experts. It has merely been obtained from a report presented to the Municipal Council some weeks ago. It shows, however, that, notwithstanding the great shock which all the responsible officials must have sustained—a shock almost paralyzing in its effects—steps were taken, on the very afternoon of the accident, to set the works in order and restore the supply of gas as soon as possible. When the extent of the damage, as revealed by our illus-

trations, is borne in mind, the fact that the works were stopped for only seventeen days is creditable to the Municipal Gas Engineer (M. Des Gouttes) and to those acting under him. A highly commendable action was the distribution of warning notices to the consumers, the exercise of whose prudence, as the result, probably averted troubles outside the works. Another feature worthy of being specially noticed is the spontaneity of the public sympathy displayed on the occasion, and its tangible expression in the subscription of £2700 for the assistance of the bereaved families. The fund is now being administered. The cost of the explosion is estimated at about £4300, half of which has already been paid by the companies in which some of the damaged plant and buildings were insured. This, however, does not represent the full extent of the liability of the Municipality, as claims in respect of external damage are under investigation. Altogether, the explosion was most deplorable; and it is to be hoped that when the report of the technical experts is issued, it will not convict anyone of culpable negligence in connection with it.

High-Pressure Gas in Birmingham.

In the course of an address (abstracted on another page of to-day's issue) which was delivered a few days ago by Mr. Sydney R. Barrett, the Superintendent of the Fittings Department of the Birmingham gas undertaking, to the members of the Master Gas-Fitters' Association, interesting information was given with regard to what is being done by the Corporation in the direction of providing a high-pressure gas supply. This was not, of course, the sole topic of the lecture, which had for one of its objects to impress upon the practical audience the adaptability of high-pressure gas to manifold manufacturing operations, as well as the best means of utilizing both high and low pressure supplies for the lighting of factories. It was pointed out that, in addition to the reduced charges for lighting, specially low rates are now charged in Birmingham for gas used for motive power; while within recent weeks a further concession has been made to manufacturers in the price for gas used for heating in various manufacturing processes. In regard to these matters, however, readers may be referred to the address itself. The portion to which it is chiefly desired to draw attention here is the Birmingham high-pressure service. Mr. Barrett told his hearers that, in order to eliminate the cost to the public of increasing gas pressure by private installations, the department are now erecting plant for supplying gas at high pressure—probably about 60 inches—throughout a large district. According to arrangements already sanctioned by the Corporation, the mains for high-pressure gas—or "reinforced" gas, as Mr. Barrett prefers to call it, regarding "high-pressure" as somewhat of a misnomer—will be run in the centre of the city; and it is hoped the supply will be available in the course of four or five months. The first mains to be laid will, however, form only a portion of a very much larger scheme; and it is hoped that further developments will speedily follow. From the manner in which the high-pressure supply where available in London is being taken advantage of, there would seem to be little doubt that the Birmingham Corporation will be amply rewarded for their enterprise in this direction, and that extensions of the system will very soon be called for. The citizens generally are to be congratulated upon the fact that they are served by so go-a-head a Gas Department. While referring to this subject, it may be noted as a somewhat curious coincidence that on the day following Mr. Barrett's lecture an article appeared in the "Birmingham Gazette" entitled "Electric Power in the Factory and the Workshop," one of the paragraphs of which is headed "Wonderful Transformers." This seemingly inspired article states that the motor connection through the town mains now equals over 17,000-horse power. Taken at the low cost of (say) $\frac{3}{4}$ d. per horse power per hour (1d. would perhaps be nearer the actual cost) for nine hours per day during 300 working days, the receipts from this source (£143,437) would be considerably in excess of the total income of the department last year from current for both lighting and power (£114,200). Do their customers have motors fixed, and then find it too expensive to use them? This is a point with regard to which manufacturers will do well to thoroughly satisfy themselves before going in for electrical power installations. Extreme optimism is frequently a strongly marked characteristic of electrical articles and advertisements; and Birmingham appears to provide no exception to this.

A London Advertising Campaign.

In the "Electricity Supply Memoranda" last week, reference was made to an announcement that the metallic filament lamp has hit the London Electricity Supply Companies so severely that they have resolved upon a vigorous campaign to obtain additional custom. The campaign has begun and smartly, by a couple of pages of advertisements in the "Westminster Gazette"—the central parts of the pages being occupied by articles on "Heat and Light in the Home" and "The Romance of Electricity." But, as usual, electricity follows gas; for similar publicity for gas had previously appeared in the "Pall Mall Gazette," accompanied by bold advertisements by the Gaslight and Coke Company. For the electricity advertisements (some eleven of the London Companies are subscribers to the cost), we may say that they are very fairly framed; and there are in them none of the venomous attacks on gas that have previously characterized much of the electrical literature designed to capture fresh custom. But the electricity articles contain one or two diplomatic mistakes. John Bull was insulted. "He thinks," it is written, "in his delightful, muddle-headed way, that old friends are good enough for him;" and further on he is pictured pushing his hands into the "lowest depths of his capacious pockets, preparatory to a stretch of his clumsy limbs, and a sigh of content." John Bull is not the lethargic, muddle-headed individual that is here portrayed; for if we turn to one of the advertisements of the Gaslight and Coke Company in the "Pall Mall Gazette," we see that, in the district of that Company alone, 358,000 of the housewives of John Bull have gas cooking-stoves on hire, and in an article on "The Best Servant in the House," in another edition of the same newspaper, it is stated that "we have ascertained that considerably over 1000 gas-fires have been fixed during the past two years for members of the medical profession in London. Such testimony to their healthful qualities needs no labouring." This is only a small proportion of the gas-fires that have been connected up in the same period in London—the period of the 1d. per unit electricity for heating purposes. In another advertisement by the Gaslight and Coke Company, it is stated—and there is plenty of experience to support the assertion—that "heating by gas at 2s. 9d. per 1000 cubic feet is only one-fifth as costly as heating by electricity at 1d. per unit. That difference in cost" [all householders have not the capacious pockets represented in one of the electrical articles] "and the difficulty of obtaining adequate warmth from electric radiators, are causes that have led to the displacement of electricity by gas for heating in many instances." Lighting and many other matters, such as water heating, are dealt with in both the electrical and the gas articles. In the electricity articles, it is acknowledged that the metallic filaments of the new electric lamps "are brittle, and must be carefully handled. . . . When once placed in the holder, they should not be removed until their work is done. These considerations make it desirable that the metallic filament lamps should not be used promiscuously. They would be liable to break if employed in fittings designed to be raised and lowered, or where they would be kept in an upright or extended position."

A Campaign among Southern District Juniors.

The attention of juniors in the large number of gas-works which are situated sufficiently near the Metropolis to render possible an evening meeting in the City occasionally during the winter months, may be drawn to the remarks made at last Friday's gathering of the London and Southern District Junior Gas Association by the President, Mr. W. J. Liberty. The present session will be the second one under Mr. Liberty's chairmanship; and with characteristic energy he is entering on a recruiting campaign with the idea of largely swelling the membership roll by the time his renewed period of office draws to a close. The Association at present numbers some 140 members; and this the President expresses himself as desirous of bringing up to the good round figure of 200. To add a further 60 names during the session may not be easy; but there is no reason—considering the district from which they can be drawn—to believe that it is impossible. In fact, the indications would seem to point to the likelihood of the end in view being achieved through the "little campaign" which Mr. Liberty has announced his intention of entering upon. During the past few weeks about 20 new members have joined; and the list, which was read out on Friday, is such as to lend support to the contention that places outside London are taking a far greater interest in the Association than was formerly

the case. It was pointed out at the meeting that there were two new members present who came from as far away as Reading; and if they think it worth while to come up to town for the meetings, others in similar positions might well be induced to take an equally long railway journey. London is, of course, a large place; and trains from the surrounding districts enter it from all sides. But the Cripplegate Institute, in Golden Lane, where the meetings are now held, is probably in as central a position as any place could be, having regard to the different locations of the various termini. Additional promise for the success of his campaign is held out to the President by the fact that many of the seniors have lately expressed to him the hope that their juniors would join the Association. Indeed, it is, as he says, really in view of this that he has made up his mind to try and bring so many new members into the fold. We shall hope to be able later on to record the complete success of his efforts. It is, of course, not to be expected—and Mr. Liberty does not expect—that new members will join with the sole object of assisting him to carry out his plan. They must be convinced that they will derive material benefit from doing so; and in this connection attention may be drawn to the uncompleted portion of the programme for the present session, which includes, besides papers and several visits to works, lectures from such well-known men in the profession as Mr. Jacques Abady and Dr. Harold G. Colman. It is open to all to remain at home and read reports of the proceedings in the pages of the "JOURNAL," without lending their active support to the movement; but if everyone elected to do this, where would the "proceedings" come from? With an augmented membership—and particularly if it be drawn from a wider district—the power of the Association for doing good work will be increased; and thus, excellent as the present one is, future programmes may be rendered still more attractive. The Hon. Secretary of the Association, it may be mentioned, is Mr. S. A. Carpenter, of No. 25, Briarfield Avenue, Finchley, N.

The Reduced Welsh Coal Output.

Figures which have been published within the last day or two with reference to the output of coal in South Wales are fully sufficient to explain—if the explanation were now needed—the intense unpopularity locally of the Mines Eight Hours Act. The measure has been in operation long enough to permit of some sort of comparison being made; and the showing is a disastrous one. Something may, no doubt, be put down to the trade depression; but it must be pointed out that right up to May, outputs and exports were greater than in the corresponding month of last year; so that the subsequent heavy falling off could not possibly have been even mainly due to the existing trade conditions. On July 1 the Act came into operation; and the period that has since elapsed has witnessed a staggering change in the position of affairs. Taking Cardiff as being the chief centre, it is stated that during the first six months of the year the coal exports showed an increase of no less than 593,000 tons, as compared with the corresponding half of 1908; but during the past four months there has been a decrease of 314,000 tons on the same period of 1908. From July to October, the falling off in exports in the case of the four principal Bristol Channel ports amounts to 761,800 tons, or a loss of no less than 6½ per cent. when compared with the same period of last year—and this in place of the satisfactory rate of increase which was experienced in the first half of this year. In spite of the much smaller business, it appears from the "Labour Gazette" that the average monthly number of persons employed at the collieries supplying returns to the Government was, during August, September, and October, 144,033, as compared with 143,171 in the same period of last year. These are the considerations which affect respectively the colliery owners and the workers. From the point of view of the third party—the consumer—the price is the most important factor; and in this connection it is stated that, as compared with the first quarter of the year, the price during the third quarter for best Admiralty steam coal showed a rise of 3s. a ton.

Compulsory Uneconomic Venture.

The procedure—obligatory or otherwise—of Government Departments is not always in the best interests of communities. Instances are afforded by Widnes and Macclesfield, and several other towns might be mentioned. As a matter of principle, it is

not, of course, the correct thing that electricity supply powers should be obtained through Provisional Orders by local authorities, for the express purpose of acting as a barrier to others exploiting the district; but, as a matter of practical politics, there may be something to be said in defence. When such powers are obtained by a local authority through Provisional Order, if they are unexercised at the end of the defined period, the Board of Trade have the power to extinguish them. Under such circumstances, local authorities, being usually distinctly antagonistic to private enterprise usurping what they regard as their own rights, would rather, on the pressure of a threat of annulment being communicated by the Board of Trade, enter into a scheme, notwithstanding that it may be to the financial disadvantage of the community. Take Widnes as a striking example. There gas is supplied by the Corporation at a price lower than rules elsewhere in the world; but having an unexercised Electric Lighting Order, the Corporation are now compelled to do something to justify the retention of the powers, or have Widnes for electricity supply purposes thrown open to others—not that it would be a great catch for the others with gas at the present price. What is the effect of this forced move on the part of the Council? They are compelled to spend money on a scheme; and the loan will require sinking fund and interest. With such cheap gas in the area, this capital expenditure will not have much scope for lucrative employment; while, on the other hand, it is impossible to introduce any new form of competition without affecting established interests. With a competitor taking away part of its business—existing and possible—so much greater the difficulty of the gas undertaking in continuing to pursue, with the same vigour, past policy. Both undertakings are placed at a disadvantage, and so through them are the people of the whole district. Looking at the matter from the standpoint of economic expediency, it does not seem to us that this compulsory introduction of a competitor is in the best interests of the community.

American Commercial Gas Association.

The fourth annual meeting of this Association will be held in New York from the 14th to the 21st prox.; and in connection with it an exhibition of gas appliances will be held in Madison Square Garden. A feature of the meeting will be illustrated lectures on subjects of interest to those who are specially concerned with the practical development of public and private illumination, by Mr. H. Thurston Owens and Mr. Van Rensselaer Lansingh. The following papers have been promised:

- "The Best Policy to Follow in Increasing Sales in Towns where both Gas and Electric Companies are under One Management," by Mr. C. N. Stannard.
- "How to Increase Sales of Gas to Existing Consumers," by Mr. G. R. Chamberlain.
- "Promoting Sales of Gas in a Small Town," by Mr. A. V. Wainwright.
- "Future of Gas for Street Lighting," by Mr. E. U. Wrightington.
- "Future of Gas for Store Lighting," by Mr. R. B. Young.
- "The Development of the Use of Gas for Industrial Purposes, Present and Future," by Mr. S. T. Watson.
- "The Application of Architectural Designs to Gas-Fixtures," by Mr. L. F. Blyler.
- "Advertising," by Mr. T. R. Elcock.
- "Theory of Combustion," by Mr. T. O. Horton.
- "Sale and Maintenance of Gas-Engines," by Mr. E. C. Duerr.
- "Gas-Engines in Competition with Central Station Electric and Isolated Steam Plants," by Mr. W. W. Cummings.
- "General Maintenance and Special Tricubles," by Mr. R. H. Thomas.
- "Water Heaters," by Mr. G. W. Savage.
- "The Necessity of Maintaining Pleasant Relations between the Manufacturer and Gas Company," by Mr. George D. Roper.

On the evening of the 17th, there will be a joint meeting of the Association and the Illuminating Engineering Society. The exhibition, which it is stated will be on a scale of considerable magnitude, will be open day and evening during the six days of the meeting.

Proceedings of the North British Association.—We have received the report of proceedings at the forth-eighth annual meeting of the North British Association of Gas Managers, held at Stirling on the 29th and 30th of July, under the presidency of Mr. J. D. Smith, the Engineer and Manager of the Stirling Gas Company. The technical matter, which is illustrated by plates, is followed by lists of the officers and members, the rules and regulations of the Association, and the "Statistical Report" of the gas supply of Scotland in the year ended May 15, 1909, published by the Committee of the Association. A photograph of the excursion party at Callander, on the second day of the meeting, forms the frontispiece; and there is a portrait of the President. The book has been produced under the supervision of Mr. Lawrence Hislop, of Uddingston, the Secretary and Treasurer of the Association.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 637.)

THINGS on the Stock Exchange last week moved very irregularly. Markets were sensitive and uncertain—a prey to some degree of apprehension. Next they would brighten up a bit, only to be again cast down; and so the pendulum swung backwards and forwards almost from day to day. This was especially the feature in the more speculative lines, which at times were very flat. The opening on Monday betrayed weakness that spread and lowered the general tone. The gilt-edged class were uneven, and Rails weakened; while Americans, South Africans, and the Mining Market were depressed. On Tuesday, movements were quite irregular (some up and some down); and the choicest lines were weaker. However, Wednesday brought about some degree of recovery; the settlement (it was account week) not presenting any terrors. Business fell very quiet on Thursday. The political embroglio was the most disquieting factor; but Home Government issues were firm. The Foreign Market was good also. Things remained quiet on Friday; but the general tone was fair. Buying for investment was apparent and Consols still crept up. Most markets were stronger; and the announcement of a small failure was little noticed. On Saturday, the general features were much the same. Consols rose another $\frac{1}{8}$. In the Money Market, there was an excellent demand for Stock Exchange and other purposes, and rates stiffened; but before the close the tension was relaxing. Business in the Gas Market was not at its best. Fewer issues than usual were dealt in; and these were less active, with a dull tendency for the most part. In Gaslight and Coke, the ordinary changed hands at the same figures as the week before, but the quotation was drawn in closer. The secured issues did not vary, the maximum realizing $87\frac{1}{2}$, the preference from 104 free to 105, and the debenture $82\frac{1}{2}$ and $83\frac{1}{4}$. South Metropolitan had more transactions than lately, but at lower prices. The range was from $119\frac{1}{2}$ to 121—a fall of 1. The debenture was done at 82—a fall of 1 also. In Commercial, the 4 per cent. marked $109\frac{1}{2}$ and $110\frac{1}{2}$, and the 3½ per cent. $105\frac{1}{2}$. Among the Suburban and Provincial group, Alliance and Dublin new was done at $12\frac{1}{2}$. The debenture was put up 2—a move which followed sharply upon the purchase of a good parcel of the same stock at a much lower price at the Mart. Brighton original was marked at $210\frac{1}{2}$, British rose $\frac{1}{2}$, and nothing else was touched. In the Continental companies, Imperial was weaker, at from 178 to 175 (a fall of 1); and the debenture fell a point, also without business marked. Union realized 98 and $98\frac{1}{2}$, ditto preference 138, and European fully-paid $24\frac{1}{2}$. Among the undertakings of the remoter world, Buenos Ayres changed hands at $131\frac{1}{2}$ and $133\frac{1}{2}$, Monte Video at $12\frac{1}{2}$, Primitiva at 7 (a fall of $\frac{1}{8}$), ditto preference at $5\frac{1}{2}$ and $5\frac{1}{4}$ (a fall of $\frac{1}{4}$), ditto debenture at 96, River Plate at $16\frac{1}{2}$ and $16\frac{1}{4}$, ditto debenture at $97\frac{1}{2}$ and $97\frac{3}{4}$ (a rise of 1), and San Paulo at $141\frac{1}{2}$.

ELECTRICITY SUPPLY MEMORANDA.

A Lukewarm Reception—Failures and Effects—Active Commercial Work—Itinerant Vendors and a Question of Profit—Technical (!) Knowledge.

A LUKEWARM reception has been accorded the presidential address of Dr. Gisbert Kapp to the Institution of Electrical Engineers. The usual laudatory things were, as a matter of form, said in the speeches accompanying the vote of thanks; but behind these, the question has been asked whether Dr. Kapp has risen to the occasion offered him, and whether by a careful microscopic examination of the address anything can be found that his hearers did not know before. We will not traverse the address. It was devoted mainly to electrical engineering; but there was nothing much that had to do with the commercial side of electric supply. The immense growth of the capital of the industry during the past decade was referred to; but the lamentations as to the want of prosperity of the industry show clearly that the whole of the capital has not been usefully employed. In ten years the capital of the electricity supply companies has gone up from £9,265,793 to £45,743,744, and that of electricity supplying municipalities from £8,531,167 to £51,796,604, while the electric manufacturing capital has risen from £16,799,152 to £42,486,269. Dr. Kapp refers to this expended capital as wealth. Wealth always carries with it the idea of prosperity; but a large part of the "wealth" of the electrical industry is anything but flourishingly productive. How comes it, the President asks, that the electrical engineering industry is not nearly as prosperous as it might be? He cannot give a very decisive answer. Of this, however, he is convinced—that British shops can turn out work equally as well as Continental ones, and generally at a slightly lower prime cost. There is certainly, he says, no justification in reproaching the makers of electrical plant with backwardness; and, moreover, it is bad business policy. If, however, the reproach is levelled against the potential users of such plant, there is some justification, and also a reason. Our great staple industries are old-established, and have been fairly prosperous for generations; those on the Continent are of recent growth, and have had to struggle into existence against English competition. To become successful, they had to adopt every improvement which

science put at their disposal. With them the application of electricity is, Dr. Kapp says, almost a vital matter; with us it is only a desirable improvement. To accelerate progress, the potential users of electrical plant must be educated. A beginning in this direction has already been made by the managers of electric light stations. And so he goes on, winding up with an exhortation to the Institution to also do something to accelerate the introduction of electricity into the great industries. He soars high above domestic electrification; but his method of doing so has not the originality about it that attracts and gives pleasure.

By an inexplicable perversity of fate, just when electricity supply should be putting on its best behaviour, so as to aid the vendors of electric current to swell their business connections to balance the loss of output by the extended use of metallic filament lamps, there has been quite a crop of failures of electricity supply in various parts of the country. Some were noticed last week. Woolwich has been in trouble to an uncomfortable degree. About a fortnight ago there was a partial collapse due, so it is alleged, to a cable being punctured by a workman's pick. The injury, so it is also reported, was quickly remedied. Workmen's picks may have much to answer for; but they are appearing rather too frequently now among the minor excuses for electrical failures. It would be advisable not to cause a rapid exhaustion of patience by laying the blame too constantly upon wayward pick penetrations. But it was not a pick that caused Woolwich to suffer yet another electrical extinction on Monday night last week. This time it was confessedly a genuine breakdown at the electricity works; and such consumers and public places as were not supplied with gas descended into darkness about 7.30. Street-lamps were extinguished; many business establishments had to be closed; at the Hippodrome the performance had to be abandoned; and town councillors sitting in semi-darkness at the Town Hall were impressed by the unfaithfulness of their own electrical possession. Failures of the kind are not incidents of which one can make sport; their gravity lies in the loss, inconvenience, and danger that they occasion. Some of the streets of Woolwich were in darkness, offering vice and violence an open field. Why? Because gas had been evicted to give place to the costly and fickle rival. Business premises had to be closed where electricity was in use; and in many instances no doubt profitable custom was lost. Why? Because gas lighting was not there. The Hippodrome had to be closed. Such closure and loss of business would have been prevented, and the public safety assured, by the simple expedient of having gas in the place. Do the London County Council's regulations as to theatres apply to hippodromes? If not, why not? If they do, why was the Woolwich Hippodrome put out of action? The public safety in such places must come before the mere saving of a trifle in keeping a dual installation for artificial illumination in good working order. We notice in another suburban area that a tradesman who has suffered from collapses during the business hours of the evening has compromised matters by having his premises outside fitted with high-power incandescent gas lamps in place of metallic filaments—retaining the latter form of lamp inside the windows. In this way he has halved his patronage, but secured protection for both business and goods. The memory of failures that affect business has a lingering tendency.

Show-rooms here, showrooms there, and show-rooms everywhere. What with providing show-rooms and getting-up exhibitions which the (almost) dividendless electrical manufacturers have sometimes to stock, the electricity supply industry is busy. The time for waiting for electricity business has passed; and a greater activity must needs prevail. In some instances the show places are fitted-up with rooms tastefully furnished, so as to exactly represent how for electric lighting they should be fitted and what is the effect. Then there are those pretty little things for human convenience like shaving-pots and curling-irons to be exhibited; together with the advances of application along the expensive electrical way in the shape of radiators and various cooking apparatus of minor degree in performance and economy. There has been opened in the South Metropolitan Electric Supply Company's district an additional house, demonstrating domestic electrification. Members of the Press were invited to go down and inspect it last Thursday. We were not of the number. One of the attractions for the Press men was the promise of electrically cooked food. We have not, up to the time of writing, met with any one of the journalists who went down to see and (possibly) to eat. We feel regret, which is deeply shadowed as we remember the words of Mr. R. Borlase Matthews (*ante* p. 382): "The cooks complain that the fruit in a pie boils, while the pastry becomes heavy." Another development of the show-room business is credited by one of our electrical contemporaries to the Westminster Electric Supply Corporation. Most districts have shops to let in these times when electrical failures are not, unfortunately, the only ones to be recorded. The Electric Corporation make a choice of these places, and rent them for a period (say) of fourteen days, so that exhibiting is carried on successively in the various districts. The wrinkle is an excellent one. However, it is good to see all this activity. But there seems some idea in the electrical mind that we are opposed to electricity suppliers doing their best to advertise domestic electrification, while advocating the opposite regarding gas supply. Some people suffer from contracted vision. Our only objection to domestic electrification effort is when it is shrouded in untruth. We do not claim that our robes are of immaculate whiteness; but by no deliberate act are they soiled.

In a lecture at the London Institution last week, to which reference is made elsewhere, Mr. Leon Gaster called attention to the knavish tricks that mar the electric incandescent lamp trade, whereby consumers have palmed off on them lamps that are not what they are represented to be, and which lamps assist such inconveniences as failures of current, and sudden collapses of lamps, and expense to bring electric lighting into disrepute. Consumers, of course, are to be blamed for not dealing with tradesmen of good standing, who are in a position to advise them as to the best forms of lamps to employ. At the same time the instinct of the human race is more largely directed to economy than to extravagance in the means of artificial illumination; and this works in more ways than one to the advantage of gas lighting. The only thing that can be done to put a stop to the vicious practices of the unscrupulous dealers in such lamps is for the electricity supply undertakings to issue warnings against itinerant vendors and other traders whose wares are notoriously both cheap and nasty. The same might be done in connection with incandescent gas burners and mantles. The "throw-outs" of which Mr. Gaster speaks in alluding to incandescent electric-lamps are the "seconds" of the mantle industry, and besides them—the deformed and the otherwise defective—there are mantles of very inferior quality. We have seen examples of these that have been purchased at the door from men whom the householder may never set eyes on again; and many of these wares are the enemies of the gas industry. The itinerant class of business has extended largely to the electrical industry; and the men who engage in it are the embodiments of commercial irresponsibility and licence. They have none of the conventional drawbacks of the ordinary tradesman who is tied to his shop with all its expenses. They can sell what they please, and are satisfied if a shadow of profit crosses their palms. This condition of things, says an electrical contemporary, is rough on the genuine retailer of lamps. "He cannot possibly, even if he were willing to do so, sell high voltage tungsten lamps of any make for 3s., yet such lamps are being hawked about freely at this figure. Anyone who has bought these lamps will require a lot of persuasion to spend 4s. or 4s. 3d. apiece for the next batch he requires, and he may refuse to pay more." This statement is interesting. It indicates that respectable high-voltage lamps are being sold at 3s., at the householder's door; and the man who so sells would not walk and trade if he were not making something for himself. It also shows that rather more than a shilling and fifteenpence are the lines of profit-making the tradesman looks for in such lamps. With such a profit hanging to the lamps, there is ready understanding of the tradesman's chagrin over the action of his wandering competitor, and also of the electrical contractors' desire to do all in their power to prevent the local electricity undertakings entering into the fittings and lamp business, and so preserve the profits for themselves. Electric lighting consumers seem to be the victims of imposture from electricity supply to lamps. They are compelled to furnish the greater part of the profits of an electricity undertaking, contribute towards the capital expenses incurred in the supply of the power consumer, and, on every lamp they buy, they hand over a percentage of profit that would not have found credence with us had it not been stated in—dare we say it?—an electrical paper.

Some of our electrical contemporaries have been drawn into comment upon Mr. H. N. Clark's recent Southern Association paper; but, in doing so, they carefully avoid his evidence as to gas having displaced electricity for lighting in certain premises at West Ham, and as to the actual cost figures for running a high-pressure gas installation. On the point as to an electric stand-by for driving the compressing plant, the "Electrical Review" makes the following enlightened remarks: "One speaker was surprised that an electric stand-by should be suggested, and he pointed out that the high-pressure installation in Fleet Street was worked without the aid of electricity. Four engines are used, as it appears, *one at a time*. The stand-by, therefore, is three times the size of the running plant. Comment is needless." The speaker was Mr. W. J. Liberty; and the "JOURNAL" report of his speech states in reference to the high-pressure lighting in Fleet Street and the neighbourhood: "They had duplicate plant with four engines in all—*two in each section*; and it was only a question of turning a handle to get the other section into running." Comment on our contemporary's statement, we agree (and are indeed pleased to be in harmony on this occasion) "is needless."

A Long Concrete Pipe Conduit.—A 12-mile conduit of 36-inch concrete pipe has been built down the canyon of the Middle Boulder Creek on the east slope of the Rocky Mountains in North-Eastern Colorado, as part of the hydro-electric development of the Eastern Colorado Power Company on that stream. A high cyclopean-concrete masonry dam across the stream at Barker Meadows, 17 miles west of Boulder, and at an elevation of 8000 feet above the sea, will form a large reservoir for impounding water. According to some particulars in "Engineering Record," the 36-inch concrete pipe-line extends from the dam down one side of the canyon to a power station which is under construction four miles straight west of Boulder. The conduit is on a hydraulic grade line, having a fall of approximately 26 feet to the mile, while the creek drops very rapidly between the dam and the power-house. As a result, the pipe-line is at an increasing height above the stream; the difference in elevation between its lower end and the power-house being nearly 2000 feet.

PERSONAL.

OFFICIAL CHANGES IN THE SUNDERLAND GAS COMPANY.

THE lamented death of Mr. J. H. Cox, who for upwards of sixty years was Secretary and Manager of the Sunderland Gas Company, rendered necessary a rearrangement of the Company's staff; and at a meeting of the Directors held last Wednesday, Mr. Charles Drury was appointed Engineer, with charge of the manufacturing operations at the Company's two works at Hendon and Ayres Quay, and Mr. Norman S. Cox was appointed Secretary, with charge of the distributing department; each official being directly responsible to the Directors for the management and control of the work entrusted to him. In addition, Mr. A. H. Bagshaw and Mr. H. H. Collett, members of the Company's staff, are appointed Works Managers at the Hendon and Ayres Quay Works respectively under Mr. Drury.

In connection with these appointments, it may be interesting to mention that Mr. Drury was educated at Ramsgate and at the Cheltenham College, studied for several years under Professor Henry Adams at the City of London College, and holds numerous certificates from the City and Guilds of London Institute. In 1880 he was a pupil of Mr. P. J. Wates, who at that time was Engineer of the Vauxhall works of the South Metropolitan Gas Company. Five years later he was appointed Assistant to Mr. Charles Carpenter, who succeeded Mr. Wates. In 1892 he obtained the position of Manager of the Hendon works of the Sunderland Gas Company. During his residence there they have been largely extended and modernized; and, under his supervision and direction, installations of both West's and De Brouwer stoking machinery have been introduced into two of the retort-houses, with very satisfactory results. These works have now a total productive capacity of 6 million cubic feet gas per day, though the actual maximum make so far has been 5 millions. In addition, as our readers are aware, Mr. Drury has been engaged for the past two years and a half in designing and carrying out the entire reconstruction of the Company's Ayres Quay works, which when completed will have a maximum productive capacity of 1½ million cubic feet per day. This work includes the first installation of Dessau vertical retorts in this country, the bench consisting of six beds of ten retorts each; and, if successful, it will probably be doubled in due course. It is expected that these works, which were described and illustrated in the "JOURNAL" for the 6th of July last (pp. 22, 25), will be brought into operation in the course of a few days. Mr. Drury, it may be remembered, was President of the North of England Gas Managers' Association in 1898-9. Mr. Norman Cox was educated at Repton School, and in 1894 was Mr. Drury's pupil at Hendon. He was appointed Assistant there in 1901; and two years later became Assistant Secretary and Manager of the Company under his father.

Mr. GEORGE W. HURST has resigned his position as Manager of the Shephed Urban District Council Gas-Works.

Mr. GAVIN MUIR, Manager of the Stonehouse Gas Company, Limited, has been appointed Manager of the Neilston Gas Company; and Mr. JOHN BROWN, Assistant at Stonehouse, has been promoted to the position vacated by Mr. Muir.

OBITUARY.

Mr. T. C. SKARRATT, of Kington, who died last Wednesday, at the advanced age of 91, was for many years Chairman of the Kington Gas Company.

The death occurred, on the morning of the 20th inst., of Mr. WILLIAM SCARRATT, of Basford Park, who had been for forty years in the service of the British Gaslight Company, Limited, at their Potteries station. The deceased was widely and favourably known and highly respected; and his funeral, which took place last Tuesday, was largely attended—among the mourners being Mr. J. R. Heath, the Manager of the Hanley Gas-Works, and other officials of the Company.

The death occurred on the 8th inst., in his 81st year, after a long and painful illness, of Mr. ROBERT FIELD, who was Manager of the Bishop Auckland Gas-Works from 1865 to 1904. Prior to his appointment at Bishop Auckland, he was in the service of the Hartlepool Gas and Water Company. He was for many years a member of the North of England Gas Managers' Association. Deceased was a highly respected and trustworthy servant of the Company. At his interment at South Church, Bishop Auckland, every mark of respect was shown by Directors of the Company, fellow gas managers, the workpeople, and the general public.

Masonic.—Last Wednesday a new Masonic Lodge was consecrated in the Province of Derbyshire—the Hope Valley Lodge, No. 3397. Among the founders were the Chairman (Mr. Ambrose Frith) and Manager (Mr. T. H. Brown) of the Hathersage and District Gas Company, Limited. Mr. Brown—son of Mr. Thomas Brown, a member of the Northern Star Lodge—was appointed I.G. of the new lodge.

THE STRIKE OF GAS WORKERS IN ITALY.

No Agreement, but a Collapse.

WHEN writing last week, there were all the welcome signs of a speedy and effective ending of the strike of men employed at the works of the Union des Gaz at Milan, Genoa, Alessandria, and Modena. It will be remembered that conditions were arranged with the Prefect, the Company's Managers, and representatives of the men; and these had to be referred to the men. It was hoped that good sense would prevail; and that the men would accept them. But the contrary was the case—the conditions were declined. Further negotiations took place; and last Wednesday morning, as the result of a consultation between the General Manager at Milan of the Union des Gaz (Signor Grüss), the Prefect, the Syndic, and the delegates of the men, conditions were arrived at which the Government thought the men should accept. As the men would not signify approval, a ballot was taken on Thursday—opening at nine o'clock in the morning and continuing till five. The result was that 600 voted for continuing the strike, and 300 against doing so. Between 700 and 800 of the men did not record their vote. The ballot was carried on under very boisterous conditions; sticks and other missiles being freely used. On the result of the ballot being announced, Signor Grüss issued a notice that, unless the men presented themselves for re-engagement under the new conditions by four o'clock on Friday afternoon, they must consider themselves as dismissed; and the Company would take steps immediately to engage men to permanently replace them. The men were not long in appreciating for themselves personally the effect of the Company's ultimatum; and by midday on Friday they were returning to work in great numbers, and signing the new conditions under which they will be engaged. At Genoa the men resumed work on the Company's new conditions; and the same may be said of Alessandria and Modena.

KICKING OVER THE TRACES—INCENDIARISM.

Though, under the circumstances, there was every promise of work being peacefully resumed on the old men returning, hope was doomed to disappointment at the St. Celso station at Milan. There the men who wheel the coke from the retort-houses (the men who have occasioned more trouble than any other section of the workers), as soon as they were in the place again, refused to work unless they could have the old conditions—that is to say, maintaining the old organico, instead of the new. Carbonization, of course, had to be suspended; the stokers having to cease work on account of the coke men. Owing to this the production of gas was considerably limited; and the Manager was forced to once more curtail the supply to the town, and to leave the street-lamps unlighted. On Sunday questions also arose with other shifts; and the Manager was compelled to exercise authority and discharge fifteen of the coke men and fifteen apprentices, who declined to work for having been fined for being late. Subsequently the other squads consented, after a little discussion, to work; and it was hoped that matters would be completely readjusted by last night. To instance the absolute depravity of these men, they on Saturday and Sunday set fire to two of the large sheds that had been used for barracks. On Sunday, too, a fire was discovered near to a gasholder and benzol tank; and it was found that a fire-hydrant in the vicinity was plugged. This shows the intention of the cowardly and vindictive fellows. Articles in the latest Milan papers to hand are distinctly opposed to the men and their actions; and it is now clear that Signor Grüss was quite justified in asking, as a condition of settlement, that some fifty of these coke men should be discharged. He did not wish to have them back again, seeing that they were at the very bottom of all the trouble. It is now seen that the Manager was absolutely right; and had not cast any unjust reflections on the men.

The foregoing intelligence is gathered from the telegraphic communications received yesterday by Mr. W. Martin, at the London Offices of the Company. From Genoa, he heard that everything was going on well. There were no difficulties there; the men having gone back, accepting the conditions without reserve. Mr. Morton, the Engineer and Manager, has thus obtained, with very slight variations, what he, from the very beginning, insisted upon having. Everything, too, was reported as proceeding quietly at Alessandria and Modena.

The English contingent of gas workers who went out to render assistance arrived in London last evening.

THE OLD MEN AT WORK.

A Milan correspondent, writing before the foregoing telegraphic information was received, says:

Men voted by ballot on the 25th regarding the continuance of the strike. Over 600 voted for its continuance, and 300 odd for retaking service under the Company's conditions, while some 700 abstained from voting. On Friday, therefore, notices were posted dismissing the workmen who did not sign on before four p.m. under the terms of the new "organico," including the disciplinary clauses. This had the effect of entirely demoralizing the strikers' combination; and men commenced signing on before midday—in fact, some 1300 men personally signed their names at the various works and main offices as being desirous of commencing under the conditions imposed by the Company. These

conditions are that the scales of pay shall be the same as before the strike, including the graduatorio by which the men receive an automatic increase according to their term of service, as provided in the original organico; but the Company will be entirely masters in their own house, and the men will be obliged to give notice before leaving their work, &c. The question of reducing the number of men engaged on certain classes of work will be decided later; the Company stipulating that certain sections shall be reduced in accordance with the arbitration agreed to by the men in 1907. The arbitration decisions (which the men subsequently refused to acknowledge, and demanded in their recent famous memorial should be abolished, because they understood the ultimate decisions were not in their favour) remain unchanged.

The workmen on distribution service—including the main and service laying, street-lamp maintenance men, lamplighters, collectors, &c.—numbering about 300 men, commenced work on Saturday morning, and the works' staff were to commence on Sunday morning. The last charges were made by the English, German, and temporary Italian workmen late on Saturday; and they were (it is understood) removed during the midnight hours by special conveyances and special trains. The Company's old employees commenced service at 6 a.m. Sunday. All the works are in thoroughly good order, the machinery perfectly clean, &c., presenting a model to the men who have yet to learn what cleanliness and discipline really are. Mr. Hovey remained on duty constantly all Saturday night; and there were a number of military to ensure tranquillity. The strike has lasted some 25 days; and naturally enormous local interest has been taken in it.

Local manufacturers, and probably many others, are much gratified at the Company's success; and it is generally expected that the conditions of labour in Italy will be greatly modified as the result of this strike and the Company's strenuous fight. Certainly the men could scarcely have presented a more sorry spectacle before the eyes of the public and even of other workmen; for all knew that the Company had treated them much too generously in view of their indolence, their slovenly demeanour, and their insubordination.

During the strike excellent service has been rendered by Englishmen, Germans, and even Italians. Among the latter have been found some excellent men who actually seem to work for the love of it. The Company have a great number of applications for work from men in various stations of life; and it would be easy to construct an entirely new staff from these volunteers. The foreign assistant engineers have also done good service.

THE INCITING DEMAGOGUES AND LEADERS.

A document called the "Order of the Day of the Strikers" has been received. According to the organ of the men, the leaders of the strikers in Genoa met at the Chamber of Work, and approved unanimously of this so-called "Order." It shows how the leaders exercise themselves with all the subtlety of their kind to excite their followers, and how unscrupulous are their methods and statements. The order is worth preserving; so here it is:

The General Council of the Chamber of Work of Genoa and Sampierdarena having met in order to consider the position created by the strike of the gas workers,

Having read the report of the Executive Committee of the Chamber and that of the gas workers,

Considering that the Union des Gaz in refusing to take back their staff on the former conditions (after the men gave up the claims contained in the memorial) act with criminal premeditation with the view of getting rid of a part of the men, and to crush their class organization, in order to be able to impose heavier conditions of work, and to humiliate the men with ferocious disciplinary conditions,

They applaud the dignified behaviour of the strikers, approving and encouraging their decision to continue in the resistance till they obtain the legitimate satisfaction to which they are entitled,

And reserving to adopt such other measures as may in future appear necessary for defending and supporting the strikers fighting against a foreign capitalistic company trying to oppress their men, also because they are Italians, and they consider them nothing more than persons from whom the most is to be obtained and the least given,

They decide—

- (1) To approve the urgent decision taken by the Executive Committee in reference to the publication of a Manifesto to the townspeople, and in reference to the subscription inviting once more all sections of the Chamber and all the members to pay in the first special contributions from their funds, and the amount of half-day wages respectively.
- (2) To give to the Executive Committee the mandate to promote, as soon as possible and contemporarily, some great public meeting in Genoa and Sampierdarena, to inform the townspeople of the present dispute, informing them of the enormous profit made in Italy by the Franco-English Company, and keeping alive the agitation against the strikers.
- (3) To invite the Communes of the Liguria to municipalize the important public service of the lighting, with advantage to the workmen, to the consumers, and to the communes.
- (4) To protest against the abuses of the police against all the strikers, and against the maintenance of soldiers inside the works.
- (5) To appeal to all the consumers sympathizing with the cause of the strikers, asking them to refuse paying the amount due for gas consumed till the Company has taken back in the works the old staff with a guarantee that the agreement, the decisions of arbitrators, and the existing uses will in future be respected.

By the conversion of the words "Chamber of Labour" by

"Union des Gaz," an "order of the day" in very similar terms might have been issued by the Gas Company.

From the "Corriere di Genova" we extract the following:—

A SHAMEFUL DEMONSTRATION AGAINST THE MANAGER OF THE UNION DES GAZ.

Yesterday afternoon, we had at Genoa a proof of the new kind of education which the poor class receive at the hands of the pedagogues of Vico Casana Street.

The peaceful people who at six p.m. were hurrying home to dinner had to witness a demonstration reminding one of the beginning of the disturbances at Genoa in September, 1904, and at Milan in 1908. A crowd of hooligans, from 7 to 15 years old, accompanied by a number of women, marched from Via Lomellini, where the offices of the Union des Gaz are situate, to Piazza Deferrari, giving way to all the privileges of the uneducated and ignorant class, screaming and hissing the Union des Gaz first and the Municipality after.

And this is not all. At a stage of their glorious march, they saw in the street Mr. Morton, the Manager of the Gas-Works; and at once they surrounded him, and chased him the whole length of Via Carlo Felice, hissing and swearing, as far as the Hotel de Gênes, which the pursued man entered, withdrawing in that way from the deplorable chase.

And this is the most edifying part: The marchers were enclosed by policemen and "carabinieri," who proceeded carelessly, and almost smiling, as if it were the most natural thing; and no one knows how long the shame would have lasted undisturbed, if Mr. Morton had not had the good sense to enter the hotel.

These young heroes are certainly the same who at night crowd the gallery of the Apollo Theatre, enjoying the licentious performances which are served to them with the indulgent approval of the Authorities, who, being only anxious that the public order should not be disturbed, do not trouble about property being respected or the law of hospitality, and allow the mob to indulge in excess which may lead one to think that Genoa is an uncivilized town.

CHANDLER'S LATEST WASHER-SCRUBBER.

Patent "Spray" Washer-Scrubber.

THE spraying of liquor on to surfaces as they revolve, so that the gas has a wetted substance to rub against, and the spraying of it simply into space through which the gas passes—depending alone upon centrifugal means for the efficient extraction of ammonia—are, of course, totally different systems of "spraying" liquor. Both applications have the same object in view; and while much may at times be expected with regard to many matters from information acquired from laboratory tests or even from results of actual working upon a very small scale, yet when large volumes of gas (running into millions per diem, or into figures such as those quoted below have to be dealt with), much speculation may arise in the minds of engineers as to the satisfactory accomplishment of purifying the gas by means of sprayed liquor alone. It may be found in the latter case that the gas and liquor part company far too rapidly, too easily, and very much too soon for the accomplishment of the desired aim. Although some four years have elapsed since the introduction of the vertical arrangement, up to now little has come before us of what has been done.

In the "JOURNAL" for Jan. 19 last, in an "Editorial" under the heading "Purifying by Means of Ammonia," we made some reference to a document furnished by Mr. Samuel Chandler and perused by us regarding the above invention. The specification and drawings of the patent now completed, and which we publish below to-day, will give more complete information to readers. It was stated in the "JOURNAL" referred to that, while there were reasons at the time for withholding fuller details of the subject regarding Mr. Chandler's latest ideas on washing and scrubbing gas, as disclosed by the document then before us, a notable advance appeared to have been made and that the inventor had again struck novel ground so far as the rotary washer-scrubber was concerned. There were also good reasons for believing that by the adoption of his improvement, washing and scrubbing apparatus designed for a capacity of 3 million cubic feet of gas per day would be equally efficient for 5 millions; and a perusal of the specification seems to establish our opinion as then expressed.

This being so, it should be admitted as a very great stride in the development of rotary washer-scrubbers, especially as such an important advantage as this by no means stands alone. It is noticed in the provisional specification that an example is given as to how this large additional work is accomplished—viz., "if a machine contains a total wetted washing and scrubbing area of (say) 30,000 feet, generally there remains about 12,000 feet of such surface buried beneath the liquor;" this leaves only 18,000 feet above the liquor-line to deal with and purify the gas. It, therefore, obviously follows that when this 12,000 feet are liberated from the liquor and become exposed for active service to the gas, the washing and scrubbing power is increased by two-thirds. Hence, as we foreshadowed, a 3 million a day machine has sufficient surface available for contact with the gas to purify 5 millions; and a $4\frac{1}{2}$ million machine is equal to $7\frac{1}{2}$ millions, and so on. Such evident possibilities will doubtless be much appreciated by the gas profession at home and abroad, and provide an economical means for extensions of plant of this kind.

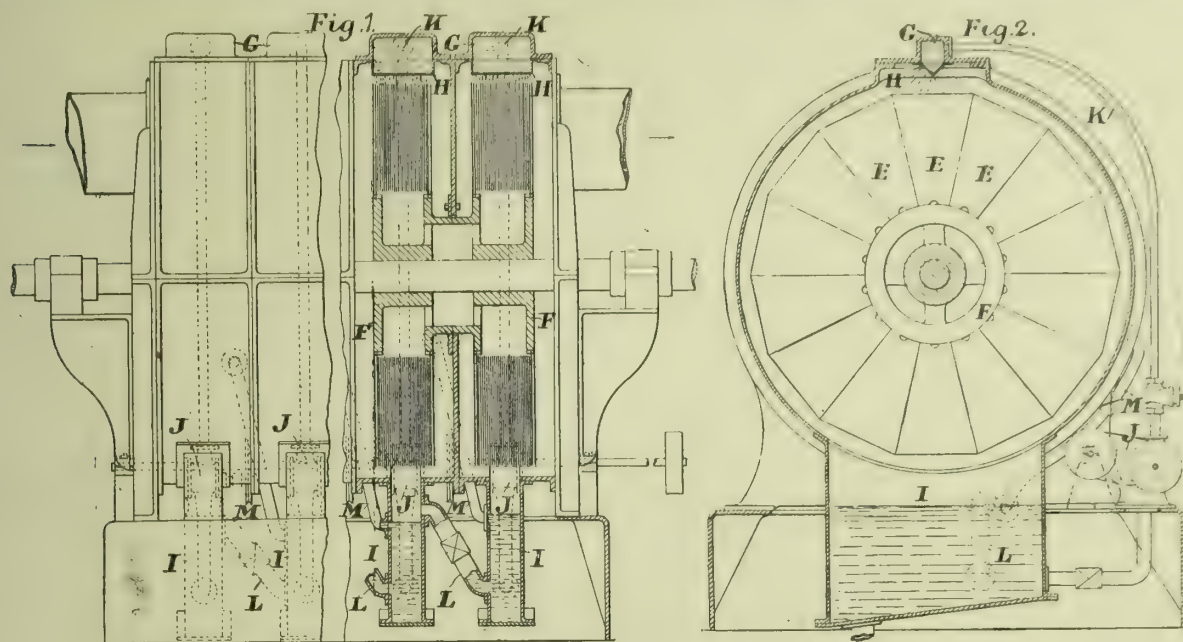
Another valuable result attained and pointed out by the adoption of this latest device is the easier and better-balanced manner

in which the several wheels of surfaces are caused to revolve, owing to the freedom obtained through their not having to overcome the resistance of the liquor through which, until the introduction of this invention, they had to pass. Also since the abandonment of this obstruction, the power to drive must be considerably reduced, as well as the liability of twist or strain to which the shaft is otherwise subjected—tending to its ultimate breakage. By the use of apparatus of this kind, greater concentration of the effluent liquor should certainly be secured, and a more near absorption of the carbonic acid from the gas be obtained. Further, as we have already observed, such an improved washer-scrubber should surely also be adaptable for employment in the purification of gas by means of causticized liquor.

One of the chief faults of the early plant used for the latter purpose was want of compactness and simplicity, whereby much loss of ammonia was sustained; and considering that this latest apparatus contains in a comparatively small compass so great a wetted surface, it may fairly be described as a compact design; while, by the simple manipulation of the cocks, the

machine can, in emergency, be worked temporarily on the present lines. As the inventor sets out in the earlier part of his specification, the distinct advantages are that, "there being a much larger open area for the passage of the gas, less pressure is given; the gas travels slower, and is kept longer in contact with the surfaces; by doing away with the resistance caused by the immersed wheels, less strain is on, and less power required to drive the shaft and the wheels of surfaces it carries; weak liquor can be put into any bay and worked up to enhance its value; and ground space is largely saved."

These are some of the advantages claimed over the old type of rotary gas washer-scrubbers; and altogether this latest development appears to have brought rotary washer-scrubbers up to a very high degree of excellence—at all events, so far as using all the surface enclosed in the vessel to the highest possible pitch. Mr. Samuel Chandler, who for so many years has been and is a well-known and acknowledged successful worker in this class of gas purifying apparatus, is certainly to be congratulated upon bringing it to a much nearer state of perfection.



Chandler's Latest Patented Washer-Scrubber.

The patent referred to above is No. 27,841, dated Dec. 22, 1908, and was granted to Samuel Chandler, of Brixton Hill, S.W., for "Improvements in Apparatus for Gas Purification."

In his specification, the patentee says his invention relates to apparatus wherein a series of washing devices is arranged in bays or compartments and mounted upon a common shaft, which extends through the apparatus and has bearings at the ends. Each of the washing devices is preferably composed of a series of sections E, carried by hubs or bosses F secured upon the shaft. As shown, these hubs or bosses are made hollow, and are connected in pairs, so that the gas which enters one compartment flows through one washing device from the periphery to the centre and thence into another device, through which it flows from the centre to the circumference, and so on.

Fig. 1 is a sectional side view of the apparatus. Fig. 2 is a section on the line X of fig. 1. Fig. 3 is a sectional side view illustrating a modification of the apparatus.

The bays or compartments of the apparatus have in them washing devices mounted on a common shaft, which extends through the apparatus and has bearings at the ends. Each of the washing devices is preferably composed of a series of sections E, carried by hubs or bosses F secured upon the shaft. As shown, these hubs or bosses are made hollow, and are connected in pairs, so that the gas which enters one compartment flows through one washing device from the periphery to the centre and thence into another device, through which it flows from the centre to the circumference, and so on.

At the top of each compartment or bay is arranged a chamber G, having a perforated bottom H, through which liquid will be sprayed on to the washing device. At the lower part of each bay is a sump or receptacle I into which the liquid which falls off the washing devices drains. In connection with the receptacles I are pumps J, which draw the liquid away from the receptacles I and deliver it through pipes K into the chamber G, from which it is sprayed on to a rotating washing device.

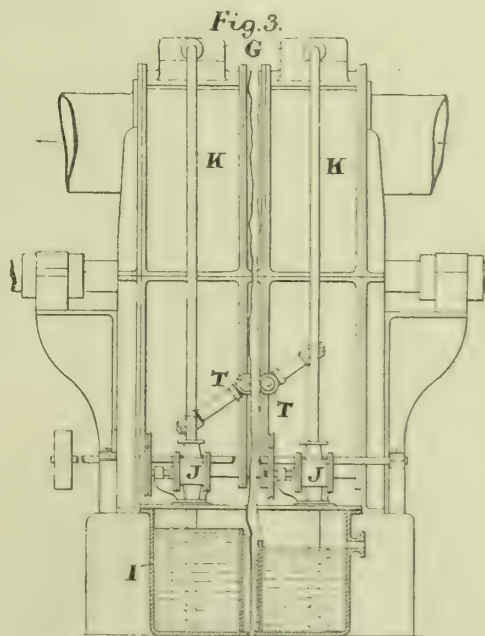
The several receptacles I are connected by pipes L through which the liquid can overflow from one vessel into the next, and so on; each overflow pipe being connected at one end to the lower part (from which liquid overflows) and at its other end to the vessel into which the overflow runs, so that the denser liquid is discharged from the lower part of each receptacle into the next receptacle, and so on.

The arrangement of these receptacles and overflows is such that the washing device in the compartment into which the gas first enters will be wetted with a dense liquid, while that in the compartment from which the gas escapes will be wetted by relatively clean liquid.

In order to provide for the working of the apparatus in case of accident to the pumping or spraying arrangement, there is a second set of overflow pipes M, arranged at a much higher level than the pipes L, so

that the apparatus can be worked with the washing liquid in the bottom of the compartments in the ordinary manner.

To provide for the proper working of these overflow pipes, however, it will be necessary to prevent by means of cocks the flow of the liquid through the pipes L.



A Modified Arrangement.

In adapting the invention to existing washer-scrubbers, the patentee provides the alternative arrangement shown in fig. 3, where the receptacles I, instead of being arranged immediately beneath the main compartments, are separated from them, and are connected with their respective compartments by pipes. The tank I may be common to all the washing compartments—being simply provided with partitions at varying heights, so as to dispense with the necessity for using the overflow pipes T. With this arrangement also, the pipes M, for affording connection between the respective bays when the washing devices are working with immersion instead of with the spray, are arranged outside the apparatus; each connecting pipe being provided with a cock for closing it when not in use.

WATER LEGISLATION FOR 1909.

[SECOND ARTICLE.]

IN the "JOURNAL" for the 2nd inst. the Acts obtained by Water Companies this session were noticed. We deal to-day with some of the measures of Local Authorities containing proposals in regard to water supply.

The Derwent Valley Water Act enables the Derwent Valley Water Board to make a deviation of an aqueduct, authorized by their Act of 1904, commencing in the parish of Morley and terminating in the parish of Hopwell. The Board are granted an extension by five years, from the 9th of August last, of the period specified by section 63 of their Act of 1899 for the completion of the Howden reservoir; a further period of three years from the passing of the Act for the purchase of certain land; and a like period from the first-named date for the completion of works by the Leicester Corporation under the Act of 1899. So much of section 147 of that Act as relates to the Hall Gates low-level reservoir is repealed, and authority is given for the work to be proceeded with, notwithstanding the expiration of the period of ten years mentioned in the section. The Act contains various financial provisions affecting the Board as well as the Leicester and Sheffield Corporations. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Llanelly Water Act empowers the Llanelly Urban District Council to construct and maintain additional water-works, and define and extend their limits of supply. The works consist of seven pipe-lines, which are to be completed within five years from the passing of the Act; and the proposed extension of the water area will take in certain specified proportions of the parish of Llanelly Rural. Authority is given for the purchase of mains and pipes within the extended limits. After the completion of the filtration works authorized by the Act (for which three years are allowed), all water supplied by the Council from their existing reservoirs is to be efficiently filtered before it is put into the mains for distribution for domestic purposes. Power is given to hold lands necessary to prevent the fouling of water, to fix and maintain meters and other apparatus for the detection and prevention of waste, and to make bye-laws in connection therewith. The Council are authorized to borrow £8175 for the purchase of lands, £12,925 for the construction of works, £41,700 for the extension and improvement of the water undertaking, and the amount necessary for defraying any purchase-money and compensation payable in respect of the acquisition of mains and pipes from the Rural District Council. For the repayment of the two first-named sums, sixty and forty years are allowed, and thirty years for the remainder. The Council are not to supply water within the Burry Port district, except to the Council, without the consent of that body. [*Parliamentary Agent: Mr. A. Rhys Roberts.*]

By the Northallerton Water Act, power is given to the Urban District Council to construct additional works, consisting of an impounding reservoir to be formed by a dam or embankment across the stream known as the Oak Dale Beck, five conduits or pipe-lines, two catchwaters, and other works; and to borrow £14,100 for carrying them out, and for the purchase of lands and wayleaves—to be repaid within sixty years so far as the money borrowed for the reservoir is concerned, and within forty-five years for the rest. A period of ten years was asked in the Bill within which money borrowed to defray the costs and expenses of the Act must be repaid; but only five years have been allowed. All water supplied by the Council is to be properly and effectually filtered or otherwise treated so as to prevent it acting on lead in such a manner as to endanger the health of the consumer; and they are to be liable to a penalty not exceeding £10 a day for default. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Oldham Corporation Act confers power upon the Corporation to construct additional works, comprising a pumping-station with a receiving tank in the parish of Butterworth, in the urban district of Milnrow, in the county of Lancaster, two aqueducts or pipe-lines, and a line of steam-pipes from the Butterworth Hall Colliery of Messrs. Platt Bros. and Co., Limited, to the above-named pumping-station—all to be completed within five years. The Corporation are authorized to borrow £20,200 for the purchase of lands for water-works purposes, as well as £75,000 for the construction of the water-works authorized, and for new mains, extensions, service-pipes, and meters; to be repaid in sixty and thirty years respectively. The water-rent for other than domestic purposes outside the borough is not to exceed by more than 13½ per cent. the rent payable for a similar supply within the borough. The prices per 1000 gallons of water supplied by measure are to be: Under 50,000 gallons per quarter, not exceeding 2s.; above 50,000 and under 500,000 gallons, 1s. 6d.; above the latter quantity, not more than 1s. The minimum is 5s. per quarter. [*Parliamentary Agents: Messrs. Lewin, Gregory, and Anderson.*]

The Act obtained by the Risca Urban District Council authorizes the transfer to them of the undertaking of the Western Valleys (Monmouthshire) Water and Gas Company, confirms the construction of the existing water-works, and sanctions the carrying out of subsidiary works and the supply of water and gas in their district and in adjacent places. The present works consist of a reservoir, a tank in the parish and urban district of Risca, six intakes, and seven conduits or pipe-lines. The limits of water supply are the whole of the urban district of Risca and

a portion of the urban district of Mynyddislwyn. The rates chargeable are to be based on the rateable value of the premises supplied. Where this is not higher than £4 per annum, the charge is to be 2d. per week; above £4 and up to £7, 3d.; above £7 and up to £10, 4d. Premises rated higher than this are to be charged upon a percentage, decreasing with the increase in the value. For an extra closet 7s. 6d., and for a fixed bath 10s. 6d. per annum may be charged. The price of water supplied by meter is not to exceed 1s. 6d. per 1000 gallons. Authority is given to borrow such sums as may be necessary for the purchase of the undertaking and lands and waters for the purposes of it, and such sums as the Local Government Board may sanction for the extension of the works, providing working capital, and defraying the costs and expenses of the Act. The money borrowed for the purchase is to be repaid within forty years, and for the lands and waters within sixty years, from the date or dates of borrowing. The other water clauses are of the usual character. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Stourbridge and District Water Board Act constitutes and incorporates a Water Board for the urban districts of Stourbridge, Lye, and Wollescote, in the county of Worcester, and Amblecote, in the county of Stafford, and the rural district of Kingswinford, in the latter county; and authority is given for the transfer to the Board of the undertaking of the Stourbridge Water Company, and for the construction of additional works. The Board is to consist of twelve members, who are to be elected within eight weeks from the date of the passing of the Act, or within such further time as the Local Government Board shall allow; and they are to remain in office until April 28, 1911. The method of election, the conditions of membership, and many other matters bearing upon the constitution and duties of the Board and its officers, are fully set out in the Act. The consideration to be paid for the undertaking is to be such an amount of Stourbridge and District redeemable water stock as will yield an aggregate dividend equal to the maximum dividends on the capital of the Company to which the shareholders were entitled at the date of the Provisional Order of 1908, plus £2000 of such stock. The construction of the existing works is confirmed, and authority is given to make new ones, consisting of a pumping-station in the urban district of Stourbridge, a covered reservoir in the township of Upper Swinford, in the same district, and three pipe-lines—all to be completed within five years from the passing of the Act. The limits of supply are to be the respective districts of the Stourbridge, Lye and Wollescote, and Amblecote Urban District Councils, the parishes of Pedmore, Hagley, and Clent, in the Bromsgrove rural district, and a portion of the parish and rural district of Kingswinford. The charges for water are to be based on the rateable value of the premises supplied; the minimum being 6s. per annum without a closet and 7s. with one. Extras are allowed for an additional closet or a bath. Where water is furnished by meter, the price is not to exceed 1s. 6d. per 1000 gallons. Borrowing powers to the amount of £10,800 are granted for the purchase of land and the construction of works; £5200 for new mains, extensions, services, &c.; £2000 for working capital; and whatever sum it may be necessary to pay the Company in connection with the transfer of their undertaking and to defray the expenses of the Act and of the Councils' opposition to the Order of 1908. The Act confers the powers usually granted to suppliers of water. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Wakefield Corporation have been granted an extension, by ten years from the passing of their Act, of the period limited by the Act of 1889, as amended by an Act of 1899, for the completion of such of the works thereby authorized as have not been finished. The other provisions relating to water supply contained in the present Act include power to proceed against persons who wilfully injure meters or fittings. The Corporation may borrow £150,000 for the completion of the works indicated, to be repaid within sixty years. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The Watford Urban District Council Act authorizes the Council, among other things, to extend their limits of water supply so as to include as much of their district as is not at present within the limits of the Colne Valley Water Company. Power is given to maintain the present works and construct others, consisting of a well and pumping-station adjoining those now existing, a reservoir in the parish of Bushey, a conduit or pipe-line connecting them, and another leading from the reservoir to the junction of High Street, Watford, and the St. Albans Road. A period of ten years is allowed for carrying out these works. The rates for the supply of water are to be based upon the rateable value of the premises; 4s. per annum where this is less than £4, and 5 per cent. where more. The Council may supply water for other than domestic purposes by measure, at a price not exceeding 1s. per 1000 gallons; but they are authorized to charge for each supply (except in the case of houses partly used for trade) not less than 10s. per quarter. Borrowing powers are granted as follows: For the purchase of land and construction of reservoir, £14,190; for the erection of pumping-station, machinery, buildings, &c., £86,438; and for water-softening plant, &c., £9900—to be repaid in sixty, thirty, and twenty years respectively from the date or dates of borrowing. [*Parliamentary Agents: Messrs. Baker and Co.*]

At the inaugural meeting for the present session of the Junior Institution of Engineers, it was announced that the Durham Bursary for 1909-10 had been awarded to Mr. Frank J. Hawkins, the writer of the thesis on "Artificial Lighting."

LEWES'S IMPROVED INVERTED GAS-MANTLE.

THERE has lately been published the specification of a patent taken out in France by Professor Vivian B. Lewes, for improvements in gas-mantles.

The patentee points out that the ordinary Welsbach mantle generally employed in inverted incandescent gas-burners, which is composed of about 99 per cent. of oxide of thorium and 1 per cent. of oxide of cerium, furnishes a light too rich in violet and ultra-violet rays; the consequence being that the light is more injurious to the eyes than an artificial light which contains only a few of the ultra-violet rays, but a sufficient number of those at the red end of the spectrum to illuminate agreeably the surrounding objects. The patentee goes on to say that it is a well-known fact that mantles containing oxides of aluminium and chromium, either with or without the oxides of zirconium and thorium, produce the light just described. It was owing to this fact that, in the early days of incandescent gas lighting, many consumers preferred upright mantles made in accordance with this principle to ordinary Welsbach mantles. But, notwithstanding the agreeable light they emitted, and the lower cost at which they could be put on the market, they gradually dropped out of use because it was found that the mantle contracted and deteriorated near the top of the burner, in consequence of the great heat thrown off at the place where the inner cone—the green cone of the bunsen flame—came in contact with the tissue of the mantle, and caused volatilization of a portion of its constituent material. Various means were tried to avoid this inconvenience—for example, strengthening the edge of the mantle in order to prevent its contraction—but without obtaining satisfactory results. The consequence was that this type of mantle disappeared before the arrival of inverted burners.

The invention under notice consists in the utilization of the weight of the mantle in preventing its contraction and deterioration. This is effected by the use of a mantle such as that already described in combination with any kind of inverted burner. It will be readily understood that, by means of this arrangement, the heat is distributed equally over the entire surface of the mantle, and that the weight of the latter is sufficient to prevent its contraction. In the manufacture of these mantles, the composition which seems to produce the best results in practice is as follows:—

	Per Cent.
Oxide of aluminium	87
„ zirconium	4
Chromic oxide	9

Slight variations in these proportions do not, however, make a great difference in the quantity of light emitted by the mantle. Very good results are obtained by replacing the zirconium by thorium; and inverted mantles of excellent quality, so far as concerns their light-giving power, may be produced by means of combinations varying in the following proportions:—

	Per Cent.
Chromic oxide	5 to 10
Oxide of aluminium	48 „ 60
„ thorium	42 „ 35

In this combination, part of the oxide of thorium may be replaced by oxide of zirconium.

ILLUMINATING AGENTS.

A Sketch of a Lecture, with Some Comments.

THE fact cannot be disguised that the public do require educating in the matter of artificial illumination, and that the only qualified teachers are those who make a study of the question, whether they be independent experts (a title which few can at present claim), or the advocates of any particular system. It was with pleasure that we saw a large audience at the London Institution, Finsbury Circus, yesterday week, to hear a lecture on the subject (arranged for by the Committee) by Mr. Leon Gaster. During one part of the lecture, Mr. W. Williams, of the European Gas Company, presided. The character of the lecture was, of course, popular; but it had its good points for those who aspire to teach others. The lecturer practically devoted himself almost entirely to indoor illumination. He passed lightly over the history of the subject, to point the lesson of how vital had been the effect of good lighting, socially and industrially. The early pioneers in lighting, he mentioned, in a passing sentence, had much difficulty in their work; and he might have added that time has not lessened the difficulties of the illumination workers. The subject is such a big one now that it requires detailed study, and to be dealt with by the illumination expert. Light is the cause; illumination the effect. Effect is what a consumer pays for; and an expert's duty is to see that a consumer gets value in effect for his money.

The marked progress in electric lighting was next brought under review; the progress having culminated in the metallic filament lamp, in connection with which invention has not been exhausted. For the first time (he believes) in public, the lecturer showed a 16-candle metallic filament lamp for 200 volts. He then illustrated the effect of over-running incandescent electric lamps—increasing the voltage beyond the rating, and so obtaining augmented illuminating power, which would shorten life. He also demonstrated the incongruity of running lamps in series that are not properly paired. Then he had a shot at unscrupulous electric

lamp manufacturers and vendors, who trade fraudulently on the public confidence by selling lamps improperly marked, and which lamps are not distinguishable by the non-technical from good varieties. Numbers of foreign lamps are known to be bought up cheap by British dealers, who subsequently mark on them their own fancy names. "The 'throw-outs' from the Continent have a very funny way of coming this way. They don't sell them on the Continent; they sell them here." The point he enforced is that there should be some means of compelling all lamps to be properly marked; so that wherever and whenever the user bought a lamp, he should know that the marking on it truly represented its capabilities. But the lecturer does not altogether absolve the public from participation in giving encouragement to wrong dealings of this sort. There are those who will adopt the "penny wise and pound foolish policy" of saving a few pence on the lamps, and wasting a good many pence as a consequence on the electricity consumed. Another point at which the lecturer had a gentle tilt was as to the claim of some makers of metallic filament lamps that they show a 70 per cent. economy. That, he said, is not the true economy, because the expense is not only made up of the current consumed, but, in addition, the cost of the lamp and the duration of its life. Though the electricity might not be expensive, if the lamp is expensive, and if it has a short life, the economy claimed is not there. With reasonable price and reasonable life lamps, the economy may be high; but the direct economy claimed is not borne out in practice. The consumer's position in regard to his lamps should be improved; and this can best be done by co-operation between the reputable lamp makers and the central stations. As it is, under the present condition of things, the consumers look upon their bills something in the same way that they do upon their income-tax papers. They do not like them; and the worst of it is they do not understand them.

The lecturer next had a fling at the deputation appointed by the City of London Corporation to visit the Continent to investigate systems of street lighting, though what this really had to do with indoor lighting was not explained. Of course, the great unpardonable sin of this deputation is that they did not take an expert with them. But the lecturer did not say that they had the advice of the experts of the municipal authorities in every city they visited. Had they taken an expert, who would Mr. Gaster have elected—Professor Vivian B. Lewes or Mr. Voysey? The work of the deputation, as the mass of information in their report shows, was not "mere ocular" demonstration. Nor can we see, looking at the constitution of the deputation, that in their case "the result of mere ocular demonstration depends upon whether one has had dinner or not." Mr. Gaster's point, of course, is that non-technical observations are of limited value. In a matter of this kind, he said, one has first to know what one wants to do; and then how to do it. There is, he says, a ready way of ascertaining this—through the expert. But the deputation came home, and recommended further experiment. This, the lecturer feels, is not the proper way to settle the street lighting question. We disagree. The whole of the members of the Corporation cannot be expected to give a vote one way or the other, without they have some ocular demonstration of the methods advocated by the deputation. We have not yet come to local government in any single matter being controlled by a single "expert"—professedly independent with a leaning. The importance, added the lecturer, of the decision of the City of London is that—not being owners of the gas and electricity supply—the selection by the Corporation of any system of street lighting will have an important effect on other communities who look to the City for guidance. Incidentally, the lecturer mentioned that in Stuttgart, he had seen a new method of suspending gas-lamps on wires spanning the street, after the manner recommended by the deputation.

Turning to gas lighting, Mr. Gaster confessed that he was again faced by a vast and interesting subject. He traced the improvements, in the superficial manner that time only admitted, from flat-flame burner to inverted gas-lamp. The early difficulties of this last form of burner have been overcome by the proper provision of gas and air regulators and mixing chambers. A number of burners had been kindly fixed up by the Gaslight and Coke Company in the otherwise badly electric-lighted hall, so as to demonstrate some of the advances made. Norden's "Airostat" burner was exhibited, as the latest production, in that it provides for the automatic regulation of the air supply. Such automatic regulation, the lecturer thinks, bids fair to mark progress in the means of artificial illumination. Then Mr. Blakey's "Twin-Burner" was shown, whereby the products of combustion from a lower inverted burner are made to pass into a vertical burner above, and, with a small addition of pure gas, are there utilized for incandescing a vertical mantle. The Lucas "Thermopile" lamp was exhibited, as showing a happy combination of electricity and gas. Here the lecturer produced one of the new gas lighters invented by Welsbach. The greatest advance of all, however, says Mr. Gaster, is high-pressure gas lighting, which is going to hold its own against ordinary arc lighting and in many places against the flame-arc lamp. It may be suggested that the new forms of high-pressure lamps can, where gas is at a reasonable rate, compete in all cases with the flame-arc lamp. Where it is not desired to put up compressing plant, there are the various self-intensifying lamps available. Oil-lamps by which the oil is vaporized, and burned in connection with incandescent mantles, petrol air gas, and acetylene, were noticed; and reference was made to the ability now to systematically apply lighting and extinguishing appliances to gas.

Then the lecturer came to that all-important question of cost

and also asked which among illuminants is the best means of illumination. He cannot give any categorical answer to the latter question that would be generally applicable. What is good for one is not always good for another. But as to cost, the lecturer quoted figures that should be modernized. For instance, 1½d. per 1000-candle power per hour is not the price under the latest system of high-pressure lighting, using gas at 2s. 6d. per 1000 cubic feet. We suggest that Mr. Gaster should study the actual figures from a modern installation at West Ham as given on p. 396 (top of second column) of our issue for Nov. 9. Then the lecturer referred to the recent lifting of photometry from a state of bewildering uncertainty on to a more definite basis; and he then went on to allude to the necessity for good lighting in schools, factories, hospitals, and so forth—proper illumination being as important as good sanitation. The importance of scientific control of illumination, in order to, while giving the eyes sufficient light, avoid injury through glare, was emphasized. So, the lecturer went on, with information that impressed his hearers with the vastness of the subject of illumination.

Then we came to the crucial point. When doctors differ, who is to decide? Where are we to find the man of sufficient weight, knowledge, and varied sympathies to guide the user of illumination; a man unconnected with any system of lighting, and taking an impartial view of things; a man who can recognize not only the economical, but the physiological side as well; a man *sans peur et sans reproche*. Echo answers "Where!" And we leave the subject wondering in our minds, whether Mr. Gaster—the pioneer in the "impartial platform" movement—has ever professionally recommended an installation of incandescent gas lighting.

FUTURE OF THE ELECTRIC LIGHTING INDUSTRY

Suggestions for Combating Gas.

BEFORE the Institution of Electrical Engineers last Thursday, Messrs. Handcock and Dykes submitted a paper entitled "The Present Aspect of Electric Lighting." It might better have been called "Methods of Charging for Electric Supply," for the burden of the communication was to devise a means whereby the many small gas consumers might be tempted to transfer their custom to suppliers of electricity. In short, it is proposed to deal with such consumers by the introduction of a "contract" system—i.e., a fixed charge of 12s. per 30-watt lamp per annum is to be made, inclusive of wiring rental for an all-day supply, and 10s. per lamp per annum for a "dusk to dawn" supply. Naturally, no meters will be installed; and in order to ensure that consumers connected on this system shall not change their contracted lamps for others of higher candle power, it is proposed to adopt a special form of holder, which can only be obtained from the supplying authority. The prices mentioned above are suggested as an average, though they may be varied according to the locality. Mr. G. Wilkinson, the Electrical Engineer to the Harrogate Corporation, has had such a system in use for a short time; the charge being 11s. per lamp per annum. By the general adoption of this method of charging, the authors anticipate an influx of long-hour consumers who have hitherto used gas; and they are sufficiently enthusiastic to claim that the system and prices are such that no gas company will be able to compete. An expression of opinion of special interest to gas companies is that short-hour consumers can never be remunerative to electrical undertakings; and engineers of supply stations are urged to concentrate their attention upon the long-hour consumer.

A lengthy discussion followed the reading of the paper.

Mr. Wilkinson said he had found the system quite successful at Harrogate—in fact, it was more remunerative than the ordinary flat-rate or maximum-demand system. He has consumers who have preferred to go over to the contract system, conscious that it will cost them more, for the reason that they know exactly what they have to pay. He pointed out, however, that the system could not be applied to heating and cooking; and he remarked that it would be waste of money to do anything of the kind in a neighbourhood where there were small houses, as it was possible to get as many British thermal units out of 6 cubic feet of gas as could be got out of a unit of electricity.

Mr. C. H. Wordingham (Electrical Adviser to the Admiralty) entirely disagreed with the system proposed. He advocated a sliding-scale, and regarded it as ludicrous to charge the long-hour consumer at the same rate as the short-hour one. If the conductors of electric undertakings chose to do this, they would allow the gas companies to go on for ever, and would never get any business away from them. He disagreed with "dusk to dawn" supply; and, speaking as an old central station engineer, said he was strongly of the opinion that the primary thing to aim at was continuity of supply. If consumers could not look upon electric supply in the same manner as they did water or gas, they would have none of it.

Mr. A. H. Seabrook (the Engineer and Manager of the Marylebone Electric Supply Department) agreed with the principle of the contract system, but did not like the "dusk to dawn" idea. He said there were hundreds of consumers in every district who used both gas and electricity, but when necessity arose they had the gas flaring all day and at night electricity came on. With a contract system it would pay these consumers to use electricity

all day, for gas could not compete with electricity at 1d. per unit. This, of course, would have to be a "contract demand" system, with a small standing charge and a very low price per unit for the current supplied.

Mr. J. S. Dow wished to know how the authors had come to the conclusion that no gas company could possibly afford to utilize such a system as the one proposed in the paper. That afternoon he had been speaking to a leading representative of the gas industry, and he had told him that the gas people could afford to do it perfectly well; but very few gas companies would be induced to do it, simply because they had such a convenient and simple method of charging at the present time. As a matter of fact, in the early days of gas lighting, they adopted a similar system to the one proposed; but he believed difficulties had arisen in applying it to heating and cooking. It worked quite well for lighting, but with cooking it was very difficult to prevent people wasting.

Mr. H. A. Scott-Moncrieff (the Engineer to the Electric Supply Corporation) said it had often annoyed him very much to see gas-burners going all day. The best way to deal with this was to offer a contract system for the long-hour supply, and deal with the short-hour supply in the ordinary way, by meter.

Mr. F. Risch complained of electrical engineers grumbling at the effects of metal filament lamps. He said these had brought down the cost of electric lighting; and now that the price had been reduced, the very consumers to whom they had all been looking were to be regarded as unremunerative. One station engineer of his acquaintance was very jubilant when he started the new system, for he was charging 5s. or 7s. 6d. per lamp per quarter and 1d. per unit; but he (the speaker) had warned him that he would not be able to do this for long, for their "friends the enemy"—the gas company—would soon be going around to the customers and telling them how they were being robbed. Electrical people were too scientific; they were not commercial enough. A speaker had just said something to the effect that gas companies could do anything the electric light people could do; and he believed it. The gas people did not scoff at the small consumer. They put in a slot-meter for him; and the dividends of gas companies went up by leaps and bounds in consequence. And these were the small consumers which the authors suggested they should leave alone.

Mr. H. Hirst thought there was no need for panic measures on the part of engineers and managers of supply stations in consequence of the introduction of metal filament lamps, which enabled a very effective attack to be made upon the £26,000,000 revenue which the gas companies prided themselves on getting from small consumers. Once a cheap wiring system was available and a better supply of lamps, wonderful progress would be made in this direction.

Mr. H. W. Handcock, who replied to the discussion, said it was not the authors' intention to change over every consumer to the new system right away. What they said was that, owing to the new conditions that had prevailed since the introduction of metal filament lamps, electric undertakings were in a position to supply a large number of consumers, hitherto using gas, at a price which would make it more profitable to them to use electric light. He claimed that this could be put to such consumers on the score of economy alone; but metal filament lamps also enabled the suppliers of electric light to give better effective illumination at a price which compared favourably with that which gas consumers were now paying. It was not so much a question of changing over existing consumers, as some speakers seemed to think, as of opening up an unexplored field for electricity.

Statistics of Scottish Gas Undertakings.

In the notice of the report of the proceedings at the last annual meeting of the North British Association of Gas Managers which appears elsewhere, it is mentioned that following the technical matter is the Statistical Report of the Gas Supply of Scotland for the twelve months ended the 15th of May last. Our readers may remember that this report has for some years been included in the annual volume of "Transactions." This year, however, it has undergone several very interesting changes. Mr. Hislop, the Secretary and Treasurer of the Association, who has the preparation of it, has omitted thirteen undertakings with regard to the working of which information has not hitherto been given. On the other hand, he has added eight, some of which have newly come into existence. He has dropped the columns recording the maximum night pressure and the day pressure at the governor outlet, these items having no longer their former interest, and has added columns in which are given the number of ordinary and slot consumers, the number of cookers, the mileage of mains, and the illuminating power of the gas supplied. According to the report, there are 236 gas undertakings in Scotland; and the managers of 152 of these undertakings are members of the Association. This leaves a large number who are outside. But they are managers of the smallest gas-works, and their absence can scarcely be called a loss, except to themselves. It is matter for regret that there are as many as 42 undertakings in regard to which information is not furnished; and of these, it may be mentioned, there are eight under the management of members of the Association. Mr. Hislop deserves the thanks of all for the interest he takes in the production, and for his care in the keeping of it accurate and up to date.

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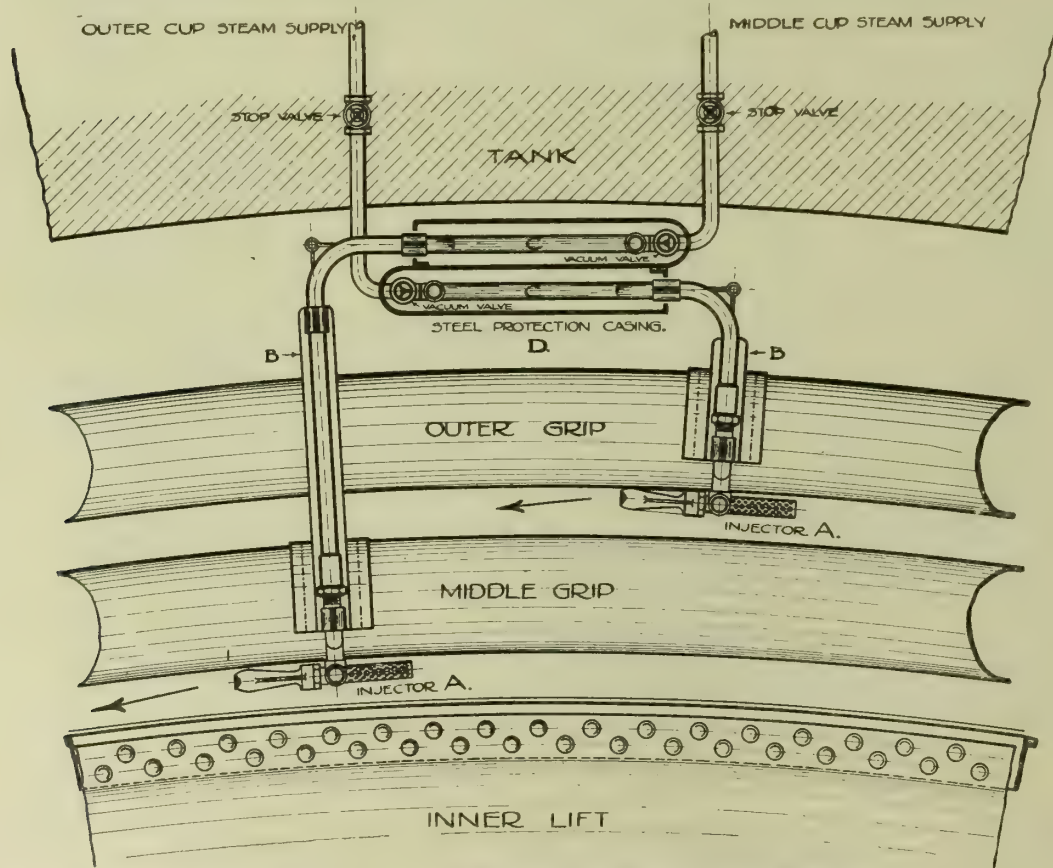
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SOCIETY OF BRITISH GAS INDUSTRIES.

The Autumn Meeting of the Society was held last Tuesday, at the Waldorf Hotel, Aldwych—the PRESIDENT (Mr. Thomas Newbigging) in the chair. There was an excellent attendance of members, together with visitors, including the President of the Institution of Gas Engineers (Mr. James W. Helps, of Croydon), and certain of the Presidents of the District Associations of Gas Engineers.

The SECRETARY announced that letters of apology had been received from, among others, Sir William B. Richmond, K.C.B., R.A., President of the Smoke Abatement Society, Sir William Bull, M.P., Mr. J. H. Balfour Browne, K.C., Mr. Corbet Woodall, Mr. Charles Carpenter, Professor Vivian B. Lewes, Dr. William A. Bone, F.R.S. (Leeds University), Professor John Graham (Manchester University), the two Vice-Presidents of the Institution of Gas Engineers, some of the Presidents of the District Associations, and Mr. Doig Gibb.

THE PRESIDENT-ELECT.

Mr. CHARLES CLARE (the Chairman of the Council) announced that the Society had been very fortunate in having obtained the consent of Mr. J. H. Balfour Browne, K.C., to take the presidency in the coming year. [Applause.]

SOME POINTS FOR CONSIDERATION.

The PRESIDENT then delivered the following address:

Gentlemen,—As President of the Society, I feel it my duty, at times, to look at matters from your point of view, sinking to some extent my own individuality as an engineer who has usually to confront you on behalf of clients, and trying to realize some of the obstacles, or the difficulties, or the discouragements, which you meet with in the course of business.

On some of the points with which I will deal, most of you would hesitate to speak your mind, fearing that in so doing you might injure your custom. I have no such ground of hesitancy, so long as I feel that the necessary word ought to be spoken.

THE PRECIOUS GIFT OF TACT.

There is a special variety of the genus engineer to whom I have often yearned to offer a word of advice. Those to whom I refer may be clever and conscientious; but they are also great martinets, and sadly wanting in that most precious gift of tact.

I have occasionally come in contact with these in the course of business, both in gas matters and in other spheres of operation. I am not referring to engineers in the gas industry alone, but also to some engineers outside it. They make up their mind from the outset, when they are having any kind of work done by contract, to look upon the contractor as a natural enemy who needs carefully watching and tying down with the utmost rigour to the performance of the veriest trifle, without giving him the slightest assistance or encouragement, and as though the whole success of the work when completed depended on the rectification of (say) some small defect which the contractor had probably overlooked without any intention to evade his responsibility.

I have known poor contractors harried out of their very lives with such small-minded men, and the payment of their instalment money, or their retention money, postponed unreasonably on this account. If a bolt is found to be loose which the turn of a key would remedy, or if a slight crack in the brickwork appears through which a puff of smoke is issuing, and which would be stopped by a dab of cement laid on with a trowel-tip, or other such trifling defect, they make no end of a list of delinquencies on the part of the contractor for which they claim abatement from the contract amount, and almost force their Committee or Directors to believe that they have had an arrant rogue to deal with throughout the job, and but for his (the engineer's) vigilance they would have been defrauded to any extent. Men of this kind often land their employers in arbitrations and law-suits that cost hundreds of pounds, which a little tact and the expenditure of a few shillings at the outset would have prevented.

My experience as an engineer is that if you want a good job doing, and with as little friction as may be, you should make a friend of the contractor (if a man of repute), and even give him an odd lift if a difficulty arises which you can readily help him to solve. Mutuality of this kind is a policy of insurance tending to peace of mind on both sides and the obtaining of a good result. I have known the fair fame of honest contractors being seriously damaged by such sticklers for modicums that amount to nothing in reality. Happily, they are in the minority; most engineers taking a broad-minded view of their position and duties.

ENGINEERS AND ENGINEERS.

There are various abuses which place the members of this Society at great disadvantage, and which the council may well discuss with a view to devising a remedy.

For example: There is the practice largely followed by certain engineers in these degenerate days, who, instead of themselves preparing a specification and drawings and taking out quantities for the apparatus they require or the work they wish doing, ask (say) half-a-dozen or a dozen firms to send in specifications and drawings. The final result, of course, is that five out of the half dozen, or eleven out of the twelve, have laboured in vain and spent their strength and money for naught; for the engineer in

question would open his eyes very wide indeed if he received an account from each of the unsuccessful competitors for the time and labour expended on the specifications and drawings they had been invited to prepare and send in.

If an engineer asks for specifications and drawings, good and well; but let make-believe cease and let the obligation be owned. A charge should be made and paid to every firm, whether successful or not, who has submitted designs by request. There is no hardship in this; the hardship is that firms should be mulcted of their due.

By and by, when the contract is completed and the machinery, or apparatus, or plant has been put to work, a report of the inauguration ceremony appears, where it is stated that the whole has been executed to the designs and under the supervision of Mr. So-and-So the engineer, Messrs. So-and-So having been the contractors. This is obtaining credit under false pretences. The system is rotten at the core. There can be no independence on the part of the engineer, and no real confidence on the part of his employers under such conditions. The matter is on a different footing where a firm has a speciality, whether protected by patent-right or not. In such case the firm may be expected to supply the details of their special work or appliance.

AMENDED TENDERS.

There is also the iniquitous system practised, oftener by local authorities than companies—though the latter are not always blameless—of asking for “amended tenders” from firms who have submitted a tender, in response to advertisement or otherwise, and who have already, in face of trade competition, cut down their price to a point which leaves but a bare margin of profit on the job. Any reduction, as the parties believe, is so much money saved; not realizing the fact that a policy of this kind is a direct encouragement to the cutting-down of strengths and quality, along with the turning out of less perfect workmanship than would otherwise have been put into the contract.

The remedy for these barefaced abuses is in the hands of the members of the Society; and it is quite certain that if they made a compact to put an end to them, and remained faithful to each other, a different state of things in this respect would very soon prevail.

TENDERS INVITED BY LETTER.

Again, when a set of drawings, specification, and quantities have been prepared by the engineer, and he receives instructions from his Committee to invite by letter—not by public advertisement—tenders for the work from a specially selected number of manufacturers or contractors, it seems only reasonable and fair in such case that the lowest tender shall be accepted. This is by no means always done, as I know from actual knowledge; though I consider, as a point of honour under such circumstances, that the firm whose tender is lowest ought to be successful, and that they have a just grievance at being passed over. When tenders have been invited by open advertisement, the case assumes a different aspect.

THE POOR INVENTOR.

The wise man tells us that “the way of the transgressor is hard.” I often think that the lot of the inventor is harder still. Occasionally he receives the encouragement which is his due, but in nine cases out of ten it is otherwise.

A man (say) realizes that a certain apparatus or process in gas manufacture and supply—or in any other department of industry—might be greatly improved in efficiency, and he sets to work to accomplish that end. A solution may spring upon him suddenly; but, as is more generally the case, he spends his days and nights in study and experiment, until at length, after the expenditure of much effort and no little hard cash, he has arrived at the point when his invention may be secured by letters patent.

“I had toiled at it, Sir, every night for a year,
So hopeful and happy in seeing my thought
Turned now into fact, and coming out clear;
At last, through a plain inspiration I got:
For why should not God inspire minds to invent
As well as to preach, and be praised for His gift?
Sir, it came like a flash and a thrill that were sent
In a moment of failure, when I was adrift.”*

Is he, then, at the end of his quest? In one sense, yes. In another, far from it. Although the new and better process he has invented, or the improvement which he has effected, may be perfectly obvious to all who examine it, yet there is no haste to adopt it. Its ingenuity is recognized, but the old and less efficient methods suffice and are retained, and the inventor of the new and better method is relegated to neglect. He has apparently spent his strength and his means and got no return. No wonder if he loses heart, and, if he lacks the capital or assistance to work it himself, parts with his invention for a tithe of its value to someone who has the means of exploitation. Before many years have elapsed, he has the melancholy satisfaction of seeing the wide-spread adoption of that which his ingenuity and toil produced, and the pecuniary benefits reaped by others. I need not quote instances, they will recur to most of you.

Many gas authorities prefer to lie low and wait developments rather than lend a helping hand towards the success of an invention. To say the least, this is not an admirable spirit, however well it may accord with the parsimonious views of those who

* “Dick Dalgleish,” by Walter C. Smith.

pride themselves on being wise in their generation. There ought to be more readiness on the part of gas companies, and gas authorities generally, to encourage any worthy inventor, by giving his invention a fair trial on such adequate scale as would prove its value or otherwise. The risk of doing so would not be great; the advantages to be gained might be many and profitable.

Much has been said, and much more might be spoken, in favour of the endowment of research. The country that wisely adopts it will reap advantages a hundred fold. Bacon says that "among all the benefits that can be conferred on mankind, I find none so great as the discovery of new arts, endowments, and commodities for the bettering of man's life." If that be so, it is not reward enough to the poor inventor to leave him to "the consciousness of well-deserving," and to that only.

VERTICAL RETORTS.

Speaking of inventors and inventions, I must make mention briefly, of the impending change that is likely to take place in our methods of carbonization. I refer to the system of vertical retorts at which a number of ingenious minds have been at work. I have not yet had the opportunity of viewing the Dessau system in operation, nor that of Messrs. Woodall and Duckham—though we may shortly have the opportunity of seeing both of these on a considerable working scale at Sunderland and Burnley respectively; but I have recently seen that of Messrs. Glover and West at the St. Helens Gas-Works, and I am impressed by the evident efficiency, and not less by the simplicity, of the whole arrangement and its details.

On the general question of carbonization in vertical retorts, the striking features about it are that the system (in the case of two of those mentioned) is continuous; there is no time or heat lost in charging and drawing; there is a greatly increased production on a given space area, with a larger yield per ton of coal carbonized, and an absence of nuisance in the operation. But the most remarkable thing about the process is that the services of the twin giants—"Manual-Labour" and "Machinery"—are almost dispensed with—or at least dwarfed to the very minimum—so far as charging and discharging are concerned, gravity being the mainspring of action. There are other minor advantages, but those mentioned are the salient points that will appeal to every gas engineer. We are not able yet to speak definitely as to capital cost nor as to durability—the latter has to be proved by efflux of time; but, so far as one may judge, these are more likely than otherwise to exceed in economy all existing carbonizing appliances.

Of course it will take time to supplant the methods and machinery at present in use, because existing appliances will not be "scrapped" immediately. But in my opinion the new system of carbonization in vertical retorts will have a steady and continuous growth. It is satisfactory to know that British inventors are not lagging behind in the race.

AMERICAN EXPERIENCE.

Since we last met, I have had the pleasure of a professional visit to Canada and the United States. It was gratifying to me to see while there that the gas machinery apparatus and plant of British makers are held in high estimation by our kinsmen across the sea. Without mentioning the names of firms, many of whose representatives I see before me to-day, I may say that I saw British-made appliances of such excellence and efficiency that they do not suffer, but rather gain, by comparison with what are produced on American soil.

I could not but observe this also, that, much as we admire, and justly admire, the spirit of enterprise and strenuous endeavour which meets us on all hands in the New World, there still remains this to be said—at least as regards the apparatus and plant with which the members of the Society are mainly concerned—that there is a lack of originality displayed by our friends of the Continent of America. I make an exception of the "Bronder" charging and drawing machinery in use in many gas-works both in the United States and Canada. This remarkable machinery draws and charges four retorts at once. I saw it at work and timed the operations. The four retorts were drawn in forty-two seconds and charged in twenty-four seconds, and that, too, with the utmost precision and ease. In this respect it will be admitted that our cousins are ahead of us. Perhaps also they beat us at inventing what are termed "wrinkles"—the invention of small, natty, useful expedients and things; but the evidence is plain to any expert that, as a rule, their imitation of your work is rampant.

No doubt in certain respects they improve upon our makes and methods, and in that way surpass us to some extent, but the fact is patent that their root ideas are of British parentage.

"Full steam ahead," however (very often "with a nigger squat on the safety valve"), is the motto across the herring pond, and we shall only continue to hold our own if we are alert, and enterprising, and progressive; not slow to adopt new ideas while improving on the old. Otherwise, there is danger of our being left behind in the march.

One thing amongst many struck me forcibly; labour-saving appliances are universal, be the cost what it may. But, like the application of the steam-hammer to the cracking of a nut, the suggestion occurs to me whether this labour-saving craze is not sometimes overdone in regard to matters of comparatively small importance.

PROGRESS OF THE SOCIETY.

I am glad that the Society continues to make progress, and that there is an increase in the membership. It cannot, from the

nature of things, be expected that there should be a large yearly influx of members, because the majority of those engaged in your special industry became members at the outset. But there are still some important firms outside who may find it to their interest to come in. Whether this may be so or not, there must be no flagging of interest on the part of those already composing the Society. Let every individual member bear his share in promoting its welfare and usefulness. Its effects for good may well be far-reaching, but only to the extent which you determine they shall be, and work to that end.

Above all things we should be on our guard against allowing our minds to become stereotyped—imagining that perfection has been reached in any one process or appliance. That is to stagnate, to go to sleep in our methods. In such a frame of mind the chances are, that, like Rip van Winkle, after the lapse of years we shall wake up to find that the old faces (methods) which we once recognized and swore by have vanished from our ken and we are left behind, stranded in the shallows of a bygone time.

"My grandfather was a most wonderful man," as the old song has it, but we have outlived his ideas; the world has progressed in the interval since the days of our grandfather, however wonderful he may have been, and no doubt was. One of the great objects of the Society is to stimulate its members to keep abreast of the times, and so prevent the stagnation which isolation is apt to encourage. Let us, therefore, feel that all our best achievements are but stepping-stones to greater things. These are not too strong expressions to use in regard to a Society such as yours. Defoe was right when, two hundred years ago, he declared that Trade and Industry were the foundations of England's greatness, and that success in Trade was the most honourable patent of nobility. That was true in his day, and it is no less true in these later times of Sturm und Drang.

SOME LEGAL ASPECTS OF THE SMOKE NUISANCE.

Mr. C. E. BRACKENBURY, Barrister-at-Law, then read a paper on the above subject. Extracts from the communication, together with a condensed report of the discussion, appear in another part of the "JOURNAL," pp. 601-05.

DINNER, AND SOME AFTER-SPEECHES—CO-OPERATION.

The members dined together in the evening, with the President in the chair; the vice-chairs being occupied by Messrs. Harry J. Donkin, Fred. J. West, Hugh F. Wright, Thomas G. Marsh, J. W. Broadhead, and Charles Clare. At the top table to the right-hand side of the President, were the following: Commander W. J. Caborne, C.B., Mr. Dugald Clerk, F.R.S., Mr. J. W. Helps, Mr. S. Y. Shoubridge, Dr. H. A. Des Vœux, Mr. F. W. Goodenough, Mr. Laurence W. Chubb, and Mr. R. Bruce Anderson. To the left-hand side of the President were Mr. D. Milne Watson, Mr. John W. Morrison, Mr. James Paterson, Mr. T. H. Duxbury, Mr. C. E. Brackenbury, Mr. W. T. Dunn, and Mr. A. L. Griffith.

After the loyal toasts,

Commander CABORNE gave the toast of the "Society of British Gas Engineers." He commented on the large field of theoretical, practical, and scientific work, whether looked at from the point of view of the engineer or the chemist, that the Society occupied. He had read the address of the last President (Sir George Livesey), whose death had been a great loss both to capital and labour, as well as the Inaugural Address of Mr. Newbigging; and he was struck by the lofty ideals pervading the two addresses. That afternoon, they had listened to an able paper and discussion on the "Legal Aspects of the Smoke Nuisance." He thought every engineer would agree with him that where there was emission of smoke from the shops of manufacturers, it was owing to inattention, and was simply waste. It showed there was imperfect combustion. As a member of the Executive Committee of the Smoke Abatement Society, he might mention that classes for stokers had been formed, because one of the factors contributing to the smoke nuisance was bad stoking. He was happy to say these classes were an unqualified success. During the discussion that afternoon, Dr. Brackenbury stated that he knew of certain invalids who came to town in order to breathe London fog in the winter time. With great deference, he might say that coal smoke was always inimical to health; and it was also a disadvantage in that it deprived people of a great deal of sunlight. The smoke was detrimental to property, too, and to plant and shrub life. Their President, in closing the discussion, stated that it would be impossible to have any legal enactment prohibiting smoke from chimneys. He (Commander Caborne) understood that such a prohibition existed in New York; and what had been done there might be done here. This would bring into common use smokeless fuels, among which would be in the very front gas and coke. He had sincere pleasure in proposing the toast, and in hoping the Society might expand greatly in usefulness.

The PRESIDENT, in responding, thanked Commander Caborne for his wise words in stating the position of the Society and its aims, and for his good wish that the Society might have a prosperous career of usefulness. The objects the Society had in view, and which would be strictly pursued by the Council, with the concurrence and assistance of the members, were good and desirable objects in every sense of the word. These objects might be briefly summarized as: Public benefit in the direction of sanitation, efficiency, and economy. As an example of this, they pointed to their organized efforts to abate smoke pollution—a subject which had been ably handled by their friend Mr. Brackenbury that day, and with which the Society would continue to deal in the future. The second object was the promotion of the interests of the members of the Society in every just and reasonable way, while observing honourable practice in the conduct of business. And, third, their periodical meeting together to discuss all these objects, and to encourage the

spirit of good fellowship. These were worthy aims which could not be gainsaid; and they would strive towards their accomplishment. Much of the success of the Society depended upon a wise Executive, bent on reconciling conflicting interests, and neither showing weak hesitancy nor reckless aggressiveness. Their prospects were certainly of the brightest. They had proved once more the truth of the old adage that "In union there is strength." This was as true to-day as it was when first uttered by Æsop, 600 years before the Christian era. And while the Society recognized the truth of the proverb, they had been able to prove the falsity of that other—"Two of a trade can ne'er agree." They had shown that they could not only agree, but that they could fraternize, and meet together to mutual advantage and for mutual enjoyment. In conclusion, he expressed the pleasure they all felt in having Commander Caborne as a guest on this occasion, and to have listened to, and enjoyed, his genial remarks, for which they heartily thanked him.

Mr. HUGH F. WRIGHT proposed the "Institution of Gas Engineers and Kindred Associations." He spoke of the great value of co-operation between the different organizations in the gas industry in the cause of progress; coupling with the toast the name of Mr. Helps, the President of the Institution, and of Mr. James Paterson, the President of the Southern District Association.

Mr. HELPS, in his acknowledgment, also spoke largely on the subject of co-operation. The President had said that "in Union is strength." Union could be either by combination or co-operation; and by co-operation some good work had been done between the Society of British Gas Industries and the Institution in the matter of the model contract clauses and in other ways. It was also hoped there would be a successful issue to their joint efforts in connection with architects and the building of houses; so that gas stoves and fires might have a better chance than they had at present. There were many other subjects they could discuss with mutual benefit and for the benefit of the gas industry. He believed that, in such matters as those with which they had to deal, co-operation was almost preferable to combination. There could be co-operation in research work; and in this connection he was glad to see the steps that were being taken to ensure that, in the manufacturing of gas appliances, the work was performed scientifically. He hoped that some of the industry's manufacturing firms would, in this way, be able to find employment for young men trained at the Leeds University.

Mr. JAMES PATERSON also responded. Among his remarks he said he felt particularly that there was a strong bond of union between the District Associations and the Society. This bond, though perhaps invisible, was not any less insoluble, because everything the members did to effect improvements must affect in a strong way the work of the gas supply undertakings. Referring to the model contract clauses, he said that any engineer who had read them through must have been struck by the minute care and completeness with which the clauses had been modelled. He felt sure it would be the desire of one and all engineers to embody the clauses in the contracts it was their privilege to arrange, on behalf of their undertakings.

Mr. F. W. WEST proposed the toast of the "Visitors," coupling with it the names of Mr. D. Milne Watson, the General Manager of the Gaslight and Coke Company, and Mr. H. A. Carpenter, of Pittsburgh, U.S.A.

Mr. MILNE WATSON, in reply, referring to the work manufacturers are doing to advance the common industry, mentioned that, fortunately for the gas industry, the winter had set in early and severely; and there had been experienced a large boom in gas-heating apparatus. This boom was causing his Company no little anxiety in keeping pace with the demand; and he was told there were manufacturers working night and day in order to supply the demand for goods. One of the most interesting things about this boom was that it was not all due to the cold north-east winds, but was also attributable to the quiet persistent efforts of the gas-appliance manufacturers in producing more economical gas-fires. In this respect he considered the gas-supply industry was greatly indebted to the manufacturers.

Mr. H. A. CARPENTER thanked the members for their kind reception of him; and from what he had seen that day, there was, he thought, every reason for the formation of a Society of American Gas Industries. It had been a great privilege to him to meet their President, Mr. Thomas Newbigging. In his (Mr. Carpenter's) earliest experiences in connection with the gas industry, he made the acquaintance of "Newbigging's Handbook." He had listened with great pleasure to Mr. Newbigging's address that afternoon; but there was one point—that was, the impression the President brought back with him from America as to stoking machinery—that was absolutely wrong. By America he (Mr. Carpenter) meant the United States, and not Canada. In the United States, there was not a single installation of West's stoking machinery that, from the time the first lid was opened to the time the last lid was closed in a draw, would not deal with 50 per cent. more coal than the machines the President described as extraordinary in his address. Had he known Mr. Newbigging was in America, he could have shown him stoking machinery handling 3000 lbs. of coal a minute, and most beautifully distributed in the retorts, with heavy charges.

"The President," proposed by Mr. CHARLES CLARE, was the concluding toast.

Between the speeches, an excellent programme of song and recitation was passed through by well-known London artistes; and, in every respect, the enjoyment of those present, if it did not surpass, certainly equalled all previous similar occasions.

Modern Methods of Artificial Illumination.—The series of Cantor lectures on the "Modern Methods of Artificial Illumination," delivered by Mr. Leon Gaster before the Royal Society of Arts in February and March last, have been published in separate book form. It makes a unique collection of information on illuminating methods—including gas, electricity, oil, petrol, air gas, acetylene, alcohol, &c.—and is liberally illustrated with pictures of the lamps and apparatus referred to in the course of the lectures, as well as with diagrams and curves. The price is two shillings.

LEGAL ASPECTS OF THE SMOKE NUISANCE.

By C. E. BRACKENBURY, Assoc.M.Inst.C.E., Barrister-at-Law.

[Extracts from a Paper read before the Society of British Gas Industries, Tuesday, Nov. 23.]

The subject of the law of this country in regard to nuisance arising from smoke naturally falls into two great divisions—under the common law of the land, and under statutory law.

I.—AT COMMON LAW.

To understand the legal aspects of the matter, it is necessary to consider some general legal propositions and definitions relating to nuisances generally; for, of course, nuisance from coal-smoke is but one of a vast number of various kinds of nuisance. All nuisances must be one of two classes: public or private.

A public nuisance was defined in the Criminal Code (Indictable Offences) Bill, 1879, s. 150, as "An unlawful act or omission to discharge a legal duty which act of omission endangers the lives, safety, health, property, or comfort of the public, or by which the public are obstructed in the exercise or enjoyment of any right common to all Her Majesty's subjects." To be a public nuisance, the act or omission must affect, or tend to affect, a large number of people, or it must interfere with rights which the public might otherwise enjoy. The most common illustrations of this are, perhaps, in connection with obstructions to highways, as in *Reg. v. Longton Gas Company* (1860), 8 Cox C.C. 317, where it was held an indictable misdemeanour for a gas company without parliamentary powers to open up the highway for the purpose of laying gas-mains; or in regard to pollution of water, as in *Attorney-General v. Cockermouth Local Board* (1874, 18 Eq. 172), where, though a nuisance was not established, it was held that a local board was not entitled to discharge sewage into a river so as to deteriorate the water. That case is also of interest as it lays down the rule that where a public body transgresses its powers, it is not necessary to prove that injury to the public will result therefrom.

It may here be noted that where statutory powers are conferred on any body, there is generally a proviso, as, for example, in the Gas-Works Clauses Act, 1847 (10 Vict. c. 15 s. 29) to the effect that "Nothing in this Act contained shall prevent the undertakers from being liable to an indictment for nuisance."

Proceedings to remedy a public nuisance may be either by abatement, when the persons aggrieved take the law into their own hands; by indictment; or by action at the suit of the Attorney-General, as representing the public. In regard to smoke nuisance, of course, the usual procedure is by summary proceedings as provided by the Public Health Acts.

Turning to private nuisances, these may cause damage to property or inconvenience to personal comfort; but in either case there must be some substantial injury or material interference.

Lord Cranworth, when giving judgment in what was practically a dispute between two gas companies in Sheffield (*Attorney-General v. Sheffield Gas Consumers' Company* (1853) 3 De G. M. & G. 304) used these words:—

"All these cases of nuisance or no nuisance arising from particular acts must, from the nature of things, be governed by particular circumstances. If a carriage were to drive up in Belgrave Square, and stand half the day at the door of a house waiting for some person calling there, I do not think that that could be made out to be a nuisance."

... Suppose, however, the same thing happened in the narrow part of the street that runs from Covent Garden to St. Martin's Lane, I do not know that that would not be a nuisance. Each case must be governed by its particular circumstances. The particular place or object in view must be regarded. I take it that all these questions are of this nature, 'Are you using that which is the subject-matter of inquiry in a reasonable way and according to the uses for which it was intended?'

Applying, for a moment, this pertinent question to the subject-matter of coal-smoke, it seems clear that the only answer that could be given would be that the ordinary consumption of coal in a domestic fireplace is use "in a reasonable way and according to the uses for which it was intended."

Upon the same point, as to the importance of the particular circumstances and the particular locality, the judgment of Baron Pollock, in *Bamford v. Turnley* (1862) 31 L.J.C.B. 286, is instructive. He says:

"Most certainly, in my judgment, it cannot be laid down as a legal proposition or doctrine, that anything, which under any circumstances lessens the comfort or endangers the health or safety of a neighbour, must necessarily be an actionable nuisance. That may be a nuisance in Grosvenor Square which would be none in Smithfield Market. That may be a nuisance at midday which may not be a nuisance at midnight. That may be a nuisance which is permanent and continual, which would be no nuisance if temporary or occasional only."

In general, a kitchen chimney, suitable to the establishment to which it belonged, could not be deemed a nuisance; but if built in an inconvenient place or manner, on purpose to annoy the neighbours, it might, I think, very properly be treated as one. The compromises that belong to social life, and upon which the peace and comfort of it mainly depend, will furnish an indefinite number of examples, in which some apparent natural right is invaded, or some enjoyment abridged, to provide for the more general convenience or necessities of the whole community."

Here, again, it may be observed that the usual emission of coal-smoke will be covered by this phraseology, and, though undoubtedly invading some apparent natural right, as of breathing

pure air, yet will fall within the compromises of social life for the general convenience of the whole community.

There is a maxim of the law, *Sic utere tuo ut alienum non lædas*—Use your own rights so that you hurt not another's—which was considered in a case of alleged nuisance from smoke, *Rich v. Basterfield* (1847) 4 C.B. Rep. 783. This is an interesting case for two or three reasons, among which is the fact that, though I have looked at a large number of authorities, it is the only instance I have come across of an action arising out of the smoke from an ordinary house chimney belonging to a defendant as distinct from a factory chimney. The plaintiff lived in St. Pancras, and the defendant owned and let two houses adjoining the plaintiff's. The plaintiff alleged that "the defendant, well knowing the premises, but contriving and intending to injure, prejudice, and agrieve the plaintiff, and to incommode and annoy him and his family . . . wrongfully and injuriously erected a shop and building and two chimneys . . . near to the dwelling house of the plaintiff . . . and . . . lighted divers fires in the said shop and building, and caused divers large quantities of noxious, dirty, offensive, and unwholesome smoke, vapours, and stench to arise and ascend and issue from and out of the said chimneys; and that the said smoke, &c., . . . spread over and through the said . . . dwelling house . . . and . . . rendered [it] uncomfortable, unhealthy, and unwholesome and unfit for habitation; and the plaintiff had . . . been forced to keep the windows . . . closed for long, unreasonable, and inconvenient spaces of time, . . . and was prevented from obtaining and receiving fresh air . . . and the furniture and chattels of the plaintiff . . . were . . . dirtied, spoiled and damaged. . . ." Defendant contended (1) that the act of lighting the fires which caused the smoke was the act of the tenant; (2) that the premises were in the possession of the tenant; and (3) that "every man has a right to the use of the atmosphere for the purpose of carrying off smoke proceeding from an ordinary chimney, with the use of the ordinary fuel." A former occupier stated that he used to make fires in the stove, principally of coke, and that no smoke which could be at all injurious then issued from the chimney. Justice Erle told the jury "that every man is bound so to use his property as not to injure his neighbour's rights—with this qualification, that he may make a reasonable use of his own rights, exercising them in a reasonable place." The jury awarded the plaintiff 40s. damages; but, on appeal, the verdict was entered for the defendant on the ground that the defendant had caused no nuisance and had not possession of the premises. The case of *Rich v. Basterfield* may, therefore, be taken as an authority for the statement that the owner of premises is not liable (apart from statute) for smoke from a stove or chimney becoming a nuisance by reason of improper user by a tenant.

The legal maxim that we are considering is, however, subject to qualification by another—*Lex non favet votis delicatiorum*—The law does not favour the wishes of the fastidious. Thus in a case of nuisance from brick-burning at Surbiton, Surrey (*Walter v. Selfe* (1851) 20 L. J. Ch. 433; 4 De G. & Sm. 322), Vice-Chancellor Knight-Bruce said:

Ought this inconvenience [of smoke, vapour, and floating substances of some kind] to be considered in fact as more than fanciful, more than one of mere delicacy or fastidiousness, or as an inconvenience materially interfering with the ordinary comfort physically of human existence, not merely according to elegant or dainty modes and habits of living, but according to plain, sober, simple notions among English people.

The case is also an authority for saying there must be "substantial inconvenience and material discomfort" before there can be a common-law nuisance. There must be something more than mere loss of amenity.

Upon similar grounds, those who live in towns and cities must (as far as the law is concerned) put up with town and city smoke and discomforts. Lord Cranworth (Lord Chancellor), in *Clark v. Clark* (1865) 1 Ch. App. 16, said: "Persons who live in towns, and more especially in large cities, cannot expect to enjoy the same unobstructed volumes of light and air as fall to the lot of those who live in the country." Similar terms were used by Lord Westbury, L.C., in *St. Helens Smelting Company v. Tipping* (1865) 11 H.L.C. 642. "If," he said, "a man lives in a town, it is necessary that he should subject himself to the consequences of those operations of trade which may be carried on in his immediate locality, and which are actually necessary for trade and commerce, and also for the enjoyment of property, and for the benefit of the inhabitants of the town and of the public at large." But the same case is also an authority for saying, that if there be a nuisance, it is no defence to an action to say that the plaintiff himself came to the nuisance.

It has been held that smoke by itself may constitute a nuisance. In giving judgment in *Crumph v. Lambert* (1867) 3 Eq. 409, which was a case against iron bedstead manufacturers at Walsall for an injunction to restrain them from sending out a large quantity of smoke from their factory chimney, and from making a noise, Lord Romilly (Master of the Rolls) said:

I consider it to be established by numerous decisions that smoke, unaccompanied with noise or noxious vapour, that noise alone, that offensive vapours alone, although not injurious to health, may severally constitute a nuisance to the owner of adjoining or neighbouring property. . . . The real question in all the cases is the question of fact, viz., whether the annoyance is such as materially to interfere with the ordinary comfort of human existence.

An interesting point arises as to whether the combined smoke

from a number of different chimneys belonging to different persons might, in certain circumstances, constitute a nuisance, although the smoke from each chimney separately could not be so regarded. It would appear that conceivably there might be such a case in which an action might lie. "Suppose one person leaves a wheelbarrow standing on a way, that may cause no appreciable inconvenience, but if a hundred do so, that may cause a serious inconvenience, which a person entitled to the use of the way has a right to prevent; and it is no defence to any one person among the hundred to say that what he does causes of itself no damage to the complainant."

This dictum was approved of and followed in the two cases of *Lambton v. Mellish* and *Lambton v. Cox*, reported in (1894) 3 Ch. 163. There the nuisance complained of was "maddening" noise, jointly and severally produced by the merry-go-round organs of the two defendants who were rival amusement caterers at Ashted. Justice Chitty held that "If the acts of two persons, each being aware of what the other is doing, amount in the aggregate to what is an actionable wrong, each is amenable to the remedy against the aggregate cause of complaint;" and an interim injunction was granted restraining each in respect of his own share of noise. Two rights may, therefore, apparently in law make a wrong; and might it not be that two or more ordinary smoke producers might cause together a legal nuisance for which an action would lie?

The remedies for a private nuisance are either by abatement (without process of law), or by action for damages, or for an injunction, or for both.

II.—UNDER STATUTE.

Having now considered the aspects of smoke nuisance at common law, let us for a moment look at the statutory enactments relating to the subject.

The first statute in respect of public nuisances was passed in the year 1388, 12 Rich. II., c. 13. It was for "the punishment of them which cause corruption near a city or great town to corrupt the air." We are here to-day in a great city, over 500 years later, inquiring how we can remedy or prevent the corruption of the air. It was not, of course, till the Victorian era, with its vast industrial development and rapid growth of dense population, that General Sanitary Acts appeared on the statute book. In 1833 was the Lighting and Watching Act. In 1847 came the Towns Improvement Clauses Act, the Water-Works Clauses Act, and the Gas-Works Clauses Act, supplying model clauses that could be adopted into Local Acts. In 1848 was the first Public Health Act, the basis of all subsequent sanitary legislation. Then followed the Nuisances Removal Act of 1855, and the Sanitary Act of 1866. Scotland had its Public Health Act in 1867, and England, excluding London, the Public Health Act, 1875 (38 & 39 Vict., c. 55), which superseded and consolidated previous enactments, and still remains in force as the principal Act. I do not propose to deal in any detail with its sections relating to nuisances, among which is smoke. Section 91 is the really important one defining nuisances, included in which is "any chimney (not being the chimney of a private dwelling-house) sending forth black smoke in such quantity as to be a nuisance." In the second proviso to this section a factory fireplace or furnace is hedged round with legal safeguards so as to prevent its smoke being regarded as a nuisance, and the domestic chimney is entirely excluded from the Act.

The summary remedies provided by the Act are, by section 111, in addition to any rights or remedies already existing or available at law or in equity.

The corresponding Act which governs the Metropolis is the Public Health (London) Act, 1891 (54 & 55 Vict., c. 76). Its provisions are slightly more extensive than those of section 91 of the Public Health Act, 1875, and its penalties made cumulative. A dwelling-house chimney is again excluded from the scope of the Act; and in *M'Nair v. Baker* (1904), 1 K. B. 208, it was held that premises formerly used as a private dwelling-house, but at the time of the nuisance as a club, were not exempted by the Act.

III.—GENERAL OBSERVATIONS.

What, then, is the net result of our survey of the legal aspects of smoke nuisance? I am afraid it is of a rather negative character. As regards factory chimney smoke, the statutory law provides certain checks in a halting kind of way, and penalties not too easily or strongly enforced. As regards house chimney smoke, the statutory law leaves it severely alone, and the common law does not recognize its ordinary production as a nuisance. With such a statement my duty in connection with the subject-matter of this paper is really completed; but I feel constrained, at the risk of travelling a little outside my allotted sphere, to venture on a few observations with a view of seeing or suggesting what remedial steps might be taken to tackle or mitigate the actual, if not the legal, smoke nuisance.

To look to the legislature as a means of initiating any effective reform in this respect may, I think, be regarded as doubtful, not to say hopeless. If the present Public Health Acts were amended, so as to bring within their scope the smoke from private dwelling-houses, little or no good would, in my opinion, result; for it can hardly be alleged that a chimney of a private dwelling-house frequently, if at all, sends forth "black smoke in such quantity as to be a nuisance." There was, I believe, a Public Health Bill introduced in the parliamentary session of 1906; but it was not proceeded with, and I do not think it contained any reference to

smoke nuisance. This may be taken to show that, in the view of the governmental authorities, the troubles arising from coal-smoke are not such as to call for immediate or urgent legislative enactment. Legislation cannot proceed much in advance of general public opinion. And upon this question of smoke nuisance it cannot be denied that there is a dead-weight of public indifference and inactivity. The problem, therefore, is how to stir up or remove this heavy lethargy of the public. I am not sure, however, that one way of doing this successfully would not be by the legislative imposition of a tax, on the lines of the chimney-money or hearth-money of Charles II.'s reign (14 Car. II. c. 2), on every chimney used for carrying off visible smoke from houses above a certain annual rental; and I make a present of the suggestion to next year's Chancellor of the Exchequer, whoever he may be.

First of all, we have to ascertain exactly and scientifically what is the actual position and what are the real effects of the emission of coal-smoke. Next, to have our minds clear as to what we actually want done; then to ascertain correctly and advisedly how it is to be done; and finally, to get it done.

Facts and figures—concrete, precise, specific—as to the causes and effects of the pollution of the air are essential and imperative. How many house chimneys are there, and how many factory chimneys? What is the average volume of smoke discharged per day, per week, per year, from each class of chimney? What share of blame is to be attributed to each class? What are the average constituents of each kind of smoke? In what proportion are they noxious or harmless? To what extent do they interfere with light, air, health, and wealth? How do they affect vegetable life and human life? To answer such questions as these I should like to see a census taken of chimneys. We have a census of trade production; let us have, also, a census of smoke production. Let our medical officers of health, chemists, and sanitary officials tabulate the results of their experience, and make investigations. If needs be, let chemical officers of health be appointed, and prepare analyses of air to ascertain its degree of purity or pollution. If every town had properly qualified sanitary officials to do systematically such work as has been so admirably done by Professor J. B. Cohen and Mr. A. G. Ruston at Leeds (and recorded in a paper before the Health Congress in July*) there would soon be such an array of indisputable facts and unimpeachable figures that public opinion might be roused, and some ameliorative action ensue. Such statistics would provide ammunition for a campaign; at present there is nothing but vague generalities.

The relationship of smoke and disease might be enquired into, and vital statistics obtained. All that one has now is some kind of intuitive feeling that smoke means dirt, dirt means disease, and disease means death.

I believe that in the educational curriculum of our State schools there is included the subject of hygiene; and the uses and abuses of tobacco and alcohol are taught and explained. It would not seem unreasonable to include in such lessons, or in the house-keeping classes, instruction in the benefits of smokeless or gaseous fuel. The coming generation would reap the advantage.

I do not shut my eyes to the fact that the question of the presence or absence of coal-smoke is fundamentally one of cost. It is idle, in my view, to ignore this, or to endeavour to gloss over it by enlarging on the convenience and the cleanliness of the gas-fire—except, of course, in particular circumstances and for trade purposes. If we seek deliverance from the smoke nuisance of coal fires (assuming for the moment that the domestic coal grate is, at least, partly responsible for it), we must face the fact that it is a question of economics. It is but nibbling at the problem to put a few gas-fires into the houses of the well-to-do. If the domestic smoke from the small house or the poor man's room is the culprit, the nuisance will only be in measurable distance of being removed when something cheaper and better is offered in place of coal. And I suppose it is, to some extent at all events, more within the power of gentlemen in this room, and of the Institutions and Societies that they represent, to find that "something" than it is within the power of any body of gentlemen elsewhere.

I take it that all are theoretically in favour of the abolition of coal-smoke and of the nuisances accompanying it; and it only remains to convert the theory into practice, and energetically, aggressively, and practically to combat the evil. To do this efficiently requires the whole-hearted and enthusiastic collaboration of many men and many interests and many Societies, among which prominent places must be taken by your own Society of British Gas Industries, the Institution of Gas Engineers, and kindred technical Associations. The Coal Smoke Abatement Society, under the presidency of Sir Wm. B. Richmond, K.C.B., R.A., has long directed attention to the matter. Artists, architects, chemists, engineers, manufacturers, medical men, scientists, and last, but not least, the man in the street, as well as the woman in the house, are all interested and concerned in the question. It is the day of Garden Cities, of a longing for land, of a leaning to the country—all symptoms, if I mistake not, of a reaction against the dirt and noise and crowding of our urban centres. Let us turn this desire for cleanliness and for fresh air to account, and though the task be great, do what in us lies to leave behind us a brighter, cleaner, healthier, and happier community.

Discussion.

The PRESIDENT (Mr. Thomas Newbigging) thought the members must all agree that the paper to which they had listened was

one of an excellent character. It would be good for reference for years to come, not only by the members, but by others interested in the question elsewhere. He was pleased to see the President of the Institution of Gas Engineers present; and he would ask him to open the discussion.

Mr. JAMES W. HELPS (Croydon) was glad to have an opportunity of saying a few words on this important question; but, before doing so, he should like to congratulate Mr. Brackenbury upon the excellence of the paper, and the food he had given them for future thought. He could not help asking himself when he heard a paper of this kind, why it was that they, as gas engineers, and those engaged in the manufacturing and commercial work of the industry, were acting somewhat the part of philanthropists. They naturally had a great desire to see the towns in which they lived freed from fog and smoke; but they, as it were, were really doing far more than had been done by those who had these desires quite as much at heart as, if not more than, they themselves had. He could only answer his own question by saying that it was because the gas industry had something to sell, by means of which, and by the appliances by which it was used, they hoped eventually to bring about the desired result. There was no use whatever disguising the fact that it was because they were makers of gas and of a good solid smokeless fuel, and also manufacturers of the apparatus and appliances which were best calculated to use gas and coke, that they were doing their best in this matter. It seemed to him that was naturally the attitude they were compelled to assume on this question. And they had to direct attention to two particular points, if they wanted to see any good arise. First of all, it was absolutely necessary that they should devote even more attention than they had done in the past to prove to the general public that the use of gas-stoves was not deleterious to health. He was quite aware that a great effort was being made at the present time in this direction—partly at the Leeds University, and partly, he was glad to see, in the laboratories of those broad-minded manufacturers who had taken up the subject from a scientific point of view. A great deal more, however, remained to be done before they would get rid of the erroneous idea which was prevalent in many towns. In his own town, one might hear sometimes of a doctor who the first time he was called in to see a patient would say something to this effect, "Turn out that gas-fire; if you do not, I shall not come here at all." This had not been said to him personally; but he had it from other people that it was said. They must not be satisfied, therefore, until they could get such information to lay before medical men as would prove to them that a gas-fire was quite as hygienic as a coal-fire. He was sure much good was being done by directing attention very seriously to the abolition of the smoke nuisance. Another point to which they must pay careful attention was this: It was no good advocating that a fuel should be used continuously and regularly, unless they were prepared to say that it could be supplied at something near the same price as the one it was going to displace. It was not any good saying, and he did not think anybody would attempt to say, that a room could be warmed for an extended period at the same price by means of a gas-fire as by a coal fire. He (Mr. Helps) could not honestly say so. Therefore, it was their bounden duty to do all they could, by every means in their power, to supply gas at as cheap a rate as they possibly could. He did not know that there was anything he could suggest which would help to cheapen gas for this particular purpose. It was true that one could perhaps suggest that larger discounts should be allowed for gas consumed for heating than for lighting and other purposes. But, again, there was no use denying the fact that in winter, when gas was used for heating purposes, gas was produced at the highest cost. Every extra foot of gas they made for use in gas-fires during the dark hours of winter cost so much more in its equivalent in retorts, mains, and everything else, and so put the cost at a higher figure. The same contention did not apply in regard to cooking; and it was in the direction of doing away with the coal range in summer for cooking that he particularly felt inclined to direct his energies, because he thought it was a good thing not only in respect of the abolition of the smoke nuisance, but for the manufacturers of gas cooking-stoves and for those who sold gas for this purpose in the day and the summer time. However, in respect of the subject in hand, they must bear in mind that they were taking up the smoke nuisance question principally on account of the sale of their commodities; and that it was their bounden duty therefore to do all they possibly could do to prove that gas was firstly, hygienic, and, secondly, that it was cheap.

Dr. BRACKENBURY (brother of the author) said he had no connection with the gas industry, other than his relationship with the author; but he thought he might say in connection with the paper that he stood there in three capacities. In the first place, he was a medical man; and the last speaker had referred to the relationship between medical men and the gas industry in terms that were quite reasonable. In the second place, he was a member of a public health authority. And, in the last place, he was chairman of an educational authority. There was one statement in the paper that required qualification. The author had spoken about the inactivity of the public health authorities. This was undoubtedly true with regard to the smoke produced by ordinary house fires; but he could not say it was true in regard to the smoke produced by chimneys of other descriptions. When he came up for election, as he had to do in this public authority every three years, to say nothing of the times in between, he received as much complaint from the public with regard to the smoke nuisance as he did in connection with any other kind of nuisance or inconvenience.

* See p. 613.

But the public had to put up with some of these things; for it was really difficult to know how to deal with certain of them, which were really nuisances. Nor did he know, after hearing this paper, how to deal with some of the cases that came before them. He gave an instance of a railway engine-shed; explaining the circumstances in connection with it. Passing on, he said, as a medical man, he could say that it was becoming increasingly recognized by the medical profession that there was no harm, from any point of view, in a gas-fire. He had himself recommended that patients should have coal fires taken out of their bed-rooms, and gas-fires put in, because there were certain advantages which were not disadvantages from a sanitary point of view. Another medical aspect of the matter had been pointed out by the last speaker, in referring to the gas industry as philanthropists. There was no doubt the gas industry was such in respect of the purification of the atmosphere. But there was another side to that. He had a patient who came to London every winter because he could breathe better there than elsewhere. [Laughter.] And it was true there were some people suffering from real asthma who could breathe better in a thick atmosphere than in any other. It was quite possible there were such people in the neighbourhood of chimneys which were producing smoke that was a nuisance to others, but who might be absolutely better for its presence; and if remedial measures were taken to stop the nuisance, these people might start some legal action in the matter. [Laughter.] It had been suggested in the paper that notice might be taken of this matter of smoke prevention and the use of smokeless fuels in our public elementary schools. To a certain extent this was being done. The teaching of hygiene in schools had become very generally recognized; and in almost the first syllabus that he drew up for this purpose, he introduced the question of the proper heating and ventilation of small rooms. In their own schools and other schools, this subject was not neglected; and he believed it was capable of further development. There was not the slightest reason why in elementary schools the children should not be taught the value of smokeless fuels.

Mr. LAWRENCE W. CHUBB (Secretary of the Coal Smoke Abatement Society) remarked that it seemed to him, after listening to Mr. Brackenbury's paper, that there was one point which they ought to consider; and it was as to whether the law as expounded by him was at the present time in the satisfactory state in which an intelligent community would expect to find it. Was the law as expounded equal to performing all that it ought to perform? In theory, he thought Mr. Brackenbury had shown that it was; in practice, those of them who were concerned to some extent in the administration of the law were bound to confess that, for one reason or another, in many cases at least, the law was a dead-letter. They had in London authorities who were a standing pattern to the whole country in regard to the administration of the law with regard to this nuisance. Headed by the London County Council, with the help of the City Corporation and the Borough Councils, they had a series of most vigorous local authorities who did look, and look efficiently, after the interests of the community all round London. But there was a ring of authorities who, on the whole, absolutely ignored their responsibilities to the public in this important matter. The reason might not be far to seek. In the smaller municipalities, as a rule, they found, unhappily, that the smoke makers were very well represented. It was not, therefore, to be expected that the sanitary officers who were charged with the duty of reporting upon the smoke nuisance would not hesitate to report nuisance which might have arisen in respect of the premises of members of their own Public Health Committee; and until the law put the sanitary officer on a proper footing, and gave him protection (which one was glad to see was accorded to the medical officers of health) against being discharged at the whim of the Public Health Committee, and establishing him in office until the Local Government Board said he must go, this condition of things would not be rectified. It was a disgrace to us as a community to see West Ham and other municipalities pouring out their black smoke in the air. Whereas in London they were forced to comply with the law, the people in the outer ring were allowed to throw into London masses of smoke, which went to form the November fogs, and to do so with impunity. The law was not particularly easy to administer, in the experience of many authorities, for one very simple reason—that it was the emission of "black" smoke that constituted a nuisance. They knew that "black" was a relative term, and what to one man might appear black might be looked upon from quite the opposite aspect by another. The smoke might be pungent, and it might form a perfect canopy over one's head; but unless they could convince a magistrate by the evidence of inspectors that the smoke was black, they would not succeed in getting a conviction. This seemed one of those instances which showed that the law was either the proverbial ass, or that it required amendment. He was glad to see the London County Council had begun to deal with this particular matter so far as the Metropolis was concerned, and that municipalities, such as Nottingham, where it was important in view of the industries of the town that there should be a clean atmosphere, had obtained special powers from Parliament enabling them to put down the emission of smoke as soon as the smoke was sufficiently dense to constitute a nuisance. The following day the "London Gazette" would contain a notice that the London County Council intended to apply to Parliament in the next session for authority to amend the Public Health Act of London by deleting the little word "black." If this proposal became law, they would be capable of dealing

with the matter, providing it was possible to prove that the smoke was a nuisance. There was, however, a popular impression that, if they put down the smoke nuisance, they were persecuting the manufacturers. The evidence that the Smoke Abatement Society had from some of the most brilliant engineers of the day went to prove conclusively that the nuisance could be abated to the profit of the manufacturers. Messrs. Crossfields had publicly stated that by adopting proper machinery for the consumption of coal, they saved over £25,000 a year in their coal bill. The Chairman of a well-known London brewery quite recently stated that they saved over £3500 by consulting an engineer in this matter, and adopting the most simple inventions. If they could only make their local authorities realize that, when trying to abate the nuisance from a manufactory, they were not pressing hardly upon the manufacturers, but conferring a benefit upon them, they would succeed in doing something really good. Mr. Brackenbury suggested in his paper that the question of the adoption of gas-fires and smokeless methods of heating was entirely one of cost. He (Mr. Chubb) thought if they coupled with cost prejudice, the statement would be perhaps a little more accurate. Why people should have a rooted aversion to putting in comfortable methods of heating, the Smoke Abatement Society had never been able to determine. A year or two ago, at the request of the Office of Works, and with the active assistance of that office, the Society conducted a series of tests, aided by the Gaslight and Coke Company, of a number of the best gas-stoves. The tests were most elaborate; and they attracted considerable attention. The trials proved that gas-fires, if properly fixed and looked after, were most effective methods of heating. The air of the room did not in any way confirm that the health of the inhabitants of rooms in which gas-fires were would in any way suffer; but that the fires could be adopted by all and sundry without fear of the consequences. The Society had in this way done their utmost to increase the use of gas. They recognized that in gas they had one method, and one of the most important methods, of removing the abuse which had existed in the past, and to remove also that stigma under which the Metropolis suffered. So far as the gas industry contributed, by the adoption of gas cookers and fires, to the amount of sunshine that the inhabitants of London and other large cities and towns received, he said with all sincerity on behalf of the Smoke Abatement Society "more power to your elbow."

Mr. R. H. CLAYTON (Chairman of the Manchester Section of the Society of Chemical Industry) said he had turned his attention to the analyzing of the constituents of town smoke, and comparing it with factory smoke, hoping thereby to obtain some idea as to the relative proportion of impurities in the air through domestic fires and through factory fires. He had been much struck, even in large towns, where the factory smoke was well washed, and was not visible to any great extent, by the fact that the atmosphere did not show any very great improvement. He had therefore come to the conclusion that domestic fires were much greater causes of the smoke nuisance in London than factory fires, and that, if factory fires in London were to be abolished altogether, he did not think that the atmosphere would be much better. He agreed with Mr. Brackenbury's statement that they could not advance legislation before public opinion. He took it it was the view of those present that public opinion should be forced forward, not as in the past by legislation and police court methods, but rather that they should investigate the causes of the pollution of the atmosphere, and ascribe the right proportion of nuisance to each evil-doer. It was only by the application of the higher scientific methods, by the analysis of the air, by comparison of analyses from different towns, by putting the matter in the hands of investigators and inspectors of the type of the Alkali Works Inspectors, that they could really hope to push forward this matter. The purification of air was, in his opinion, a question for the communities and local authorities to take up just as much as the purification of sewage. There was a point as to the cost of gas. It had been stated that the cost could not be much reduced; but it occurred to him in thinking over the point, that there was a way if the use of bituminous coals was prohibited in ordinary fire-places. The fuels left would be gas and coke. Coke was a finished product, and not a raw material; and, doubling the price of coke would only bring it to the same price as coal, roughly. The difference derived from this would bring the cost of gas to about 6d. per 1000 cubic feet. In other words, the price of coke should be pushed up; and the price of gas down. That was a question which had not yet received the attention it deserved. Of course, it was subject to the prohibition of the use of bituminous coal. He wanted to more particularly put forward the point as to the analyses of town air showing an enormous amount of tar oils, which were produced from domestic fires by slow distillation. In domestic fires the coal burned or distilled would produce 5 per cent. of its weight as tar oils and soot. He calculated that the 6 million tons of coal used in a year in London gave 300,000 tons of soot and tar oils per annum. This was the problem facing them; and the point must make itself sufficiently apparent, that this amount of soot and tar oils going into the London air must make itself felt. He quoted analyses made by himself to show that air pollution in Manchester was due more to domestic than to factory smoke.

Mr. THOMAS G. MARSH (Manchester) related how the previous Friday he was passing the Manchester Town Hall, and saw smoke coming from all the offices round about; and there was a great column of smoke coming from the Town Hall. He went in, and called the attention of the Superintendent of the Nuisances

Department to it. The Smoke Abatement Inspector of Manchester had informed him that Manchester air was practically free from factory smoke; the manufacturers having too great an eye for economy to allow any considerable amount of smoke being emitted. The people he should like to get at first, and the people who ought to show the way, were the municipal leaders; and it was in the hands of each and every one of those present to do a part in converting the public. In Manchester, the district rates were reduced by 1d. in the pound with money seized from the gas profits; and the personal expenditure of the citizens was increased by something like 3d. or 4d. in the pound in the decoration of their buildings, in cleaning them, in laundry work, and in supporting hospitals for consumption and other diseases caused by air pollution. He considered the Corporation ought to sell gas for such purposes as would tend to the cleanliness of the atmosphere at very little above cost price. They could afford to do so, and would gain through the reduced expenditure of their Committees. He would never be converted to the advantages of municipal trading so long as he saw the profits taken from one Committee simply for the purpose of bolstering up others. The great thing was to make the general public fully alive to what was going on. Their President had inadvertently referred to the Society for the Abolition of the Smoke Nuisance. He (Mr. Marsh) should like to see the word "abolition" take the place of "abatement," because there was no necessity whatever for smoke. They could get heat without smoke, and they could get power without smoke. Mr. Clayton had put the matter forcibly when he referred to the money spent on purifying sewage before passing it into the rivers. It would make the hair of municipal councillors stand on end if it were said that the water the people were drinking was impure; yet though each individual breathed in many more volumes of air every day than he drank water, they heard nothing about the impurity of the air. He had received a letter from Dr. Brown, the Medical Officer for Bacup, who thought very strongly upon the action of municipal authorities round about Manchester. He pointed out that the death-rate was made higher by the smoke and other impurities prevailing; and he asked why gas could not be sold by municipalities at 10d. or 1s. per 1000 cubic feet. He (Mr. Marsh) believed that the reason some doctors objected to gas was because there was not sufficient draught caused by the fires; and this was due to gas being dear, and consequently there was economy in the quantity burned. In his letter, Dr. Brown also suggested that at an early date a conference on this subject should be held, of members of the sanitary societies, medical officers of health, the Smoke Abatement Society, and practical engineers and chemists. From such a conference might come the solution of one of the greatest problems and difficulties of the country to-day.

Mr. SAMUEL GLOVER (St. Helens) said he thought it would be a mistake for the Society of British Gas Industries and representatives of the gas-supply industry present, in the presence of the Coal Smoke Abatement Society's representatives, to sound nothing but a deploring note year after year. Surely something was being done; and if they summed up the continual pegging-away that was going on, he thought some credit would be given to those working in the gas industry. The result of their pegging-away was that the deplorable state was either not so bad as it used to be or not so bad as it would have been if nothing had been done. It was within his knowledge that a great deal was being done not only in the way of reducing domestic or town chimney smoke other than manufacturing smoke, but a great deal was being accomplished in reducing the smoke of works' chimneys, inasmuch as it had been found economical to attack the smoke abatement nuisance from works' chimneys by the adoption more and more of internal combustion engines. This had been done very largely indeed in many towns, and even in small towns. He thought corporations and companies supplying gas should have credit for the large reduction in the output of objectionable smoke that had been made by the use of gas-engines, large and small. They were also much encouraged by the knowledge that every month thousands of gas-fires were going into use; and if the community did not already do so, it was high time they did appreciate the fact; also that steps had been taken to deliver to householders smokeless fuel in the form of prepared gas coke; and, further, that great improvements had been made in the production of gas-fires. A great deal of good was being accomplished; and if this was the only practical way of doing it, something was year by year being achieved, and was at last reducing the difficulty that they had all observed.

The PRESIDENT said it seemed to him to be an almost hopeless task to deal in some drastic way with the production of chimney smoke. There was nothing for it, it appeared to him, but to keep pegging-away to show the community how much better it would be if they would use something else than coal as fuel. He did not say gas. It might be anything else in order to get rid of this fearfully deleterious nuisance. But he did not think there would ever be any legal enactment to compel people not to use coal. In the reign of Elizabeth there was an Act passed preventing people using what was called sea-coal for their domestic fires. They could hardly pass such a measure to-day. So there was nothing for it but to keep pegging-away, and showing people there was something—possibly some economy—in giving up their bad habits. But it was an awful job to eradicate bad habits. The discussion would be very useful to them, in their several spheres throughout the country, in the promulgation of this great sanitary question.

SPREAD OF LONG-DISTANCE GAS SUPPLY ON THE CONTINENT.

Some particulars have been given from time to time in the "JOURNAL" [see Vol. CIII., p. 507] of the numerous installations of high-pressure mains, for the supply of villages at a considerable distance from the gas-works, which have been laid down in recent years in Germany and adjacent countries. A communication on the subject was presented by Herr Menzel, of Berlin, to this year's meeting of the Brandenburg Association of Gas and Water Engineers; and as it reviews the development of this branch of gas supply in a very comprehensive manner, particulars may be quoted from a reprint of the communication which appeared in a recent number of the "Journal für Gasbeleuchtung."

After referring to the comparatively small number of installations for the supply of distant communities which were at work in the year 1905, the author points out that nearly all these have been enlarged or extended, and that a great number of fresh installations have come into being. More than forty gas-works now supply gas to small townships at a considerable distance from the works; and the results of such supply have proved entirely satisfactory. The advantages of a supply of gas for lighting, cooking, and heating purposes are thus brought within reach of the inhabitants of small outlying towns. A tabular statement of the existing high-pressure mains of a length of a mile-and-a-quarter and upwards to 12 miles is given, from which it appears that there are thirty such long-distance supplies working with equalizing gasholders and nine without these special holders. Taking only distances of 5 miles and upwards, the following is a statement of the existing supplies:—

TABLE I.—Long-Distance Gas Supply Plants.

Situation of Gas-Works.	Place Supplied.	Length of High-Pressure Main.	Diameter of High-Pressure Main.
		Miles.	Inches.
(a) Installations with Equalizing Gasholders.			
Bühl	Steinbach, Sinzheim	6.1	3½
Kiel	Wik	5.0	..
Leyden	Sassenheim	9.1	4
Lichtenberg (Berlin) . .	Malsdorf	11.5	4
Lübeck	Schlutup	6.2	3½ to 4
Lübeck	Travemünde	12.2	3½ to 4
Meilen	Staefa, Erlenbach	8.8	2½ to 3½
Mülheim (Ruhr)	Saarn	7.0	..
St. Margarethen	Marbach, Altstetten	10.5	3 to 6
Salò	Maderno	5.6	3½
Schaffhausen	Diessenhofen	5.8	2½
Schneidemühl	Usch	6.5	..
The Hague	Ryswyk	8.1	8
Thonon	Evian	5.5	..
(b) Installations without Equalizing Gasholders.			
Heidelberg	Schlierbach	5.0	..
Mariendorf (Berlin) . .	Wilmsdorf	5.8	..
Mügeln (near Dresden) .	Zuschendorf	13.7	4

The high-pressure system for the supply of gas to a distance has the advantages that the cost of the main is low, owing to the high-pressure admitting of large quantities of gas being pumped through a pipe of comparatively small diameter, and that either by increasing the working pressure, or by extending the time during which the gas is pumped through the main, its working capacity can readily be increased to meet an extension of the local distributing system or an enhanced consumption of gas due to any other cause. It has been found advantageous to wash the gas with oil for the extraction of naphthalene before pumping it into the high-pressure main; and when this has been done, there have been no cases of obstruction of the main by naphthalene deposits. Either Mannesmann tubes or cast-iron pipes have been used, according to the ideas of the engineer of the gas-works concerned; and it cannot be said at the present time that one has any special advantage over the other. The joints are made sound in the ordinary way, with lead and tarred hemp; but in a few places lead wool has been satisfactorily employed in place of run lead.

The working pressures hitherto employed have not necessitated the use of any other joints than these, which have the advantage that they allow of a certain displacement of the main without giving rise to leakage. The pressure of the gas is raised by means of either Roots blowers, fans, or piston pumps; and, generally speaking, all three systems have proved completely satisfactory. Where, however, specially high pressure is required, the piston pumps or compressors are to be preferred. It is essential that some safety appliance which stops the compression when a maximum pressure has been attained, should be inserted in the system. Specially adapted for this purpose is a device of Rabas, which consists of a ratchet and pawl arrangement by which the compressing plant is put out of action when a particular maximum pressure is attained. Thus it is not necessary to exercise great care at the gas-works in maintaining continuous supervision of the compressing plant, as the working is thus rendered more or less automatic. It has been found advantageous to employ gas-holders fed either continuously or else at certain times through the high-pressure gas-main. The holders have the advantage of

equalizing the pumping of gas irrespective of fluctuations of consumption. Consequently, the high-pressure main may be of smaller capacity when these holders are used. This reduction in the size of the high-pressure main balances to some extent the cost of the gasholder. Also when a holder is used, the main need not be continuously kept under high pressure.

It has been found valuable in many instances to connect detached houses and works adjacent to the high-pressure main to it. As, however, the pressure in the main fluctuates greatly, special governors have to be employed on these isolated connections. Herr Hase, of Lübeck, devised a special governor for this purpose when some consumers were directly connected to the high-pressure main between the Lübeck Gas-Works and Travemünde. This governor has been in use there for several years, and has proved satisfactory. It consists of a water-chamber in which a bell moves and actuates two taps, which serve as throttles. The bell may be replaced by a parchment or similar diaphragm. It is specially important that two throttles should be used, so that very high pressures may be taken up in two stages; while in the event of one of them becoming temporarily ineffective, the second one prevents the high pressure passing into the consumer's service. District governors are used where the high-

pressure mains are directly connected with the low-pressure distributing system. These are usually placed in an underground pit. The pressure is taken on and off by means of weights, and continuous supervision of the governors is not necessary. These district governors may advantageously be connected with a long-distance pressure lamp lighting and extinguishing device. A device is attached to the gasholders by which the inflow of gas to the holder is automatically cut off as soon as the holder is approximately full, and is resumed as soon as a certain amount of gas has been withdrawn from the holder.

The best proof of the successful results which have attended the introduction of the high-pressure system of supplying gas to a distance is afforded by the statistics which the author has collected of the consumption of gas in a number of the communities thus supplied. The installations in the majority of cases have been in existence for only a year or so; and, consequently, it is only in a few instances that particulars are available for a series of years, and that the growth of gas consumption from year to year can be shown. The statistics collected by the author are set out in the original paper in much detail in a series of tables. Table II., which has been prepared from them, gives the more important totals and essential data.

TABLE II.—Particulars of Output of Gas Through a Number of Long-Distance Supply Plants.

Gas-Works From Which the Supply Emanates.	Places Supplied; With Their Approximate Population.	High Pressure Main.		Date at Which Supply Started.	Output of Gas for the Years Stated.		Increase in Output Over Preceding Year, Per Cent.	Proportion of Total Output Sold for		
		Length, Yards.	Diam. Inches.		Year.	Cubic Feet.		Lighting, Per Cent.	Cooking, Per Cent.	Public Lighting, Per Cent.
Lichtenberg (Berlin).	Kaulsdorf, &c.— 7,250	20,168	4	June, 1905	1906	8,898,680	—	39·3	22·8	37·9
					1907	13,124,700	47·5	38·8	28·9	32·3
					1908	17,680,800	34·7	35·7	32·1	32·2
Heidelberg.	Wieblingen, &c.— 10,400	—	—	Dec., 1907	1908	6,883,910	—	20·6	43·3	36·1
Salmünster.	Wächtersbach— 2,400	8,240	3½	Dec., 1907	1908	1,995,390	—	42·6	40·0	17·4
Crefeld.	Bockheim, &c.— 17,085	4,648	6	Jan., 1908	1908	14,978,500	—	36·8	45·8	17·4
Schaffhausen.	Diessenhofen— 2,000	10,060	2¾	Oct., 1905	1906	2,258,350	—	—	—	—
					1907	2,508,610	11·1	—	—	—
					1908	2,957,450	17·9	—	—	—
The Hague.	Ryswyk— 6,000	1,258	8	Feb., 1906	1906	3,119,050	—	—	—	—
					1907	6,055,130	94·2	—	—	—
					1908	8,764,410	44·8	—	—	—
Lübeck.	Travemünde, &c.— 7,554	31,715	3½ to 4	Sept., 1903	1904	4,629,650	—	42·7	35·8	21·5
					1905	7,790,160	68·3	43·0	37·8	19·2
					1906	9,555,540	22·1	41·4	39·8	18·8
					1907	12,833,600	25·6	37·2	47·7	15·1
Leyden.	Voorschoten— 5,072	15,530	4	Oct., 1907	1908	14,648,500	12·4	38·1	48·0	13·9
Differdingen.	Rodingen, &c.— 8,552	5,468	2¾	Nov., 1905	1906	3,262,190	—	42·5	34·2	23·3
					1907	4,839,430	48·4	45·2	35·4	19·4
					1908	5,565,540	15·0	44·1	35·2	20·7
St. Margarethen.	Marbach, &c.— 38,900	18,590	3 to 6	1903	1906	21,288,100	—	50·4	45·0	4·6
					1907	27,402,500	28·7	39·4	57·0	3·6
					1908	33,754,400	23·2	33·3	63·5	3·2

It is noteworthy that about half of the total quantity of gas supplied through these installations is used for cooking purposes, which indicates that, even in quite small places, there is a demand for gas for cooking. The price is generally regarded as the all-important factor in increasing the sale of gas for cooking. Nevertheless, there is in all cases a steady increase in this branch of the gas consumption. A striking example of the applicability of the long-distance supply of gas is afforded by the installation at Lübeck. One of the places supplied—viz., Travemünde—is a bathing resort, where there is a specially large consumption of gas for cooking, because visitors, coming mostly from large towns, are accustomed to cook with gas.

Of the installations outside Germany, the most interesting is that in the Rhine Valley (St. Margarethen), because it was the first long-distance supply on a large scale and because it has continued to develop in a very striking manner. The general deduction to be drawn from a consideration of the figures relating to long-distance gas supply is that there is a demand for gas in quite small communities, and that the gas industry should exploit these places which have hitherto been exclusively reserved for long-distance supplies of electricity. The management of each gas-works should carefully consider whether in its vicinity there are not places that are suitable for long-distance supplies of gas. Where there are no existing gas-works within easy reach, it is worth while considering whether a number of small places may not combine to erect a gas-works for their common use; the supply being by high-pressure mains, such as those referred to in this article.

At the conclusion of the reading of the foregoing paper, Dr. W. von Oechelhaeuser, the Managing-Director of the German Continental Gas Company, of Dessau, addressed the meeting. He referred first to the use of turbine blowers as described by Herr Pfudel and Herr Pohmer [see "JOURNAL," Vol. CVII., p. 378] in connection with a supply of gas at high pressure. In regard to the opinion expressed, that these blowers constituted an immense advance for the gas industry, he wished to point out that many advances had been similarly claimed in the past for other inventions by which it was anticipated that the gas industry would be

placed in a much more favourable position than its rivals. It was only necessary to refer to the expectations raised by the Körting steam jet-exhauster in 1872, the use of compressed air with West's charging and drawing machinery in the beginning of the seventies, the adoption of hydraulic power in the Foulis stoking machinery in 1875, and the driving of dynamos for electric central station work by gas-engines, which was adopted at Dessau in 1886. In the electrical industry likewise, old types of certain plant—e.g., accumulators—have been displaced in turn by others.

It is necessary to mention these points by way of contradicting a widely-spread impression that there have been comparatively few advances in connection with the gas industry. For instance, the Welsbach light is often spoken of in a manner which implies that, prior to its discovery, there had been practically no advances in gas lighting, and particularly in the construction of burners. As a fact, the advances in burner construction were enormous before the introduction of the Welsbach burner. There has been likewise the same continuous advance in the development of retort-settings, from the plain direct-fired setting to that provided with producer firing, and so on through the various types of regenerative settings to the inclined retorts, in the development of which the late Mr. Ed. Drory was specially active. We have passed on now from the inclined retort to the vertical retort. The long distance supply of gas at the present time is only a new form of an old system. When the speaker was in England for the first time in 1877, he saw the long distance main from the gas-works at Beckton to the distributing stations in London; and he believes that it was worked at a pressure of 26 to 28 inches. There is not a very great jump from this pressure to the 50 inches or so which is now being employed in the high-pressure mains for distant supplies. The speaker also referred to a more daring proposition which his own father, at the beginning of the seventies, laid before the City Council of Berlin. It was feared that in the City there would not be sufficient room under the street pavements for the large gas-mains which would be required subsequently for the supply of gas; and the proposal was to connect to the present low-pressure system of mains high-pressure mains

working at a pressure of several atmospheres. This plan was too bold a proposition for the time, and it was believed that the compression of gas to a high pressure was not industrially economical. Nevertheless, the plan has been to a certain extent followed in the modern mains for the supply of gas to long distances; but those who are busily engaged in the gas industry at the present day are too apt to blot out from memory the recollection of what has been done in the past, in their zeal for what is being accomplished at the present time. It is sometimes beneficial to take a backward as well as a forward view of events.

At the conclusion of Dr. von Oechelhaeuser's remarks, Mr. E. Körting, of Berlin, the Chairman of the meeting, expressed the hearty thanks of those present to him, and to Herr Menzel, the reader of the paper, for their valuable communications.

COMMERCIAL USES OF GAS.

Lecture by Mr. S. R. Barrett, of Birmingham.

On Wednesday evening last, an interesting address, on the "Commercial Uses of Gas," was delivered by Mr. Sydney R. Barrett (the Superintendent of the Fittings Department of the Birmingham Corporation gas undertaking) to the members of the Birmingham and District Master Gas-Fitters' Association. The following are some abstracts of the lecture, which was accompanied by diagrams and experiments.

Natural gas is one of the mainstays of the great iron-producing districts in the United States; and we can realize the enormous commercial value of this natural resource, when we know that this gas has continued to flow from the huge natural reservoirs beneath the earth's surface for the past 25 years, at a pressure of 70 or 80 lbs. per square inch, and of a quality 50 per cent. better than that of the best artificially distilled coal gas. Entire towns are lighted and heated by it; while in the reduction of ores, obtaining steam pressures in boilers, and obtaining power direct from gas-engines, the whole appliances of modern American factories adapted to high-pressure gas in the natural-gas districts have become perfected. As the demand for natural gas has increased, it has become necessary to extend the area of supply; and in districts 150 miles from the site of manufactories, fresh wells have been sunk, and the natural gas has been conveyed through long pipe-lines to smelting furnaces and factories. It seems, therefore, that Nature had intended in the first instance that gas should be used by man in a compressed form—in other words, that it should be used directly as high-pressure gas.

It is very interesting to note that, as far back as 1825, Professor Faraday gave a lecture before the Royal Society of London on oil gas, as manufactured from mineral and vegetable oils by the Portable Gas Company of London; and gas as first sold to Londoners for lighting their houses was compressed to 30 atmospheres, or 440 lbs. per square inch, and was sold to them in this form in iron vessels. This Company did not last long; but their iron vessels did, and for years afterwards on the site of the present Roman Catholic Cathedral in Westminster, which had been used as a dumping ground for scrap and refuse of all sorts, these old iron gas-bottles were found by the score. Earlier than this, in 1792, Murdoch compressed coal gas at Handsworth.

Mr. Pemberton, of Birmingham, made a series of experiments on the production of coal gas and its application to lighting, and exhibited gas-lights in a variety of forms in front of his establishment in one of the main streets of the town; and in 1808, he erected an apparatus for Mr. Cook, a toy manufacturer, by whom gas was employed for soldering purposes. From that time, Mr. Pemberton devoted himself to the construction of gas-works. This was in all probability the first occasion that coal gas was used for a manufacturing purpose in Birmingham.

In 1819, Gorden and Heard took out patents for compressing coal gas into a portable receiver, for placing under the seats of carriages or on board ship, in order to obtain light; and in 1845, Brunell compressed coal gas up to 440 lbs. per square inch in iron reservoirs, for lighting railway carriages. This use of gas at high pressure was abandoned in consequence of the cost of compression, and of the necessarily strong receivers, and the difficulty of reducing the pressure to such a point that the gas could be burned regularly and without waste. It was not until Pintsch, of Berlin, in 1873, introduced his high-pressure governor that compressed gas came into general practical use. Since then it has been universally employed for railway carriage lighting, floating beacons at sea, lighthouses, and for many manufacturing purposes. At the present time, ordinary railway carriage lighting utilizes oil gas compressed to 120 lbs. per square inch in cylinders containing about 28 cubic feet. With the introduction of inverted incandescent burners and mantles, and the consequently small consumption (0.4 cubic foot per hour for each burner), the solution of the problem of lighting railway carriages appears to have reached its most economical point.

When in these days we speak of high-pressure gas, it rather conveys to the mind at the first thought the high pressures in pounds per square inch, as those of which we have just been speaking. But modern high-pressure gas, as is now known and utilized, does not approach such heavy compression, and to my mind it is rather a misnomer, and a pity that we should call it high pressure. It would be, I think, better described as rein-

forced gas—that is, gas taken at a pressure of (say) 2 inches in the mains, and increased by compression to (say) 50 inches of pressure. Until experiments had shown the advantage that could be obtained in flame temperature by using forced-pressure gas, the best results were secured by compressing air and forcing it to unite with the low-pressure gas, as distributed from the town mains, in bunsen burners, arranged as in the ordinary blow-pipes; and this type of burner is the one chiefly used for gas-furnace work.

Perhaps at this point it will be interesting to give you some idea of what ordinary town pressure really means. Up to fifteen years ago, 2 inches of water pressure in a town supply was considered high; but 2 inches of pressure is more than double that necessary for all the old conditions under which gas was used. The earlier burners of the fish-tail type, numbered 1, 2, 3, 4, and 5, were constructed to burn 1, 2, 3, 4, and 5 cubic feet of gas per hour in accordance with their number, at a pressure of only 6-10ths of water. This pressure was sufficient to spread the flame, and give the most economical illuminating results. One inch of pressure means only $\frac{1}{2}$ oz. per square inch. Two inches of pressure, which is too high for an ordinary flat-flame burner, is only $1\frac{1}{10}$ oz. per square inch; while the highest pressures to be obtained from the largest gas-holders do not exceed 10 inches—just half the pressure that can be exerted by the human lungs.

Now, with reinforced gas, we use pressures varying from 12 inches of water, equal to 7 oz. per square inch, up to 60 inches of water, equal to 33 oz. per square inch. So that the maximum pressure at which so-called high-pressure gas is used is only 2 lbs. per square inch. All existing gas mains and pipes, if properly laid in the first instance, are structurally quite capable of withstanding a much higher pressure; and I see no reason why still higher pressures should not become universal, provided the fittings and joints are made more carefully than has been the practice hitherto in dealing with low pressures of from 1 oz. to 2 oz. per square inch. We already know that for flat-flame burners low pressures not exceeding $\frac{1}{2}$ oz. per square inch are necessary, in order to preserve the shape of the flame; so that reinforced pressure gas is useless for flat-flame burners. But with the bunsen burner, and the incandescent mantle used with the bunsen burner, we have arrived at the conclusion that the higher the pressure the better the result.

With the introduction of the air-blast to bunsen burners, blow-pipes were found to give better results—in other words, a higher flame temperature was obtained; but used on a large scale in factories, the necessity of putting down air-compressing plant or foot-bellows for each blow-pipe and running a system of air-blast pipes throughout the works is a costly matter. This is an arrangement that is open to some objections on the score of the danger when negligently handled. At any time there is a possibility, when the air-blast is stopped, of the gas, which is delivered at a pressure of about 1 oz. per square inch above atmospheric pressure, finding its way into the system of air-pipes, thus forming an explosive mixture, which may become ignited and cause a dangerous explosion. Again, by stopping the outlet of the blow-pipe and continuing the air-blast, which is at a pressure of 12 or 13 inches of water, air may be forced back into the gas-pipes, forming an explosive mixture in the gas-pipes or meter, when a similar explosion may then result. With reinforced gas we get similar advantages as regards flame temperatures without the disadvantages and risks of the air-blast system. Thus in factories, on the introduction of reinforced gas, we are able to avoid the necessity for air-bellows or blower, and can dispense with the requisite power to drive the blower; and there is no need for a separate system of air-conduits, while all risk of explosion in the air or gas pipes through careless handling, or the leakage of gas through the valve in the blow-pipe, is done away with. With a blow-pipe, by a very simple adjustment, it may be easily arranged so that the flame can only be ignited when held by the workman in the proper position for doing his work; and when placed on one side after the brazing or heating is completed, the gas may be automatically turned off.

In employing reinforced gas for other apparatus than blow-pipes and brazing, we are able to use it directly in all existing blast-furnaces, muffles, annealing furnaces, &c., with an absolute certainty of temperature that can only with difficulty be obtained when similar results are attempted with air-blast, for this reason: Reinforced gas can be adjusted by reliable governors to one constant delivery pressure; and as the thermal value of town gas and atmospheric conditions vary so slightly, furnace temperatures, when once adjusted, remain practically invariable. With air pressure, the use of a large number of furnaces or blow-pipes at the same time affects the general pressure, through the air system, with the result that the flame temperature of the burners falls off, and the burners are sometimes liable to light-back at perhaps the critical time, when least desired.

With reinforced gas, we avoid all the inconveniences of back-lighting, and we also avoid the necessity of any adjustment of the air supply after the burner has once been adapted to the furnace. The danger of baffling-out the forced pressure flame by opening or closing the door of the stove or oven is overcome; and an absolute temperature can be automatically controlled in japanning or heating ovens by the use of a thermostatic valve.

The past seven years have seen great alterations in the methods of conducting the business of our city gas undertaking, now well to the front in all matters connected with the commercial uses of gas. Not only have reduced charges been made for gas used for

lighting, but specially low rates are now charged for gas used for motive power; and within the past few weeks a further concession has been made to manufacturers in the price charged for gas used for heating in various manufacturing processes. In furtherance of this forward policy, laboratories have been established by the Gas Department, and research work undertaken in many directions; and much has been accomplished in developing the resources of coal gas, and increasing the field of its utility and value to the public. In this connection, in order to eliminate the cost to the public of increasing gas pressure by private installations, the Gas Department are now erecting plant for supplying gas at forced pressure throughout a large district; and thus the cost of compressing plant and separate systems of air conduits, bellows, &c., and the space they now occupy, will be saved to consumers from the new system of mains. In addition to the advantages to be obtained by using reinforced gas for manufacturing purposes, all the advantages of improved lighting at a lesser cost will be available a few months hence.

In reinforced gas lighting, we find that the illuminating power of the ordinary incandescent mantle is considerably increased; and while we obtain 20 candles per cubic foot of gas at ordinary town pressure, we are able to increase this to 30 candles per cubic foot at 12 inches pressure, rising to 50 candles per cubic foot of gas used at 60 inches pressure. The increased flame temperature seems to add to the life of the mantle by the hardening of the fabric; and the reduced cost of maintenance with reinforced gas, as compared with gas at ordinary pressure, is noticeable.

Experience proves that with reinforced gas it is desirable that the delivery of the gas shall be at a constant pressure. For this purpose, governors are an advantage; and with them, having once adjusted the pressure to the desired point at the outlet of the governor, no further attention in this respect is necessary.

The inverted burner seems specially adaptable for reinforced gas lighting, and, indeed, has come to the front so rapidly as to very largely displace the original vertical burners. At the present time, under ordinary town pressure, we are able to get results from incandescent inverted burners for factory lighting that are astonishing. For instance, with the ordinary small size inverted mantle, and a gas consumption of $1\frac{1}{4}$ cubic feet per hour, giving an illuminating power of 15 candles (more than sufficient for any ordinary lathe, stamping, or sewing machine), with gas at 2s. 4d. per 1000 cubic feet, we can light twenty-six machines for 1d. per hour; and when such small inverted burners are provided with anti-vibrators, the life of the mantles in a reasonably dry atmosphere may be safely calculated, excepting always accidental breakage, at six months. With reinforced gas, where $\frac{1}{2}$ cubic foot per hour only is used, we are able to provide 70 lights at a cost of 1d. per hour. It seems therefore that this type of burner, with a small consumption and a small mantle, is the one that will become the most suitable for factory work, where a separate light is required for each machine.

For the general lighting of factories, in which work is principally done at benches, where vices and other apparatus are used, and where distributed light is necessary, an ordinary large-sized inverted mantle and burner consuming 3 cubic feet per hour at ordinary town pressure gives a light of 60 candles, and such lights placed 10 feet apart are ample for all requirements. We are able to light 100 feet of benching with nine lights at a cost of $\frac{3}{4}$ d. per hour, with gas at 2s. 4d. per 1000 cubic feet; while with reinforced gas the consumption is still further reduced to $1\frac{3}{4}$ cubic feet per light per hour, and the cost of lighting the same amount of benching comes to less than $\frac{1}{2}$ d. per hour. With an installation carefully arranged in the first instance, and with occasional attention on the part of an individual who understands that an incandescent burner requires to be kept clean and free from dust, such results as I have mentioned are certain.

In street lighting, we have yet in this country to realize the full value of reinforced gas with inverted burners, and are more accustomed to the excellent results obtainable from vertical burners. In Berlin, inverted reinforced gas lighting is predominant; and those who have seen the splendid results in the 40 miles of streets lighted in that city under the newest systems, are convinced that in this direction we have yet to make progress in this country.

The life of a well-built inverted mantle is considerably longer than that of a vertical mantle; and by the adoption of inverted mantles maintenance is reduced to a minimum. I frequently have brought before me instances where vertical mantles have lasted twelve months under ordinary pressure; and I have no reason to doubt that these remarkable results will be surpassed in the future by the use of inverted burners and mantles.

For large centres of light, such as in public halls, with reinforced gas there seems to be a huge field; while for domestic lighting, with a small consumption and resultant small effusion of heat, reinforced pressure answers the requirements of the public for a brilliant light with no increase in the temperature of the room. I feel that with the introduction of reinforced gas lighting we can look forward to a new era, and to fresh fields in the development of the gas industry which will enable it to maintain its position as the best and most economical form of artificial lighting yet discovered. But as the best results are only to be obtained by the higher perfection of the apparatus employed, so also these results will depend on the more careful installation and maintenance of them. Gas-fitters of the present day must realize that they have reached a time when old rule-of-thumb methods have passed, and

that it is absolutely necessary for them to become acquainted with the principles underlying the improvements, and the application, of the modern apparatus now so rapidly being brought forward in connection with the distribution of gas for light, heat, and power.

Illustrating the simplicity of the appliances necessary, and the speed with which the high heats required in various manufacturing processes could be obtained with reinforced gas, the lecturer showed various forms of muffles built up with ordinary fire-bricks, in which the brazing of tubes, the melting of glass, copper, and cast iron, and jeweller's enamelling work had been performed. The results of these experiments were inspected by the members with interest. It was mentioned by Mr. Barrett that, with reinforced gas, a temperature sufficient for ordinary tool hardening could be maintained with a consumption of 25 cubic feet per hour. The burner necessary was of the most simple construction.

Replying to questions asked at the conclusion of the address, Mr. Barrett stated that, according to the arrangement for reinforced gas at present sanctioned by the Corporation, the high-pressure mains would be run in the centre of the city. It was hoped that the supply would be available in the course of four or five months, after which it was possible that extensions would be made to other districts. The first mains laid formed only a portion of a very much larger scheme; and it was hoped that gradual development would speedily follow. This would, of course, depend upon the appreciation of the efforts made by the Gas Committee to please their consumers. The pressure given would probably be about 60 inches.

A vote of thanks to the lecturer was proposed by the Chairman (Mr. J. Thacker), seconded by Mr. Wiltshire, and carried with acclamation.

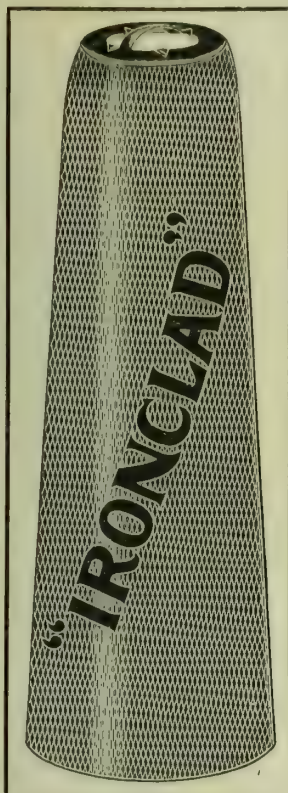
In his response, Mr. Barrett again impressed upon the members the necessity of their keeping themselves abreast of the times. They must nowadays possess knowledge and power. Even the reputation for good workmanship would not be sufficient in the future. It must be good and up-to-date work; and it was essential that the trade should make themselves acquainted with the principles underlying their work. They should possess a knowledge of the principles of combustion and the actual movements of gases under pressure, and should know how to calculate the dimensions of necessary pipes and the capacities of certain furnaces. The time had gone by when gas-fitters could go into factories and experiment with brazing furnaces. Nowadays, before an order was given, a guarantee was obtained. No well-managed cycle factory would place an order for 150 or 200 furnaces without an assurance as to results and knowledge that the maintenance would be simple. This was why he thought that, with reinforced gas, the Birmingham Gas Department were helping the trade a very great deal in removing the necessity for complicated air pressures and bunsen burners. All the compressing arrangements would be concentrated at the gas-works; and the gas-fitter would be dealing with simplified arrangements. Care and observation, however, were essential. Cleanliness in fitting up the apparatus was most necessary. They must get up to date and take a pride in their business, and if possible bring forward improvements themselves to assist manufacturers in the use and gas companies in the supply of modern gas.

The Assistant-Engineership at Wellington (N.Z.).

We are pleased to announce that Mr. Archibald Dougall, the Chemist and Second Assistant at the Hull station of the British Gaslight Company, has been appointed Assistant-Engineer of the Wellington (N.Z.) Gas Company. He is the eldest son of Mr. Archibald Dougall, of Kidderminster, and nephew of Mr. Andrew Dougall, the predecessor of Mr. John Young at Hull. He was trained at the Midland University, Birmingham, was engaged for some little time at the Kidderminster Gas-Works, and in 1899 obtained the appointment at Hull. Three years ago, the Technical College there included gas in their syllabus of education, and Mr. Dougall was appointed lecturer on this subject; and his pupils have been very successful in passing examinations. He has succeeded in winning the respect and esteem of all those with whom he came in contact. The Directors of the British Gaslight Company presented him with a cheque to emphasize their good wishes for his future welfare; the workmen gave him a beautiful illuminated address and a case of cutlery; his brother officials were the donors of a prismatic field glass and case of pipes; and the Secretary (Mr. A. W. Brookes) and the Engineer also offered him tokens of their regard. Mr. Dougall and his wife (who is a daughter of the late Mr. Andrew Dougall, of Hull) are expected to sail for their new home on the 23rd of December. In the meantime, Mr. Dougall has been commissioned to visit a number of works, both on the Continent and in this country, to inspect the latest methods of gas manufacture.

Manchester and District Junior Gas Association.—We learn from the Secretary (Mr. J. Alsop) that arrangements have been made for the members to inspect the gas-engine works of Messrs. Crossley Bros., at Openshaw, Manchester, on Saturday. The next "Coffee" meeting will be held on Tuesday, the 14th prox., at the Cities Café, Deansgate; the subject for consideration being "Gas-Works Chemical Tests."

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THE DESIGN AND CONSTRUCTION OF THE LARGE GASHOLDER TANK AT MANCHESTER.

Paper by Mr. Frank H. Robinson.

At a Meeting of the Manchester Association of Students of the Institution of Civil Engineers, held on Wednesday last, Mr. FRANK H. ROBINSON, Stud.Inst.C.E., Engineering Assistant at the Manchester Corporation Gas-Works, read the following paper on "The Design and Construction of the Large Gasholder Tank at Manchester." The chair was taken by Mr. J. G. NEWBIGGING, M.Inst.C.E., President of the Association.

Before commencing a description of the work, it will be as well to give a few facts which influenced the Gas Committee of the Manchester Corporation, and their Engineer (Mr. J. G. Newbigging, M.Inst.C.E.) in deciding to erect a holder of such large dimensions.

It is an axiom among gas engineers that a gas undertaking should have storage for at least one day's maximum consumption of gas. This gives a feeling of security to the manager, conduces to good, regular working, and gives facilities for shutting-down the plant for a portion, if not for the whole, of Sunday. For several years past, Manchester has not been in this position. In December, 1904, owing to a week's continual fog, the consumption of gas reached 27,250,000 cubic feet in the 24 hours; while the storage capacity for the four works was but 24½ million cubic feet, and the productive capacity about 24 millions. The productive capacity at this time was about 2½ million cubic feet less than normal, owing to a portion of the Gaythorn plant being under reconstruction. It will thus be seen that there was very little reserve for emergencies, such as the one stated above. This was very forcibly demonstrated then; for on the last day of the foggy weather, there were but 580,000 cubic feet of gas in stock at 11 p.m., or barely half-an-hour's supply of gas for the city.

tions, 285 feet internal diameter and 46 ft. 6 in. deep to the under-side of the footings. Framing of steel. Holder, four-lift, each lift about 43 feet deep, with steel guide-framing.

SITE.

Having now fixed the general dimensions of the structure, the next question was to find a good site—one which would be satisfactory from the engineering point of view, and one which would suit the arrangement of the new works to be erected on the adjoining land. This was found at the north-eastern extremity of the works, where the land is about 8 feet above the level of the rest of the works.

Five boreholes were sunk to ascertain the nature of the strata beneath, each hole being 4½ inches in diameter, and ranging from 50 to 80 feet deep. One was in the centre, and the remainder at equidistant points round the circumference of the tank. The boreholes showed the strata to be: First, boulder clay, then thin bands of marl and black shale, and, finally, grey shale at the lowest section. A section of the boreholes is shown on Drawing No. 1. Such ground as this is very suitable for a brick and puddle tank as projected.

GASHOLDER TANK.

This consists of a circular brick tank backed with puddle, and having a cone or dumpling in the centre on which rests a steel framework. On one side there are two pipes, 42 inches in diameter, forming the inlet and outlet of the holder. When the trench for the wall is excavated to the full depth, a layer of puddle, 12 inches thick, is spread over the whole bottom, well punned and watered, and left perfectly level. Over the dumpling, the puddle is 18 inches thick where the bed is shale; where the bed is clay, the surface of the clay is excavated with a tool for a depth of 12 inches, puddled, watered, and well trodden down. On the puddle is a bed of concrete (5 to 1), 30 inches thick under the walls and 9 inches thick on the dumpling, special blocks being formed on the latter to receive the tank-framing.

The footings are eight courses deep throughout. The main wall is 7 bricks thick at the bottom for a height of 16 ft. 6 in. above the footings—i.e., just above the centre of pressure. Above this point, it is reduced by one-half brick every 4 feet up, the top section being 3½ bricks thick. The total height of the brick wall is 44 feet from the top of the footings.

At equidistant points round the circumference, there are 32 piers projecting outwards, to support the standards of the holder guide-framing. These piers are 11½ bricks deep and 8 bricks wide for the full height; they also serve the purpose of stiffening the tank wall. In addition to these main piers, there are 32 intermediate piers for stiffening purposes. They are 7 bricks deep and 5½ bricks wide. The brickwork is laid in cement mortar (3 to 1), and built in old English bond. Behind the wall is puddle 2 ft. 6 in. thick. The puddle serves to make the tank watertight, while the brickwork is for strength and for preserving the circular form of the tank.

PRINCIPLES OF TANK CONSTRUCTION.

Let us now consider the principles governing the design of gas-holder tanks in general, taking the present one as an illustration. The forces and resistances to deal with when designing a tank of this description are, on the one side the pressure of the water, and on the other side (1) resistance of the earth-backing, (2) resistance due to the weight of the wall, and (3) resistance due to the cohesion of the material. It is evident, then, for stability and a reasonable margin of safety, together with a tight tank, the last three items added together must greatly exceed the water pressure. To ascertain if this be the case, Pole's formulæ are often applied. For consistency, the symbols use in these and in subsequent formulæ are made alike; the formulæ otherwise remaining the same as quoted in gas engineering text-books.

- Let *d* represent the internal diameter of tank in feet.
- " D "

" T "

" H "

" R "

" F "

" B "

" W "
- " external "

" thickness (average) of tank wall in feet.

" height "

" resistance to compression of earth backing in pounds per square foot.

" ultimate cohesive strength of material in pounds per square foot.

" weight of brickwork in pounds per cubic foot.

" " " " water " " " "

Taking the moments about the outer bottom edge of the wall, immediately above the footings, we get—

- (A) Moment of water pressure = $Wd\frac{H^3}{6}$
- (1) Moment of resistance of earth-backing = $RD\frac{H^3}{2}$
- (2) " " " due to weight of wall = $BDH\frac{T^2}{2}$
- (3) " " " cohesion of materials = FH^2T

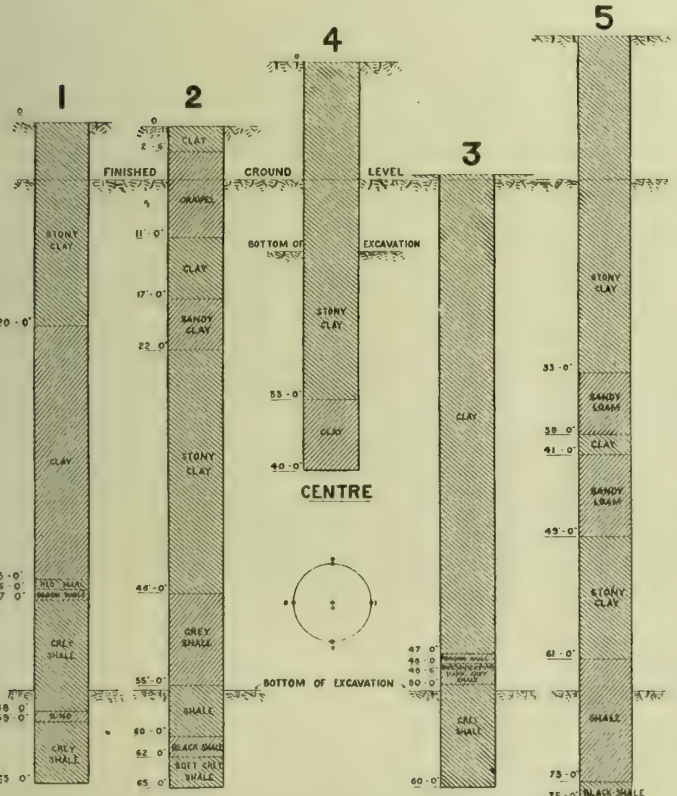


Fig. 1.—Section of Boreholes.

It was then decided to increase the storage capacity, and make it sufficient for some years to come. The question now arose as to which would be more economical, both as regards land and money—to erect one large holder, or two or three smaller ones with a total capacity equal to the larger one.

The figures given below show clearly that the advantage lies on the side of large holders :—

		Capacity. Cubic Feet.	Cost per 1000 Cubic Feet.
Manchester	1 holder (Gaythorn)	1,500,000	£13 16 0
"	1 " (Bradford Road)	7,000,000	9 15 5
Sheffield	1 "	8,113,600	6 10 7
Edinburgh	1 "	8,500,000	8 8 11
Devonport	1 "	1,500,000	11 6 1
Manchester (New)	1 "	10,410,000	8 0 6

These figures cover the cost of tank, inlet and outlet pipes, tank framing, holder, and guide-framing.

It was finally decided to erect a holder at the Bradford Road works of 10 million cubic feet capacity, having the following dimensions, &c. : Tank, of brick and puddle on concrete founda-

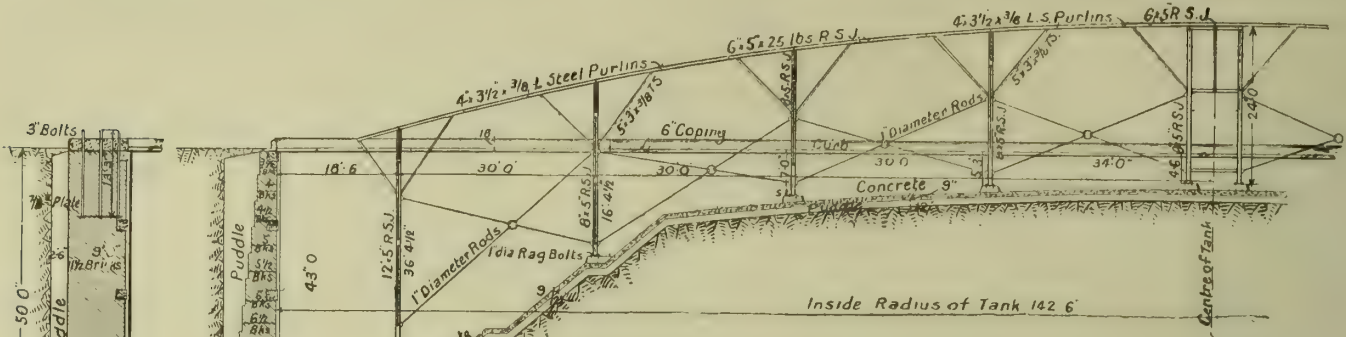


Fig. 2.—Half Section of the Gasholder Tank.

Substituting numerical values we have—

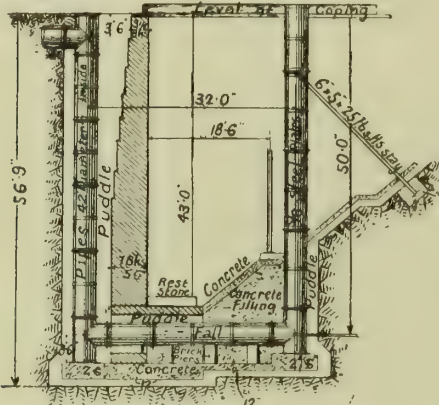
- (A) Moment of water pressure.
- $$\frac{WdH^3}{6} = \frac{62.5 \times 285 \times 44^3}{6 \times 2240}$$
- " = 113,000 tons-feet.
- (1) Moment of resistance of earth-backing.
- $$\frac{RDH^2}{2} = \frac{1200 \times 294 \times 44^2}{2 \times 2240}$$
- " = 152,460 tons-feet.
- (2) Moment of resistance due to weight of wall.
- $$\frac{BDHT^2}{2} = \frac{112 \times 294 \times 44 \times 4.5^2}{2 \times 2240}$$
- " = 6550 tons-feet.
- (3) Moment of resistance due to cohesion.
- $$\frac{FHT}{2240} = \frac{31,680 \times 44 \times 4.5}{2240}$$
- " = 123,200 tons-feet.

Adding the last three items together, we get a total moment of resistance of 282,210 tons-feet, or almost 2.5 times the moment of the water pressure. This is the factor of safety immediately above the footings, assuming that the earth-backing is boulder clay for the full depth. As, however, the lower stratum is here of shale, this factor of safety will be very much higher; the shale found being of a very hard description with entire absence of "faults."

The author has prepared a graph (fig. 4) illustrating the gradual increase of the factor of safety toward the top of the tank, showing that the thickness of the tank wall might be reduced to a feather-edge at the top. This, of course, is not carried out; for the side of the tank acts as a retaining wall to the earth-backing when the tank is empty, the surrounding ground being also subjected to rough usage during the erection of the holder. Also, if the top of the wall were made very thin, the thickness of it would require increasing at the base to obtain the necessary cross area. Thus there would be extra excavating and puddle without any great saving in brickwork. Moreover, if very thin at the top, the masonry would not be able to withstand the weather.

The above formulæ take no account of the support offered by the main piers, or of the cohesion at the base of the wall. For a

Section of Main Piers.



Inlet and Outlet Pipes.

Applying these to the tank described, we get—

- d = 285 feet
D = 294 "
T = 4 1/2 "
H = 44 "
R = 1,200 lbs. per square foot for puddle or clay
F = 31,680 " " " cubic foot bricks in 3 to 1 compo.
B = 112 " " " "
W = 62.5 " " " "

It will be noticed that the average thickness of the wall is taken. This is to simplify the calculations.
The position of the centre of gravity of the wall when considered of uniform thickness is but 1 inch away (vertically) from its actual position; so that the error introduced is small, especially as the item affected is (2), which forms but a small portion of the total resistance.

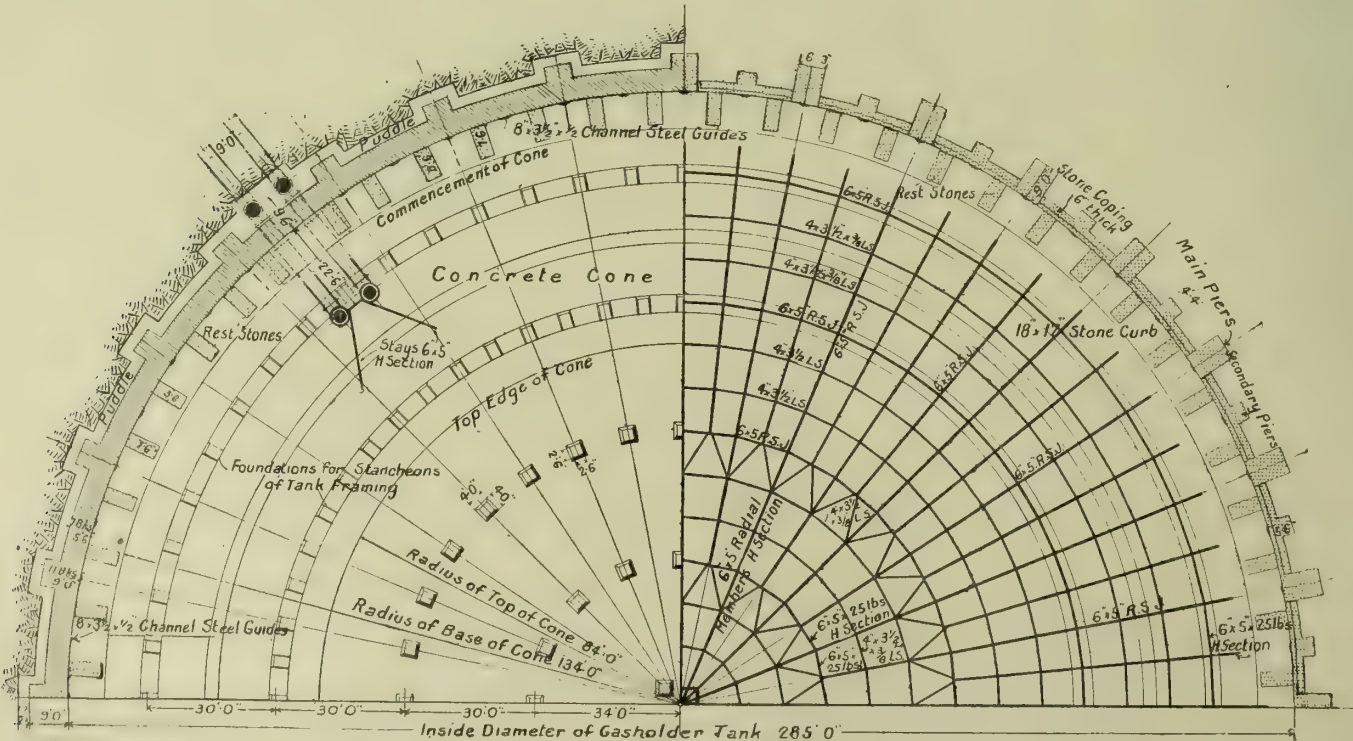


Fig. 3.—Half Plan of the Gasholder Tank.

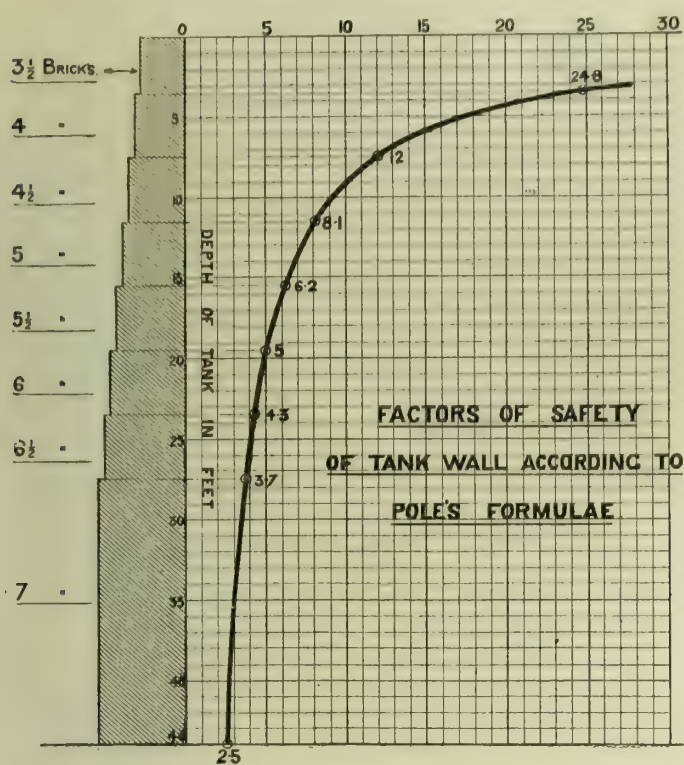


Fig. 4.—Factors of Safety.

large tank with counterforts such as the one described, the author would prefer to base his calculations on one section only of the wall, between two of these piers (shown shaded on the diagram), and allow for cohesion at the piers on either side of this elementary strip, and at the base just above the footings; for in case of failure, one of these sections would be the first to go. In other words, the author would consider one bay as a dam with earth backing.

Let L represent the length in feet of one of these sections between the piers. The other symbols are as used in previous formulæ.

- | | |
|---|---|
| (A) Moment of water pressure on section | $= W.L.H.\frac{H}{2} \cdot \frac{H}{3}$ |
| " " " | $= W.L.\frac{H^3}{6}$ |
| (1) Moment of resistance of earth-backing | $= R.L.H.\frac{H}{2}$ |
| " " " | $= R.L.\frac{H^2}{2}$ |
| (2) Moment of resistance due to weight of wall | $= B.L.H.T.\frac{T}{2}$ |
| " " " | $= B.L.H.\frac{T^2}{2}$ |
| (3) Moment of resistance due to cohesion at piers | $= 2 \times F.H.T.\frac{H}{2}$ |
| " " " | $= F.H^2T$ |
| (4) Moment of resistance due to cohesion at base | $= F.T.L.\frac{T}{2}$ |
| " " " | $= F.L.\frac{T^2}{2}$ |

The length L is found to be almost 22 feet measured at the centre of the wall. There is a difference of 12 inches between the outside and inside lengths of this section; but the author is of opinion that resistance of the earth-backing is scarcely effective for 6 inches on either side the piers, owing to the friction against these piers and the difficulty of getting the backing quite tight into the corners. The average length L is therefore taken, for these reasons and for simplicity, as being a dimension common to four out of the five items.

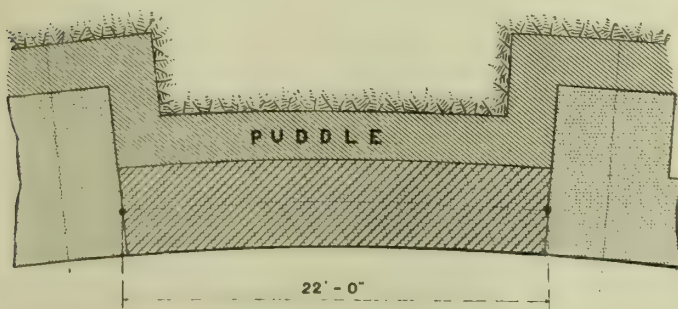


Fig. 5.—Plan of One Bay of Wall.

Substituting numerical values, we get—

- | | | | |
|---|-------------------------|--|--------------------------------|
| (A) Moment of water pressure | $= W.L.\frac{H^3}{6}$ | $\frac{62.5 \times 22 \times 44^3}{6 \times 2240}$ | $= 8715 \text{ tons-feet.}$ |
| (1) Moment of resistance of earth-backing | $= R.L.\frac{H^2}{2}$ | $\frac{1200 \times 22 \times 44^2}{2 \times 2240}$ | $= 11,410 \text{ tons-feet.}$ |
| (2) Moment of resistance due to weight of wall | $= B.L.H.\frac{T^2}{2}$ | $\frac{112 \times 22 \times 44 \times 4.5^2}{2 \times 2240}$ | $= 490 \text{ tons-feet.}$ |
| (3) Moment of resistance due to cohesion at piers | $= F.H^2T$ | $\frac{31,680 \times 4.5 \times 44^2}{2240}$ | $= 123,213 \text{ tons-feet.}$ |
| (4) Moment of resistance due to cohesion at base | $= F.L.\frac{T^2}{2}$ | $\frac{31,680 \times 22 \times 5.4^2}{2 \times 2240}$ | $= 4536 \text{ tons-feet.}$ |

In calculating the resistance due to cohesion at the base, the full thickness of the wall has been taken, not the average thickness as in (2) and (3).

Adding the last four items together, we get 139,649 tons-feet as the total moment of resistance, or a factor of safety of 16, compared with 2.5 when Pole's formulæ are used. This clearly shows the great assistance offered by the piers or buttresses.

The above calculations apply when the tank is filled with water and the brickwork thoroughly set. It is obvious that the tank must also be able to withstand any other stresses before it is filled and while the work is "green." While the inner portion of the tank is being taken out, the earth backing will be exerting a thrust on the back of the wall. This must be counterbalanced by the weight of the wall, and the cohesion of the comparatively "green" material, which might be taken as having half its ultimate strength (say) for the first four months while the inner portion is got out, or a tensile strength of 15,840 lbs. per square foot.

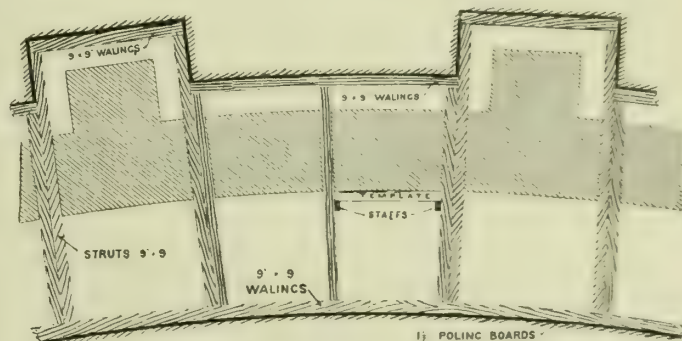


Fig. 6.—Plan showing Timbering.

The mass of earth pressing on the tank wall behind this length of 22 feet would be 570 tons (22 ft. by 44 ft. by 11 ft.) with its centre of pressure 14 ft. 8 in. up the wall. Then:—

- | | | Tons-Feet, |
|--|---------------------------------------|------------|
| Moment of pressure of earth | $= \frac{570}{1} \times \frac{44}{3}$ | 8,360 |
| (1) Moment of resistance due to weight of wall | | 490 |
| (2) " " " cohesion at piers | | 61,617 |
| (3) " " " " base | | 2,268 |
| | | 64,365 |

This gives a factor of safety of 7.7 which shows that safety is insured without waste of material. It will thus be seen that the tank is safe whether full or empty, and that the safety depends almost entirely on the cohesion of the material. The opposing forces—those of earth and water—are about equal in this case with such a backing. The other items are merely resistances, and come into play whether the tank is full or not. The slight curve on this elementary section will also assist the wall to withstand the earth-pressure behind; but as the work is "green" and the value of such assistance can scarcely be estimated at such a time, it is better ignored in the calculations.

The calculations of the resistance due to cohesion are based upon the ultimate tensile strength of brickwork in cement, which is considerably below the ultimate compression stress. There is therefore no necessity to see whether the resultant pressure falls within the middle third of the base. Further, the conditions are different to those in a long straight wall. From the above, it is evident that the thickness of the tank wall is determined by the nature of the surrounding backing and the height of the wall.

It will be seen that the use of Pole's formulæ is but a rough and general method, only suitable for comparatively small tanks where a little extra brickwork is not of much moment. It gives a factor of safety far below the true one; so running up the cost without necessity. The author is of opinion that in many gas-holder tanks, where Pole's formulæ have been used to ascertain the thickness of the wall when designing the tank, much expense might have been saved without endangering the safety of the structure or tightness of the tank—provided, of course, that due allowance was made for the nature of the surrounding strata.

SUNDRY DETAILS OF CONSTRUCTION.

In this tank, no dry well or recess is provided for the outer legs of the inlet and outlet pipes; the circle of the tank being unbroken save at the bottom where the pipes are taken through two circular tunnels in the bottom of the main wall and up through the puddle outside. Puddle is well rammed round the pipes, both in the tunnels and outside, after previously supporting the horizontal portions of the pipes by small brick piers.

The break in the bottom of the wall for the entrance of the inlet and outlet pipes constitutes a weakness in masonry tanks. Some engineers prefer to recess the tank wall, and some to construct a dry well sufficiently large to admit of the inspection of the pipes. Where the pipes are sufficiently large for inspection from their inside, the simplest and safest method is the one just described.

Six steel holding-down bolts are provided to each main pier for the standards, 3 inches diameter and 13 ft. 3 in. long, with a $\frac{7}{8}$ -inch steel plate built in the wall at their lower ends.

The stone used is Fletcher-Bank stone. The guide-stones, 320 in number, are built in the wall with a 3-inch projection from the face. Before the channel-guides for the holder are bolted to these, they are dressed off to about 2½ inches, till each is perfectly plumb over the one below.

The rest-stones at the bottom are for the purpose of receiving the holder when not in use. There are 64 in the circumference; all being level with each other and rounded on the arris.

The tank wall is covered with a coping 6 inches thick, with a circular topped curb, 18 inches by 12 inches, each section being secured to its neighbour by slate dowels run in cement.

The main pier stones, 32 in number, are 9 feet long, 6 ft. 3 in. wide, and 2 feet thick.

The "dumpling" is formed after the tank wall is built, and has a slope of 40 degrees with the horizontal. It is built in three steps, finishing with a rounded top, as shown in Drawing No. 2.

Six overflows for the excess of water are provided round the side of the tank.

TANK-FRAMING.

For the purpose of receiving the weight of the holder crown when the holder is supported on the rest-stones at the bottom of the tank, a steel framework is fixed on the dumpling. It is formed of rolled steel stanchions, rafters, and purlins of various rolled sections, braced across with wrought-iron rods and rings. The purlins and rafters are bent to suit the spherical form of the holder crown. In the centre is a square framework formed of rolled steel joists from which the whole tank framing radiates.

CONSTRUCTION.

Having now described the design, an account will be given of the method of constructing the tank. The work was commenced on Nov. 11, 1907. The Corporation set apart 37,428 square yards of land for the Contractor's use; and he fenced it off from the rest of the works. The site was first levelled; and the clay removed was piled up at one side to weather. A circular trench, 16 ft. 6 in. wide and 50 feet deep, was set out and cut, with recesses for the main piers, and a deeper pit for the inlet and outlet pipes. The sides of the excavation were close-timbered and well strutted as the excavation deepened.

Round the outside of the tank rails were laid, on which ran travelling cranes and bogies for material; the brick-making plant, pugging mills, concreting stages, &c., being placed in convenient positions adjacent to the rails. A connection was also made with the railway sidings of the Corporation. The excavating was done by hand, the material being filled into skips, hoisted by means of steam travelling cranes, dropped into bogies, and stacked for future use. Owing to the confined nature and close-timbering of the trench, and the accuracy with which the trench had to be cut, the use of a steam navvy was impossible.

The excavation for the footings was undercut 2 feet at the outer circumference. As the ground was solid, this was not a risky operation. It meant a great saving in excavating and timbering, and also left the earth behind the puddle undisturbed—an important point where tightness is concerned. The ground was found to be very solid and free from faults and water, fully confirming the borings. Drains and sump-holes had been provided in the contract for dealing with water if it should be found; but, fortunately, these were not required.

Some doubt was entertained as to whether any of the eighteenth century workings of the Bradford coal-seams had been carried sufficiently near the tank to cause anxiety. Headings were accordingly driven from the bottom of the excavation in an outward and downward direction for some 40 to 70 feet at several points in the circle. These headings were cut in the 3-foot coal-seam found at the bottom of the trench. This coal-seam had a dip of 1 in 3. On examination, the headings revealed no danger; so they were filled up with tightly-rammed concrete.

The weathered puddle was taken to the pugmills, where it was

well worked and made thoroughly homogeneous. It was then lowered into the excavation, well trodden, watered, and punned with flat punners—being left perfectly level so as to receive the concrete. It is upon the puddle that the tightness of the tank depends, hence the necessity of only the best puddle being used. The whole of the trench bottom was covered with puddle 12 inches thick before concreting was commenced.

The concrete was mixed 5 to 1 on a clean stage, lowered into the trench, well punned, and levelled. The footings were then put in and backed up with puddle, which was well watered and rammed in. The cement mortar for the wall was mixed dry on a platform, then ground in mills, slaked, and mixed again to ensure a consistent mixture. The puddle behind the wall was filled in, watered, and rammed solid as the wall rose. Before the long struts of the timbering were removed, shorter struts were put in against the inside of the wall to support the earth on the inside of the circle. The long main struts were removed and the walings and poling boards taken down. This proceeded just sufficiently in advance of the brickwork to leave working room above.

For the purpose of setting-out the circle of the tank and subsequent plumbing operations, a trammel was used. This was a large fish-backed or bowstring girder of steel sections, and triangular in cross section. The pivot end was of cast-iron, with the fixed portion bedded in a block of concrete, while the free end ran on a single rail laid round the inside of the excavation. A heavy plumb-bob was provided at this end, with a winding arrangement, so that the bottom of the excavation could easily be reached.

In addition to the trammel, staffs and templates were also used; the staffs being nailed to the struts and plumbed-down, and the short templates worked up between them, as shown in fig. 6.

Opinions differ as to the use of the trammel; some preferring to work with a template and plumb-rule only. The author is of opinion, however, that the trammel is necessary if strict accuracy is desired; the possibility of error being greater with a template than with a trammel. In this tank, when the diameter was checked with the steel tape at the completion of the tank wall, it was found to be practically a true circle.

BRICKMAKING.

The excavated clay was found to be suitable for all the puddle required in the tank and for brickmaking. A brickmaking plant was accordingly erected on the site, capable of making 30,000 bricks a day. The clay is selected from the weathering heap, run along in self-tipping waggons, and emptied into the grinding pan; all large stones being previously taken out by hand. The clay then passes through two sets of grinding rollers, to pulverize any stones or hard material present. From the rollers it passes to the pug-mill for mixing, from which it is forced by a spiral conveyor through a die on to the cutting table. The bricks are then dried in a shed, and run out into the kiln for burning.

The kiln is of the Hoffmann or continuous burning type. It is entirely open, and has only end walls and piers which contain the flues and dampers. The main flues are underground, and pass beneath the piers on to the drying shed—joining together just before entering the latter. To prevent the air passing the wrong way when filling the kiln, the unburnt bricks are plastered over with brown paper. They are then covered on top with a course of red brick and 3 inches of dust; provision being made for feeding the chambers as required with coal or breeze. The gases are drawn through the kiln from the top to the bottom by means of fans, and discharged into the drying shed, no chimney being required. There is thus great economy of fuel with this kiln. The kiln is continuous; the heat passing automatically from one division of the kiln to the next. The divisions are emptied as the bricks therein are burnt, and charged with a fresh batch ready for the time when the heat again reaches that section.

The bricks produced were, on the whole, of a very good quality, extremely hard, well-shaped, and generally superior to the local common brick. A royalty was paid to the Corporation by the brickmakers, Messrs. H. Harrison and Sons, on every 1000 bricks made.

MATERIALS USED, AND COST.

The following list gives the principle quantities of work and materials required:—

Excavating to level site	29,960 cubic yards.
" " circular wall trench	30,380 " "
" " centre of tank	48,500 " "
Puddle behind wall and to dumpling	10,000 " "
Concrete, 5 to 1	4,000 " "
Brickwork in cement mortar, 3 to 1	9,000 " "
Stonework	10,225 " feet.
Steel inlet and outlet pipes	51 tons.
" and iron tank framing	258 " "
Capacity of tank, about 9 million gallons.	

The contract amount, including clearing the ground but excluding the inlet and outlet pipes and tank framing, is £34,115, or £3 5s. 6d. per 1000 cubic feet of gasholder capacity. Arrangements were made with the Contractor, however, to level the surrounding ground within the fence free of cost if bricks were made on the site. When this matter, the saving in drainage and pumping, and the royalty on the bricks made on the site, are placed side by side with the contract sum and the extras, a final amount of £27,000, or £2 14s. per 1000 cubic feet holder capacity, stands as the approximate cost of the tank itself, to which must be added £4390 as the contract amount for the inlet and outlet pipes and tank framing, giving a total of £31,390 as the cost of all work below the ground level.

The cost may appear high compared with other civil engineering work of a like description; but when it is borne in mind that the work requires the greatest accuracy combined with the best materials, and the circular form of the structure, this high cost may be accounted for. If the tank be not a true circle and perfectly plumb down the inside face of the wall, difficulty will be found with the working of the holder. If the materials be not of the best and the tank leaks, it will be an endless source of expense and often of anxiety.

The Contractors for the tank were Messrs. E. Nuttall and Co., of Manchester, who hope to complete their work in December next, or two years and one month from the commencement of the work.

The contract for the steel work is let to Messrs. Ashmore, Benson, Pease, and Co., of Stockton-on-Tees, who will be expected to finish their work by December, 1910.

The description of the superstructure will be left over to form another paper, subject to the approval of the Council of the Institution.

The author is indebted to Mr. J. G. Newbigging, M.Inst.C.E., who is responsible for the design, for much of the information contained herein, and for permission to submit the drawings accompanying this paper, and also to Mr. W. H. Cummins, who prepared the drawings and quantities, for checking the calculations herein. And, lastly, the author is indebted to his former chief, Mr. Thomas Newbigging, M.Inst.C.E., for many valuable suggestions.

A very animated discussion followed the reading of the paper, in which about a dozen members and students took part.

The PRESIDENT wound up the discussion with the following remarks: The paper which Mr. Robinson has submitted to us this evening is an excellent one, and deals in a comprehensive manner with the forces and resistances coming into play in connection with cylindrical underground masonry tanks, and the principles which should guide us in the design and construction of large gasholder tanks particularly. The author attacks Dr. Pole's formulæ, and not perhaps without some degree of justification. Without a proper appreciation and intelligent use of the formulæ, there is no doubt a danger of excessive waste of material. Though the formulæ are known as Dr. Pole's, it must be pointed out that they originate from the work and investigations of M. Arson, a French engineer, and have been translated by Dr. Pole into English. I am afraid many engineers are apt to follow on beaten tracks; and it is refreshing to hear scientific theories and formulæ attacked. Papers framed on such lines are more interesting than mere descriptions of engineering work. It is well for engineers to overhaul these periodically, in view of the continuous advancement of our scientific knowledge; and if only for that reason, we welcome the paper which has been submitted to us to-night. Gasholder tanks and gasholders are some of the most costly sections of coal-gas manufacturing plant; and it is notorious that contractors who undertake the construction of the tanks are rarely compensated for the work and responsibility involved, in securing a fair profit. This is due, in great measure, to difficulties which invariably await contractors in some form or other during the carrying out of the work, which it is quite impossible to foresee. The author in the early part of his paper gives a list of towns where large gasholders and tanks have been constructed, with their cost per 1000 cubic feet of capacity, which is the usual method of expressing the cost of such structures. It will be noticed that at Sheffield a gasholder and tank with a capacity of just over 8 million cubic feet was constructed at a cost of £6 10s. 7d. per 1000 cubic feet; while the one at Manchester, with a capacity of 10 million cubic feet, will cost £8 per 1000 cubic feet. Such comparisons of engineering structures, without further explanation, are misleading. At the time the Sheffield holder was constructed, the price of steel ruled some £1 14s. per ton lower than at the time the Manchester holder was let by tender. Further than this, local conditions and circumstances rendered it imperative for the Manchester holder to be a more substantial structure than the one at Sheffield. Therefore, in comparing the cost of engineering structures, due regard must be paid to what has been obtained for the expenditure, the cost of the annual maintenance of the structure, and its probable life. The details of the construction of a gasholder tank, whether in concrete or brick and puddle, are largely governed by the type of holder it is proposed to erect. There are two main types of gasholders—one in which it is necessary that a system of steel guide-framing should be erected above the level of the top of the tank, in order to guide the holder to its full height of inflation, and to resist the wind and other forces exerted on the structure; and the other in which no such guide-framing is required. This latter type is known as the spiral-guided holder; the guiding and resistance to strains from wind pressure and other sources being taken up by an ingenious arrangement of guides and rollers in the tank and each lift of the holder. In the construction of a tank to float a spiral-guided holder, it is therefore not essential to build any piers or counterforts as is requisite in the case of a guide-framed holder; the circular wall being usually built in uniform sections. I am not altogether in agreement with the author in laying so much emphasis on the resistance to pressure due to the counterforts. These counterforts are constructed for the sole purpose of foundations for the standards; and though it is obvious that they do strengthen the wall to resist both external and internal pressures, it would not be wise to rely too much on the part

they play, and so be induced to reduce the section of the wall between the piers, because, as in the case of a chain being as strong as its weakest link, so is the strength of a tank wall largely as its least sectional thickness, on the line of the centre of pressure. Then, again, with a comparatively light wall adjoining a heavy counterfort, there is danger of rupture occurring at the point where they intersect—such cases coming within the knowledge of engineers. There must, in fact, be some degree of symmetry between the wall and counterfort; and for these reasons I submit that, while fully recognizing the theoretical resistance to pressure due to the cohesion at the counterforts, care must be taken that too much reliance is not placed on the practical effect of this, and other important considerations overlooked. In his method of calculating the resistance of a section of the wall to pressures exerted upon it, the author very wisely allows for the "green" state of the structure. It must be further pointed out that, in the case of a large tank, immediately on its completion, and before the commencement of the erection of the gasholder, it is sometimes tested with water; and due regard must be paid to the effect of this exerting of pressure on the comparatively green structure and its subsequent release, on the emptying of the tank, in order that the construction of the gasholder may be proceeded with. The saving in cost in reducing the thickness of a tank wall by one brick throughout its entire height, is so small a proportion of the total cost that it is not worth any consideration to carry out a cheese-paring policy in design, when it might endanger its practical stability. There is nothing more disheartening to an engineer than to find, on the completion of the construction of a gasholder tank, that, in spite of all his care and foresight, a fracture of the wall occurs, whether of concrete or brickwork, which it is almost impossible to completely repair, and which results in a continual burden of cost in keeping up the level of the water-line, which is essential for the working of the holder. Therefore, in considering the design and construction of gasholder tanks, care must be exercised that, in the endeavour to save expenditure, encouraged by evidence adduced from theoretical consideration, disastrous results do not ensue in putting these theories into practice. Theories and formulæ must all be backed up by practical experience and judgment to make gasholder tank construction successful—as, indeed, these qualifications must obtain in carrying out any engineering work.

AIR POLLUTION BY SMOKE.

In Mr. C. E. Brackenbury's paper given last Tuesday before the Society of British Gas Industries (and noticed elsewhere), he referred appreciatingly to the work done at Leeds by Professor J. B. Cohen and Mr. A. G. Ruston in their investigations into the nature and effect of the pollution of the air in and around Leeds. In view of the present interest aroused in the question of smoke nuisance generally, and as the facts and results of the Leeds experiments may not be familiar to our readers, it will be useful to record them now in our columns.

As long ago as 1897, a paper was read at the Sanitary Institute Congress at Leeds, in which it was shown that an average working day's industrial activity in that Yorkshire city resulted in the emission into the air of 20 tons of soot. Of this amount, half-a-ton was estimated to fall on an area of some four square miles, of which 20 to 25 lbs. remained on the ground and was not washed away by rain.

On July 17 last, before the Bacteriology and Chemistry Section of the Health Congress, Professor Cohen, of the Leeds University, read the paper referred to by Mr. Brackenbury, entitled "The Quantity and Nature of Impurities in the Atmosphere of Leeds and Surrounding Districts." An abstract of this paper appeared in "Nature" for Oct. 14, from which, and other sources, the following particulars are taken.

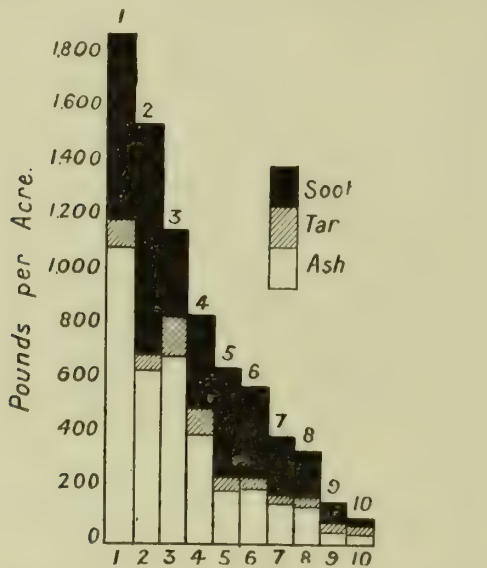
The authors' observations were directed to ascertaining the amount of suspended matter in the air, the analyses of rain water, the influence of industrial centres, the diminution of light and sunshine, and the effect on vegetation by the polluted rain water. Representative stations were selected for the experiments—extending from the heart of Leeds, all through the surrounding residential districts, and reaching to the country at Garforth, 7½ miles due east.

CONSTITUENTS OF POLLUTION.

The impurities of the suspended matter consisted of soot, tar, sand, and other mineral substances. In solution were found sulphurous and sulphuric acids, chlorides (chiefly in the form of hydrochloric acid), and nitrogenous matter, as nitrates or free or albuminoid ammonia. The table on p. 614 shows the results of the analyses of the rain water, the figures being pounds per acre for a year.

At the distance of one mile from the centre of the town, it was found that the total solid impurities fell to less than one-half, and at 2½ miles, to less than one-fifth. Looking at the table, it will be seen that the solid impurities are about twenty times greater at the industrial stations than they are in the residential quarter of Roundhay, which lies about 3 miles north-east. These results, as regards soot, tar, and ash, are graphically shown in Diagram No. 1.

Collecting Station.		Suspended Matter.	Tarry Matter.	Mineral Matter.	Free Acidity as H ₂ SO ₄ .	SO ₃ .	SO ₂ .	Chlorine.	Nitrogen as NH ₃ .	Nitrogen as N ₂ O ₅ .	Nitrogen as Albuminoid Ammonia.	Total Nitrogen.
Industrial.	1. Leeds Forge	1886	110	1113	35	123	34	164	13.0	0.0	4.7	17.7
	2. Hunslet.	1565	69	655	90	185	24	198	15.5	0.0	2.9	18.4
	3. Beeston Hill	1163	149	709	30	269	54	101	14.4	0.5	3.5	18.4
	4. Philosophical Hall (town).	849	78	423	45	149	38	75	14.4	0.3	2.2	16.9
Residential.	5. Headingley.	659	43	199	11	118	32	41	11.1	1.1	0.8	13.0
	6. Armley.	593	34	216	29	110	37	108	9.9	1.0	3.2	14.1
	7. Observatory	399	32	146	26	85	39	51	8.4	0.8	1.6	10.8
	8. Kirkstall.	352	28	141	8	77	56	57	7.7	0.2	2.3	10.2
	9. Weetwood Lane	147	26	54	11	82	13	34	8.3	1.1	2.1	11.5
	10. Roundhay.	90	14	49	0	53	16	38	5.8	0.7	1.3	7.8
	11. Garforth (country)	—	—	—	28	65	21	22	5.0	3.2	1.1	9.3



1, Leeds Forge. 2, Hunslet. 3, Beeston Hill. 4, Philosophical Hall. 5, Headingley. 6, Armley. 7, Observatory. 8, Kirkstall. 9, Weetwood Lane. 10, Roundhay.

Fig. 1.—Suspended Matter.

The least injurious constituent of the suspended matter is the mineral part of it, which, as would naturally be expected, is exceedingly high at the Leeds Forge. It consists for the most part of oxides of iron, lime, alumina, and silica.

SOOT.

In former experiments, to determine the amount of soot deposited, a measured surface of snow was collected and filtered and the soot weighed. The results obtained have been checked by, and have been found to be in agreement with, figures arrived at from analyzing the rain water. Such analyses show that the soot deposited in a year in the industrial district of Hunslet amounts to 300 tons per square mile; while in the semi-residential neighbourhood of Woodhouse Moor (about a mile north-west of the centre), the amount dropped to 80 tons.

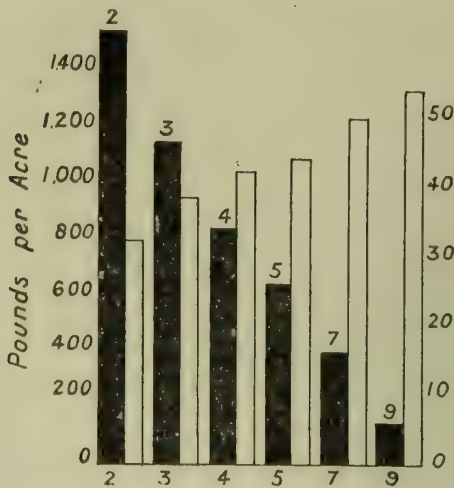
TAR.

To ascertain the quantity of tar, glass plates one foot square were formerly used, being exposed in different points in the town and district. These plates were washed under running water and the residual deposit analyzed, with the result that the amount of soot remaining was found to be 24 times greater in the town than at a distance of 9 miles away. In the later experiments, however, the tarry matter was estimated by extraction with ether; and the result was that the quantity fell from 80 lbs. per acre per annum in the centre to 14 lbs. per acre per annum at a point 3 miles north-east.

"The waste of fuel in the form of unburnt coal passing into the atmosphere must be very large, for," say the authors, "we get in Hunslet each year about 9 cwt. of soot per acre, or nearly 300 tons per square mile actually reaching the ground; while the average amount for the whole area included in the investigation (roughly, 16 square miles, or 4 miles square) works out to 100 tons per square mile."

REDUCTION OF LIGHT.

The next point to receive attention was the important one as to how far the pollution of the air interfered with sunshine and with light. The authors say: "The effect of these impurities in diminishing the amount of sunlight received in Leeds may be gathered from the fact that in 1907 the number of hours of bright sunshine registered at the Philosophical Hall, in the centre of the town, was 1162; while at Adel, some 4 miles north-west, the number was 1396—that is, in the centre of the town we get only



2, Hunslet. 3, Beeston Hill. 4, Philosophical Hall. 5, Headingley. 7, Observatory. 9, Weetwood Lane.

Fig. 2.—Influence of Suspended Matter on Intensity of Light.

83 per cent. of the amount registered 4 miles away." Another comparison showed that the smoke absorbed about a quarter of the total daylight. "The amount of light in Hunslet, where the solid impurities corresponded to 1565 lbs. per acre, was 40 per cent. lower than in the Weetwood Lane, where the solid impurities corresponded to 147 lbs. per acre." The relation of smoke to light is shown in Diagram No. 2, where the black column indicates the soot deposit, and the light column shows the corresponding daylight.

INDUSTRIAL V. DOMESTIC SMOKE.

Upon the moot question as to whether factory smoke or domestic smoke is the greater sinner of the two, the following observations are of interest:

It is sometimes stated that it is the domestic smoke rather than industrial smoke which is injurious to plant life, on account of its higher content of tar. There is a certain amount of justification for this statement, for the percentage of tarry matter in the total solid impurities is highest in the residential and lowest in the industrial areas, varying from 18 per cent. in the former to 4 per cent. in the latter. When, however, account is taken of the total tarry matter deposited each year, the industrial centres are responsible for the greater quantity, which reaches in some cases ten times the amount in the residential districts. The total sulphur, either as sulphurous or sulphuric acid, is everywhere high, but particularly in and near the chief manufacturing areas.

In the discussion which followed upon the paper, Professor Smithells wondered if Professor Cohen had got any nearer to a correct estimate of the relative contaminating effects of the two classes of chimneys. For himself, he could not doubt the evidence of his own senses. Let them notice what happened in a town like Leeds on a Sunday, or late Saturday. At such times there was a great clarification of the atmosphere. It seemed to him that industrial smoke was the chief cause of impurity; but before they charged the manufacturers with responsibility, it was important to get a correct estimate of the manufacturers' share of the blame.

FOG.

It is also a matter of some doubt as to what extent fogs are affected by smoke; but it can hardly be doubted that it is the sulphurous acid that gives to town fog its choky and irritating effects. "The large amount of this acid present in fogs may be gauged from the fact that the hoar frost collected during the dense fog of Jan. 27 last contained acid corresponding to 10.29 parts per 100,000, or more than ten times the average acidity of the same station."

EFFECT UPON VEGETATION.

The detrimental effect of sulphuric acid upon vegetation was demonstrated by experiments made upon some boxes of Timothy grass. One sample was watered with Garforth rain water, the acidity of which had been neutralized; another sample with ordinary Garforth rain water; and a third sample with Leeds rain water. In the last case, germination was distinctly checked, and the delicate green of the young grass quickly changed to yellow or brown.

The effect of chlorides must also be prejudicial to vegetation. They are particularly found in industrial centres, where, expressed as common salt, they reach as much as 3 or 4 cwt. per acre. Nitrogenous impurities, on the other hand, would, of course, be beneficial in one way or another.

In conclusion, sufficient has been said to indicate the scope and value of the Leeds experiments, and to justify Mr. Brackenbury's plea for such work to be systematically undertaken in other towns.

On Sept. 21, 1859, Messrs. Thomas Glover and Co., Limited, sold to a Mr. Harwood, of Boston (Lincs.), a 200-light meter, which was fixed in Boston Stump. On visiting this celebrated old church recently, it was discovered that the meter was still working satisfactorily; having completed fifty years of service.

CASE-HARDENING BY GASES.

At a Meeting of the American Institute of Chemical Engineers held recently at Brooklyn, a paper containing the results of experiments on case-hardening by gases was submitted by Mr. J. C. Olsen and Mr. J. S. Weiffenback. The following abstract of the paper is taken from the "Engineering Review."

The older methods of case-hardening consisted of heating the iron in contact with a great variety of solid material invariably containing carbon in large amount, and, in smaller amount, nitrogen and, at times, alkaline substances. Charred organic material was generally used, such as wood charcoal or burnt leather; the latter being advantageous because of its high nitrogen content. Such matter is invariably alkaline, from the decomposition of the alkaline salts originally present in the vegetable fibres. Potassium cyanide has also been used. This salt contains the alkali, carbon, and nitrogen.

Recently the use of gases instead of the solid carbonaceous material has been introduced, and processes of this kind are commercially now employed; but the authors said they could find no published record of experiments conducted to ascertain the relative efficiencies of the various carbon gases. The investigation was undertaken to study this question, and also to ascertain what chemical reactions take place when the carbon from a given gas enters the steel.

The temperature at which the case-hardening must be carried out has been pretty closely determined by previous workers—i.e., from about 700° to 900° C., or 1300° to 1700° Fahr. It has also been ascertained that if the case-hardening is carried out with gases subjected to a certain amount of pressure, the action is much more rapid. This was to be expected, inasmuch as the carbonaceous material is in this manner concentrated in the vicinity of the surface of the steel—this being the only place where action can take place.

The following gases were used in the experiments: Illuminating gas, methane, carbon monoxide, and acetylene. The actual case-hardening experiments were carried out on samples of soft Norway iron containing only 0.08 per cent. of carbon. This iron was purchased in rods 1 centimetre in diameter, which were cut up into 6-inch lengths. A common gas-pipe was used for the case-hardening. It was heated in an ordinary combustion furnace; the temperature of 1500° Fahr. being maintained throughout the experiment. The results were as in the following table:

Gas Used.	Hours.	Hardness.	Depth of Case.	Carbon Composition.
			Mm.	Per Cent.
Illuminating—				
NH ₄ OH (a) . . .	4	Glass	1/10	0.57
NH ₄ OH (b) . . .	4	"	2/30	0.665
NH ₄ OH (c) . . .	4	"	2/30	0.915
NH ₄ OH (a) . . .	8	"	3/10	1.12
NH ₄ OH (b) . . .	8	"	3/10	1.16
NH ₄ OH (c) . . .	8	"	3/10	1.15
CO NH ₄ OH . . .	4	"	4/10	1.45
CO . . .	4	"	4/10	1.36
CH ₄ NH ₄ OH . . .	4	Little hardness	Not well defined	0.32
CH ₄ . . .	4	" "	" "	0.26
CH NH ₄ OH . . .	4	Glass	3/10	0.98
C ₂ H ₂ . . .	4	Little hardness	Not well defined	0.41

Experiments were carried out with each gas alone and mixed with a definite amount of ammonia gas. It was found that ammonia gas facilitates the case-hardening in all instances except that of carbon monoxide, which seems to act almost as well without as with ammonia. Of the three gases studied, the carbonizing ability is in the following order: Carbon monoxide, acetylene, methane. Carbon monoxide, therefore, is by far the best gas for the purpose, as no ammonia seems necessary, and it gives the best penetration in the same time.

FLICKER PHOTOMETER AND THE EYE.

In the "JOURNAL" for the 16th inst. (p. 464), an epitome was given of a paper read by Mr. J. S. Dow, B.Sc., before the Physical Society, on "The Physiological Principles underlying the Flicker Photometer." The current number of the "Chemical News" contains an abstract of the paper, followed by a report of the remarks to which it gave rise. From the latter, we extract the portions of special interest to our readers.

Dr. EDRIDGE GREEN said he was prepared to agree with the effects described by the author, though he thought that they were capable of explanation by another theory. The theory of Von Kries was relied on because the rods contained visual purple while the cones did not.

Mr. A. P. TROTTER, after referring to the doubtful value of the flicker photometer for industrial purposes, said the present investigation should be considered as a scientific one. In discussing the effect of varying the distance of the photometer from the eye, Mr. Dow was really dealing with the angle subtended or the angle of the field of view; and it would be better to use this method of

expressing the relation, for it could then be referred to definite parts of the retina. Sir William Abney and others had mapped the areas of the retina, and had found boundaries of colour perception. He considered the angles subtended at the centre of curvature of the retina, and his smallest boundary lay within about 15° from the centre, or, according to usual convention, a field of view of about 30°. The whole of Mr. Dow's present experiments fell well within this, and did not extend to the peripheral parts of the retina. For the purpose of investigating the action of the peripheral parts of the retina, a photometrical device covering a large field of view should be used, and the middle part should be blocked out.

Dr. RUSSELL suggested that possibly mechanical vibrations were set up in the rods and cones of the eye. These oscillations having probably different periods might explain some of the curious phenomena Mr. Dow had shown to the meeting. The cones in the eye did not satisfy the mathematical definition of a cone, and it would be extremely difficult to make any calculations. He was not convinced the rods were unable to perceive colour.

Mr. CLIFFORD C. PATERSON expressed his great interest in the paper, and appreciation of the experimental skill shown by the author. He wished to make some observations upon the so-called yellow-spot effect, because while being able to offer no well substantiated theory to account for the phenomena which Mr. Dow had observed, he could not altogether make the application of the rod-and-cone theory in this instance agree with the experimental facts. He did not think that, in making comparisons, the area of the retina outside the yellow spot was used to any appreciable extent. All who were in the habit of using photometers were probably conscious that if they kept the eye fixed, only a small area of the illuminated surfaces was being considered by the observer at one moment, and the sensation from the outlying area of the surface had no appreciable weight compared with that from the centre, on to which the eye was directed. He (Mr. Paterson) was inclined to believe that many of the discrepancies of photometrical comparisons were due as much to psychological as to physiological causes, even if they were not due more to the former than to the latter. He did not see why the retina should be regarded as the only faulty link in the chain. In the latter portion of the paper, in which the flicker question was discussed, the author showed the observed facts to be very well explained by the theory of the rods and cones; and he (Mr. Paterson) could congratulate him on the flicker experiment he had shown.

Mr. Dow, replying to Dr. Edridge Green's remarks, said he quite recognized that the theory of the action of the retina was a matter for physiologists to deal with. His suggestions regarding the flicker photometer were intended to bring the phenomena into line with the other well-authenticated physiological effects which the rod-and-cone theory had served to explain so completely. Mr. Trotter had offered a suggestion regarding expressing results in angles subtended at the eye, which was a good one. In leaving the results in their present form, he (Mr. Dow) had merely wished to give an idea of conditions occurring in an actual photometer. For experimental purposes, however, it was often desirable to use a larger retinal area. Mr. Trotter's proposal that the centre part of the retina should be blocked out was diametrically opposite to the view of M. Blondel, who had suggested using only the centre part of the retina, where cones only exist. As a principle in photometry, however, it seemed desirable in practice not to depart further from the condition of the eye than could be avoided. In reply to Mr. Paterson, he might say that in viewing a coloured surface he was not conscious of any want of uniformity in brightness due to retinal peculiarities. The eye seemed to weigh up the appearance as a whole, just as in the case of white light. No doubt psychological influences played some part in all these problems. However, the existence of the yellow spot and the Purkinje effects had been known for a long time, and both had been authenticated by many observers. It was only the explanation that still seemed a matter for conjecture.

The adjourned discussion on Mr. H. A. Humphrey's paper, on "An Internal Combustion Pump and Other Applications of a New Principle"—see last "JOURNAL," p. 536—will be taken at an extra meeting of the Institution of Mechanical Engineers next Friday, at 8 p.m.

We learn from the Engineering Supplement to "The Times" that an interesting example of charcoal gas-producer plant has just been completed by Grices' Gas-Engine Company, Limited, Carnoustie, for shipment to Madras. It comprises an engine developing 120 B.H.P. and charcoal plant in duplicate. The engine developed its maximum load for six hours on a fuel consumption of 1.25 lbs. of English charcoal per B.H.P. The design is intended for use in countries where little coal exists, and where charcoal is the staple fuel. The plant is designed to gasify this fuel—supplying a good clean gas to the engine without any more trouble than if good Welsh anthracite were employed. Owing to the low calorific value of charcoal, very much larger generators and feeding hoppers are required. The light nature of the fuel demands special attention in combustion; and a washing-box is employed to trap the considerable amount of dust which is drawn over with the gas from the generator. The gases then pass along to the cooler free from every particle of grit or dust. Sometimes, with imperfectly prepared charcoal, a quantity of tar remains; and to prevent the trouble this may cause in the valves of the engine, a special tar-extractor is fitted.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

A Meeting of the Association, which was largely attended, took place last Friday evening at the Cripplegate Institute, Golden Lane, E.C.—Mr. W. J. LIBERTY, the President, in the chair. The principal item on the agenda was a paper describing the system adopted by the Tottenham and Edmonton Gas Company for cleaning gas-cookers, &c., by sand-blast, particulars and illustrations of which appeared in the "JOURNAL" for May 4 last, p. 295.

Mr. W. WRIGHT, of the Tottenham and Edmonton Gas Company, was the author of the paper.

CLEANING GAS-COOKERS BY A NEW PROCESS.

Every year one sees a large increase in the output of gas-cookers. At Tottenham, there are over 19,000 in use, most of which are on hire; and naturally there are always a number of these cookers being brought in to be cleaned and overhauled. The question of how to renovate, thoroughly clean, and turn out equal to a new cooker, with little labour and at a low cost, is a most important item, and the system adopted at Tottenham with this in view is as follows.

When a complaint comes in from a consumer that the gas-cooker is out of order and wants changing, a work card is made out "See to Cooker." About a dozen of these jobs are given to a stove-fitter, who is provided with a bicycle fitted with a carrier to take his tools and spares for the cookers. By this means, about twelve stoves per day can be attended to on the consumers' premises, so saving the expense of their being brought into the stove-shops for cleaning. Should any stove be found in too dirty a condition to be put right at the consumer's house, the work card is marked "Stove to be Changed;" and eventually it is brought away, and replaced by another. As a rule, no cooker is changed unless the consumer has had it for five years in continuous use. There are, however, constantly a number of tenants who remove from one part of the district to another. The cookers left by them are disconnected and brought into the stove-shops to undergo a thorough cleaning before being sent out to another house.

As soon as the cooker arrives at the stove-cleaning shops, it is stripped of all the brass taps and wood-work. The top bars, burners, grids, &c., are put inside the oven, so that identically the same parts shall be used with it again. The stove is then pushed into a large fire-brick oven or muffle, which is capable of holding over a dozen. This chamber is heated by a producer-gas furnace up to a temperature of about 1200° Fahr. In about half or three-quarters of an hour, all the grease and dirt, &c., is absolutely burnt up to a fine dust; and should any cooker have been in a house where any infectious disease has occurred, the disease germs are by this means very effectively destroyed. The stoves are then drawn out by means of long iron hooks, and stood on one side to cool, and another batch of dirty stoves put in to be similarly roasted. When the stoves are cold enough to handle, they are ready to undergo a most novel process of cleaning. Formerly, they were scraped and brushed down by steel brushes, and a most tedious and unhealthy job it was. But now this is a thing of the past. The London Emery Works Company have installed a sand-blast plant for cleaning these cookers; and after a six months' trial, it has proved a remarkable success. The plant consists of a vertical air-compressor, an air-receiver, a sand-blast apparatus, a cleaning room containing a table on which the cooker to be cleaned is placed, a cyclone for collecting the fine sand, and an exhaustor which draws away the dust from the cleaning chamber—the whole machinery being driven by a gas-engine.

The operations of the sand-blast plant are as follows. Air is pumped by the compressor into a steel cylindrical tank, 6 ft. 6 in. high by 3 ft. 6 in. in diameter, which is fitted with a safety-valve at the top. From here the compressed air passes along a 2-inch pipe to the two-compressor apparatus, which produces the sand-blast. This apparatus is a cast-iron vessel consisting of two chambers, the top one having a $\frac{1}{8}$ -inch mesh sieve, through which the sand passes into the hopper. It has also a cone-valve, which can be opened to deliver the sand to the lower mixing chamber. At the outlet of this chamber is a regulated steel plate, having a $\frac{3}{8}$ -inch hole in the centre, through which the sand falls. A length of 2-inch special rubber hose is connected just below this plate, and at the other end of the hose is a specially hardened cast-iron nozzle, with $\frac{3}{8}$ -inch bore. A pressure-gauge is fixed on the air-supply pipe to the sand-blast apparatus. We usually work at a pressure of 1·2 atmospheres (about 18 lbs. per square inch).

The cleaning chamber consists of a match-board chamber; and this is lined with sheet-iron to prevent the wood-work from being damaged by the blast. Inside this chamber is an iron turntable 4 feet in diameter, the top of which is fitted with eight cast-iron grids, through which the used sand falls. Underneath the table is a spiral conveyor, which draws the sand to the other end of the chamber to a bucket elevator, which carries up the sand to a slide-back into the hopper of the sand-blast apparatus to be used over again. The top of the chamber is of glass, which affords a good light on the stove to be cleaned. A sliding door, containing a window through which the operator watches the progress of the blast, is in the front of the cleaning room. The dust created in the operation is drawn away by a powerful exhaustor; and most of the fine sand is collected in a sack which is fitted on the outlet of

the cyclone dust separator. The very fine dust which passes the cyclone is caught in a brick chamber, in which are a number of baffles made of cocoa-nut matting.

The new process of cleaning may be summarized as follows. The cooker, having cooled down, is put on the turntable in the cleaning chamber. The sliding door is closed, and the operator then inserts the nozzle through a slit in the rubber which is in the centre of the door. The blast is turned on, and its effects on the stove watched by the operator through the window. As soon as one side is finished, the table is turned round by a winch and another side of the stove is operated upon; and so on until the whole stove is finished, which operation takes fifteen to twenty minutes. The effect of the sand-blast on the castings is marvellous; the appearance being of a silver-grey, and much smoother than a new casting. The hot plate is then done in the same manner. The small parts—the burners, deflectors, bars, &c.—take longer to treat in bulk, as a considerable time is taken up in properly placing them on the table, as, owing to the lightness of these articles, if they are not packed properly, they are likely to be blown off the table down into the conveyor. Again, these parts are usually much more corroded and burnt, and take a longer time to completely remove the hard scale on them. The result, however, is wonderful. An old burner is brought up to a splendid pitch, equal to a brand new one. The holes of it are thoroughly scoured out; and also the inside of the tube, as well as the outside, is splendidly cleaned. It was absolutely impossible to do this with the use of steel wire brushes; the holes having to be rimed out. It was found when using steel grit that the operations were quicker, but the cost did not warrant continuance of its use.

As soon as the small parts have been sand-blasted, they are treated by the "Bower-Barff" process, which is done by placing them in an ordinary fire-clay retort 22 in. by 16 in., heated up to a temperature of about 1300° Fahr. Steam is then let in at the mouthpiece of the retort, which immediately becomes super-heated; the result being that a coating of magnetic oxide is formed on these parts. After being in this retort for half-an-hour, they are drawn out and allowed to cool. These burners, &c., are now rust-proof, and present a very pleasing appearance. They are then taken into the fitting shops quite ready to be fixed up on to the cookers. About twelve complete cookers per day are turned out in this manner, and are quite equal to, if not better than, brand new stoves.

The advantages of cookers being treated by the sand-blast plant are many. One particular item is that the breakages of small parts are now not a quarter of what they used to be. In the old-fashioned way of chipping and scraping by hand, we were always having a lot of burners, deflectors, &c., broken; but now with any casting it can be seen directly at a glance whether it is suitable to be replaced on the stove or not, without chipping so as to find this out ultimately. Another point is that there are no holes to rimer out in the boiling and oven burners; the sand-blast cleans out the holes exactly as though they had been redrilled. Again, the cooker bodies to be revarnished do not take nearly so long to do, as the surface of the casting is so smooth and perfectly clean, and less varnish is used than heretofore. The hot plates—and particularly the planed edges—can be burnished up in a quarter of the time after receiving the sand-blast by being put on the emery bobs.

It will be clearly seen from the remarks I have made that the cookers are cleaned up to perfection. This fact is borne out by many leading gas engineers who have come from all parts of the country, also America and the Continent, to see this sand-blast plant; and all who have seen the dirty cookers sand-blasted have been astonished with the results after treatment. I have no doubt that before long many other gas companies will adopt this up-to-date method of cleaning, not only gas-cookers, but all kinds of goods, such as brass main-cocks, wrought-iron fittings, and service-pipes, which can be done in a very short space of time. Already one large gas company is having a big plant installed by the firm who put up ours at Tottenham. I may add that we are having another larger chamber and turntable installed—the grids of the latter specially made to hold the smaller parts as desired. This will enable us to cope with about 25 stoves per day with two operators.

I give you a few figures comparing the cost of methods, but can add finally that appearance goes a long way, and in hiring gas-stoves it is impossible for the uninitiated to tell the difference between a new and an old sand-blasted, Bower-Barffed, properly cleaned cooker as turned out at our establishment. With regard to cost, the following table is based on ten hours' working:—

Cost by Hand Work.		Cost by Sand-Blast Plant.	
	s. d.		s. d.
Three men at 6d. per hour	15 0	Gas for engine	3 0
Two boys at 3d. per hour	5 0	One man at 6d. per hour	5 0
Steel scrapers, wipers, emery cloth, steel wire brushes	1 0	One man at 6½d. per hour	5 5
		Oil	0 3
		Cast-iron nozzles	0 4
		Sand, 2 cwt., at 6d.	1 0
			15 0
		Less sand sold, 2 cwt., at 10d.	1 8
Total	21 0	Total	13 4

It will be seen that a saving of about 7s. 6d. per day is effected by using the sand-blast process.

Discussion.

Mr. J. R. GALE (Mill Hill) asked whether all the stoves brought in had to be treated in the same way, irrespective of whether or not they were very dirty.

Mr. WRIGHT: All cookers go through the same process.

Mr. GALE (continuing) remarked that, on the question of cost, the author did not say what was the outlay in the first instance; and he did not, in his comparison, make any allowance for this. In the hand process of treatment there would not, of course, be any similar plant required.

Mr. S. A. CARPENTER (Mill Hill) thought the plant was one of the first of its kind to be used in this connection. They, however, looked to Tottenham for initiative; and it was only natural they should find one of the earliest plants there. Those who had had anything to do with the cleaning of gas-stoves, could appreciate the practical nature of the paper. It was his privilege some time ago to see the plant at Tottenham, though unfortunately it was not running; but he was much impressed with Mr. Wright's keenness, and the great interest he took in everything connected with the installation. He did not altogether follow the author's figures in the calculation he had made showing a saving of 7s. 6d. a day; and he thought if they had the cost of cleaning per stove both by the old and the new methods, it would be most useful for comparison. Of course, too, the cost of the plant, as had already been mentioned, was an important point, because with the older method a tank was practically all the apparatus required. The oven and sand-blast apparatus must require considerable outlay. He gathered that the author considered it was much more efficient than the older plan, which, he took it, was just an oven, and then the stoves were gone over with steel brushes. Did Mr. Wright find the new method quicker? He understood it was cheaper and more efficient, and supposed it would be quicker; but he would like to hear about this. There were two points that greatly struck him. With regard to the enamel linings, it had been stated, he believed, that the action of the sand-blast ruined these; so he took it that when a cooker was subjected to this cleaning process all the enamel parts would have to be renewed. An even more important point, however, to his mind, was that the sand-blast would not touch the soft grease. Most cookers had soft grease on them; and if they could not be cleaned in this condition, it seemed the process could only have a limited application. He would like to hear whether Mr. Wright had tried shot; and, if so, how it compared with sand. What little experience he himself had had in cooker cleaning, had been with the old wet process—just boiling the dirty cookers in caustic soda solution, which was most simple. He could not at the moment see any marked superiority in the method they had just had described to them over this older plan. They had to put the stove in the oven to burn off the grease; and then they had to transfer it to the sand-blast apparatus. His first impression was that under the new system they did not have to take the stove to pieces; but so far as he could gather now, this had to be done to the same extent as with the tank. They had to renew the linings; and they must take the stove to pieces to do this. And if the stove had been through the oven, he trembled to think what a job it would be to get the bolts and screws out. It was bad enough before they had been burnt. Did Mr. Wright consider that this process cleansed the cookers to the same extent as, for instance, caustic soda? There was no possibility of any grease remaining after they had been boiled; and it seemed to him that there was a chance of grease remaining in the cookers which could not be reached by the sand-blast. There was one other point. Perhaps it did not quite come under the heading of the paper; but it would be interesting to know what conditions were imposed by the Tottenham Company as to changing cookers. Would they change them when required by a consumer; and was any charge made for doing so? He made these critical remarks with considerable humility, because they knew that what Tottenham had done had been after much careful thought. No doubt Mr. Wright would deal satisfactorily with his queries; but at the same time he did not believe that the sand-blast treatment was the final word in cooker cleaning. What they needed was a method by which a stove could be cleaned in one process, without taking to pieces. It was the taking to pieces and putting together again which ran up the cost.

The PRESIDENT pointed out that the author had stated how long it took to clean a stove by the new process; and he thought it would be interesting to know how this compared with the old method. Then he noticed there was a reference to the Bower-Barff system. He himself had some experience with a Bower-Barff Company some thirty years ago; and he would much like to know whether this was the same. The concern he knew was the Bower-Barff Rustless Iron Company. Iron was treated with a solution which prevented it from ever rusting, no matter what exposure it was subjected to. Would a stove ever get rusty again after treatment by the process the author referred to?

Mr. K. SPROXTON said he did not propose to aim any criticisms at the author, because previous speakers had referred to the points most likely to arise. He had had the good fortune to see this plant under Mr. Wright's guidance; and he came away with the feeling that that gentleman knew all that there was to be known about it. When visiting the plant, he was reminded very strongly of the ancient quest of the alchemists. They used to spend their lives looking for three principal things—the philosopher's stone, the elixir of life, and a universal solvent. It was recorded that they spent many years trying to find something that

would dissolve everything; but at last someone asked the question, "If we find this solution, what vessel is to hold it?" It seemed to him that if this sand-blast plant had one drawback with its operation, it was that the blast was so powerful that it gave trouble even in the machine which produced it. No doubt, the Tottenham people had made experiments, and were gradually overcoming this perplexing problem, and would finally succeed in doing so. He felt sure that these pioneers in North London deserved the best thanks of the profession for having introduced such a powerful scourer, whose only fault was that it began its work, as it were, before it was born. It was interesting to meet the example of pre-natal energy which they had in this plant.

Mr. F. AINSWORTH (Ilford) asked how many of the cookers treated were packed, and how many were not packed; and the cost of dealing with each kind. Did the placing in the hot oven entirely remove the grease? He supposed the sand-blast was intended to clean the cookers and give them a new appearance. As to the cleaning of the taps, he did not gather that any particular method was mentioned. If the enamel linings were in good order, did they remove them before the stove was put in the oven? The question of cost was important. He remembered visiting one works, and was very pleased with the method adopted for cleaning the cookers there; but he was told that the outlay on plant was something like £2000. Of course, this was going to add to the cost of cleaning. He would like to know the cost of the sand-blast plant, &c., at Tottenham, so that they could see what had to be added to the labour and material required in the operation of cleaning. When they went in for an expensive plant, he took it that the idea was not only to obtain a good finish, but to reduce the cost of the work. They must have a good finish. There was no doubt that cleaned stoves must be turned out like new; otherwise considerable trouble would arise which should be avoided. With his Company, the rule was that a cooker should be in use six years; but, of course, discretion was used. Every place should have a limit of time for cookers to be out. Then he would like to ask whether any liquid at all was used in the cleaning operations. At one place to which he went he had been given to understand that the oven method had been tried, and then the tank plan, with soda, was reverted to.

Mr. A. L. ARNOULD remarked that he had been struck by the fact that they had to employ the two processes of first baking and then sand-blasting; and he was wondering while the paper was being read whether it would be possible (or whether such a thing had been tried), by having a steam-blast, to do the two things in one. That was to say, whether a steam-sand-blasting would take the grease off and do the cleaning at the same time.

Mr. F. W. WEDD inquired whether, when the brass taps were sand-blasted, there was any trouble from the sand getting in and interfering with the working of the plugs. Also, was there any appreciable wear in the sand-blasting process? Did it remove an appreciable thickness of metal as well as the dirt?

Mr. J. HEWETT said it appeared to him that the ring-burners were simply taken off and baked.

Mr. WRIGHT: Yes.

Mr. HEWETT (continuing) asked in what condition they emerged from the process; and also whether the sand-blast could be got right into the inside of the tubes of these burners. It was not always grease that got inside. Very often a vessel boiled over; and the gas and air way was liable to become choked up with something that mere baking would not tend to remove, but rather to harden.

Mr. A. BROADBENT said that, with reference to the effect of the sand-blast treatment on the enamel linings, it struck him that some of the stoves at present delivered in London were treated with enamelling of the castings themselves. What process would they subject these to?

Mr. WRIGHT, replying to the discussion, said the plant cost from £200 to £250; and, of course, they must allow something for depreciation, repairs, and interest on capital. This would amount to (say) 2s. 6d., which would have to be deducted from the 7s. 6d., thus leaving a saving of somewhere about 5s. a day. The material used for the sand-blast plant was sea sand, which he put at 6d. per cwt.; and when they had worked the sand up, it had a marketable value of about 10d. per cwt. so that in reality it cost them nothing. They had tried steel shot; but owing to the exhaustor being so powerful it was drawn into the exhaust pipe, and carried away. As they lost a good deal in this manner, they gave it up. The cost of the shot was about £8 per ton; so that there was a considerable difference in this respect. The stoves were not taken to pieces at all at Tottenham. Everything went inside the muffle except the wooden knob, which would be quickly burnt up, and the brass rail and taps, which went into the pickling tank. The stove remained in the oven, at a temperature of some 1200° Fahr., for about three-quarters of an hour; and by that time every particle of grease, matches, fish-bones, mice, and anything else, was absolutely burnt up to a fine dust. He would defy anyone to find even the merest speck of grease on any part of the stove, after it had been in the oven for the time he had mentioned, and was red-hot from top to bottom. They did about a dozen at a time—some packed, and some unpacked. Those with linings went in as well. As to the questions about stoves that had enamelled parts, he might say that these were placed in the pickling tank. They did not put more enamels into the oven than they could help. They had made it a rule that a stove must be in the consumer's hands for five years before they changed it; but, of course, they used a

little discretion. If a consumer demanded a fresh stove after a short period of use, a fitter on a bicycle, with the necessary appliances, visited the house; and perhaps in a very little time the stove was put right. The Company had two of these stove fitters, each with his own district.

Mr. AINSWORTH: In such a case, what is the charge, if you must change a stove?

Mr. WRIGHT said there was no charge for changing after five years; but after a shorter period, they would charge 5s. It was astonishing how many people had never heard of the Bower-Barff process. There was no patent about it. The idea was brought out by Professor Barff thirty or forty years ago; and then Mr. Bower came along, and they formed a Company. But somehow the thing went wrong. The South Metropolitan Company adopted the process; and the Engineer of his own Company was struck by it. The system was therefore tried at Tottenham, and very fine effects were obtained. A burner, bar, or grid treated by this process was absolutely rustless. They treated a sheet-iron shelf and hung it out in the yard for about eighteen months; and not a particle of rust appeared on it. There was no smell; and it was better than a lot of paint. Most of their stoves were packed; it was only the free cookers that were unpacked. As to the cost of dealing with the two, he would not like to speak off-hand. When the stoves cooled down after being red hot, grease, &c., was reduced to fine powder; and directly they went into the sand blast, this dust could be seen absolutely blown off in two or three seconds. Taps were not sand-blasted at all. They were put into the caustic soda tank to remove grease. The taps were all opened, so that the soda should run through; and then they were allowed to drain, and were polished up. The plugs were kept in the taps; they were not taken to pieces at all. The sand blast must not be applied to the enamelled parts of stoves. The cooker was always put in the chamber with the door on. They did the whole of the outside; but when the stove was turned over to sand-blast the base and legs all round, care had to be taken not to touch the enamelled parts. As to the wear on the metal, of course it would take a long time to blast a hole in a cast-iron stove. It might be done in a week, if the nozzle were kept on one spot. The cast-iron grids of the turntable it was stated would last two years; but after ten months' use they were getting very thin, through the constant application of the sand-blast. They were about an inch thick. Of course, there was a certain amount of wear; but it must be remembered that the nozzle was not kept in one place. When parts that had been treated with the Bower-Barff process came in again, all that it was necessary to do was to dip them in the caustic soda. It was not requisite to put them through the process a second time.

Mr. WRIGHT then exhibited a series of about eighty lantern slides illustrating parts of the Tottenham Gas-Works, different makes of gas cookers, fires, geysers, meters, governors, examples of high-pressure lighting, personal photographs, &c.

Mr. SPROXTON subsequently proposed a hearty vote of thanks to Mr. Wright for his paper and the pictures he had shown.

Mr. E. SCEARS (Hampton Wick) seconded; and remarked that they would look forward with great interest to seeing the apparatus that had been described when they visited Tottenham. He did not gather that there would be very great economy in the introduction of this process, except in the case of a large company.

Mr. L. F. TOOTH, in supporting the vote, said it seemed to him that the question as to whether the process was good, bad, or indifferent could only be determined by time—for this reason: Baking a stove must naturally deteriorate it more quickly than the old method of boiling; and then, as had been said, the sand-blast also deteriorated the cooker. The point that time would have to settle was whether the saving in the cost of cleaning would more than cover the extra amount of depreciation. Everyone in the gas industry who had any dealings with cookers was watching carefully to see what the result would be.

The resolution was heartily carried.

Mr. WRIGHT, in acknowledgment, said the sand-blast plant was not at the gas-works, which the members were to visit next Saturday (Dec. 4); but Mr. A. E. Broadberry, the Engineer, had said that if any of them cared to go to No. 639, High Road, Tottenham, between 2 and 2.30 that afternoon (before going to the gas-works), they should see the apparatus at work.

The PRESIDENT, in closing the meeting, said that quite recently 20 new members had joined the Association; and he wished if possible to signalize his second year of office by bringing the total membership up to 200. This meant 60 more recruits; and he appealed specially to those gas-works outside the Metropolis which the Association had not yet touched at all, and where there was much scope for obtaining members. Many of the seniors had expressed the hope that their juniors would join the Association; and in view of this, he intended to enter on a little campaign. That night they had two new members present from as far away as Reading.

In the House of Commons on the 16th of June last, returns were ordered to be prepared relating to all the authorized gas undertakings in the United Kingdom—in the case of the Companies, for the year ended Dec. 31, 1908, and in that of the Local Authorities for the year ended the 31st of March last—in continuation of previous Parliamentary Papers. The returns have now been presented, and ordered to be printed.

EFFECT OF OXYGEN IN COAL.

In a bulletin by Mr. David White, published by the United States Geological Survey, giving the results of a comparative study of ultimate coal analysis, the author maintains that the elimination of oxygen in the preparation of coal for fuel is economically far more important than has been generally suspected, and that the oxygen is very nearly as harmful as ash. The conclusions drawn from this comparative study are summed up in "Engineering Record" as follows.

Coals with high oxygen and low ash will, in general, have very nearly the same efficiency in the calorimeter as other coals with alternated percentages, low oxygen and high ash, if the total carbon is the same. This applies to both air-dried and moisture-free coals. Oxygen and ash are of very nearly equal anti-calorific or negative value; ash being probably slightly more injurious in most coals. The negative value of the oxygen of moisture is not far different from that of the oxygen combined in the coal.

The calorific value of coals in general is essentially indicated by the balance between the total carbon on the one hand and the sum of the two great impurities, oxygen and ash, on the other; the hydrogen, nitrogen, and sulphur being usually negligible as constants. Except in the presence of unusual variations of hydrogen or sulphur, the efficiencies of the coals, if ash be constant, rank nearly in the order of the ratio of carbon to oxygen, which in each kind of coals marks the progress of coal formation under dynamo-chemical influences. Oxygen and ash being of approximately equal anti-calorific potency, the efficiency of the coals conforms fairly closely to the order of the ratio of carbon to oxygen *plus* ash; so that among coals of all kinds those having the same ratios have about the same efficiency.

A miscellaneous series of coals of all kinds, ages, and regions, when plotted according to the carbon to oxygen *plus* ash ratios and calorific values as components, describes a curve to which they conform very closely; the average variation being less than 1 per cent. of the calorific value. The greatest variations are among weathered coals—those having 79 per cent. or more of fixed carbon in pure coal (that is, those undergoing anthracitization)—and the boghead cannel group, in which the hydrogen is excessively high, so that the efficiencies describe a higher curve, characteristic of the group.

The departures from the radio-efficiency curve, on account of unusually high or low available hydrogen, are generally not large. High sulphur is usually attended and compensated by high hydrogen; the converse being true to a less extent. Unusually high sulphur acts, on the whole, as a diluent; while very low sulphur leaves the relative field to the heat-determining elements. Consequently, the variations from the curve on account of the neglected constants—hydrogen, sulphur, and nitrogen—are rarely more than 2 per cent., unless in the exceptions noted in the preceding paragraph.

Types of coals are initially determined by the nature of the ingredient matter, the conditions of deposition, and the extent of operation of the first or biochemical process in coal making; but progressive devolatilization, lithification, cleavage, and other accompanying alterations, result from the second or dynamo-chemical stage of coal formation, which in each kind removes the essential distinctions of age or region, even tending ultimately to obliterate the differences in kind. Consequently, any classification of coals based on the present form of ultimate analysis must be arbitrarily defined. There is intergradation in all parts of the process of coal conversion and coal alteration, as well as in the ingredient matter and conditions of deposition.

The weathering of the lower grades of coal, especially the lignites, bituminous coals, and peats, is marked by accession of oxygen, which is taken into combination. This increase of the oxygen content, which seems to indicate lack of equilibrium in the hydrocarbon compounds of the normal coal, readily permits a calorific deficiency, which, on account of the high anti-calorific value of oxygen, is often serious. It is possible that in many cases considerable increase of oxygen and consequent loss of efficiency are suffered by lower-class fuels between their removal from the bed and their deposit in the grate or the chemical crucible.

The adaptability of a coal to coking by the ordinary process appears to be indicated with a fair degree of certainty by the ratio of the hydrogen to the oxygen moisture-free basis. Practically all coals with hydrogen-oxygen ratios of 59 per cent. or over seem to possess the quality of fusion and swelling necessary to good coking. Most coals with ratios down to 55 per cent. will make coke of some kind; while a few coals with ratios as low as 50 per cent. will make coke in beehive ovens, though rarely producing a good article. The coking property seems to depend not so much on the amount of available hydrogen as on the relative amount of the hydrogen as compared to that of the oxygen. In coals undergoing change to anthracite, the hydrogen-oxygen ratio may fail as a guide. The failures appear, however, to be readily distinguished by the marked calorific deficiencies shown by the carbon to oxygen *plus* ash ratio and efficiency curve.

The data examined, though insufficient to serve as a basis for a conclusion, seem to point towards the need of a relatively high carbon element in the remaining volatile combustible of coals with 79 per cent. or more of fixed carbon (pure coal), in order to secure either the best coking results or the calorific efficiency indicated by the carbon to oxygen *plus* ash ratio-efficiency curve.

REGISTER OF PATENTS.

Purification of Gas.

CHANDLER, S., of Brixton Hill, S.W.

No. 27,841; Dec. 22, 1908.

This gas-washing device is fully described and illustrated in earlier columns of to-day's issue, p. 594.

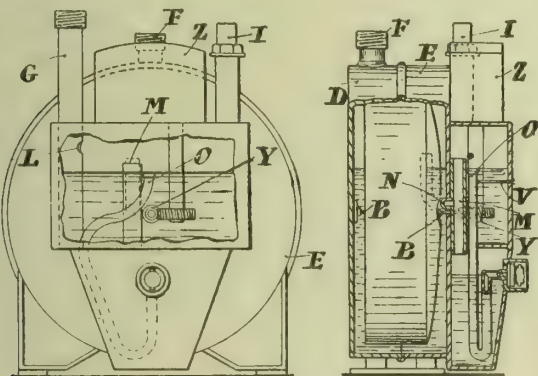
Gas-Meters.

KOZMINSKI, S., of Charlottenburg, near Berlin.

No. 4262; Feb. 20, 1909.

This invention relates to wet gas-meters in which light mineral oil—of the nature of solar oil, spindle oil, and the like—is employed as the sealing liquid. The light, non-freezing mineral oil, free from paraffin, which is employed is on the dividing line between petroleum and the light lubricating oil distillate—namely, oil of the viscosity (according to Engler) of 1.2 to 2 at 20° C. Such light mineral oils, the patentee points out, do not freeze at the lowest temperatures which occur in practice, and are such thin liquids that the gas pressure is not diminished to a greater extent by the motion of the drum than in the case of other liquids. The oils, too, are not changed by the gas, either physically or chemically; and they do not attack the gas in any manner. They neither dry up nor do they contain acids; they do not resinify, nor can they become rancid, which is the case with vegetable oils. Also they do not attack the materials of the case and drum, so that these metal parts may be made much lighter and thinner than heretofore. Of special importance, however, is the property these oils possess, in that they do not evaporate at all, nor do they diminish in volume. After gas has passed through for a very short time, the volume of the oil becomes perfectly constant, so that no physical or chemical changes at all take place in the oils when the gas is continued to be passed through them. This state of equilibrium occurs in spindle oil (for example) after it has absorbed 2.3 to 2.7 per cent. by weight of illuminating gas; and in the case of solar oil, after it has absorbed 1.7 to 2 per cent. by weight. As soon as these small quantities are absorbed by the oil the state of equilibrium occurs, and then "measurements are obtained of an accuracy which has never been obtained heretofore, and almost all supervision or refilling of the sealing liquid is done away with."

On account of the property of the liquid, that it does not vary in volume during a long period, it is also possible to do away with the floating valve employed in wet meters heretofore, "which only serves the purpose of limiting the fall in level of the liquid up to a certain point."



Kozminski's Gas-Meter.

The drum shown is of the usual construction, except that the metal is less than 0.35 mm. thick, "which is possible owing to the exceedingly small dimensions of the drum, both in diameter and in breadth." Owing to this light weight, a thin, steel needle B suffices as an axle, and makes the running of the drum very light. The axle is provided inside the front box with a worm Y, which imparts the motion of the drum by worm wheel to the counting mechanism enclosed in the box Z. The drum is enclosed in a case consisting of two halves D and E, which are divided by a joint running around the exterior of the case and connected by a narrow roll-shaped ring. In consequence of the small breadth of the drum, the outer case can be made correspondingly narrow; but in order to be able to employ the meter for pipe-line connections with the standard distance between the connecting sockets, the inlet pipe G is not located (as customary) at the rear of the front box, but is placed at the front end of it. The second pipe connection F—i.e., the gas delivery pipe—is arranged at the rear of the case. The case is filled by the inlet closed by the screw I (which may be removed only by a special key) with the thin liquid mineral oil already referred to.

In the example shown, there is no floating valve. The gas enters through G, passes through the hole L in the front box, without passing a floating valve, into the gas-pipe M, whence it passes through the bent pipe N into the interior of the drum.

In order to avoid some of the sealing liquid flowing away through the gas-supply pipe M when the pressure fluctuates on the main stop-cock being opened and closed, a special relatively narrow liquid level adjusting pipe O is arranged, so that when the level fluctuates only the small quantity of liquid which this pipe can still hold enters the pipe. At the same time the pipe M is so arranged that its mouth is somewhat higher than the pipe O, so that the fluctuations in level of the liquid cannot reach the pipe M. The bottom end of this pipe is connected with the vessel P for receiving any overflow liquid.

Before the meter is started working, it may be adjusted by a wire V

soldered to the pipe O and passing through a hole in the wall of the front box, so that when it is moved it moves the flexible tube O. When the adjustment is finished, the wire is soldered to the wall of the box and the hole in same is closed.

Incandescent Gas-Mantles.

RHENANIA GLUHLICHT COMPAGNIE (G.m.b.H.), of Cologne.

No. 5010; March 1, 1909. Date claimed under International Convention, Feb. 6, 1909.

This invention relates to soft incandescent mantles, which it has been proposed previously to secure to the ring supporting them by a string drawn through the upper meshes of the mantle and tightened in the groove of the ring intended to receive the string, and the ends then tied into a knot. To secure mantles to rings of various diameters and of various shapes without any binding or tying, the patentees propose to provide at the open end of the mantle an extensible closed securing ring—preferably consisting of a smooth extensible cord of rubber, metal, or other suitable material, surrounded with asbestos or some other refractory material. The ring may be corrugated, spiral, or of plain formation; and, in using the mantle, it is pushed over the supporting ring until the elastic ring engages with the groove of the supporting ring. Thus any special binding or tying is avoided.

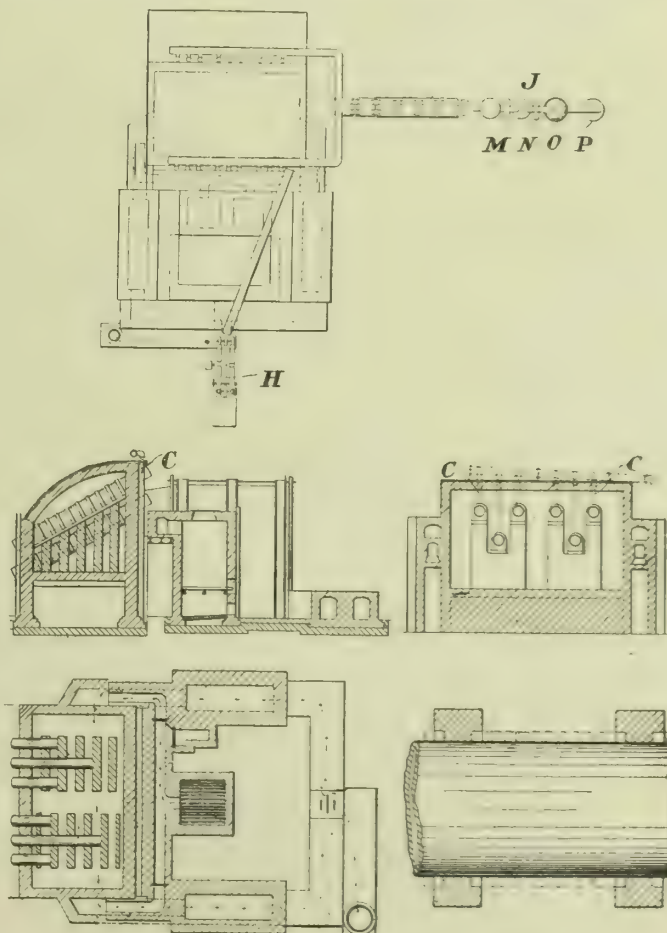
Treating Fuel and Recovering Bye-Products.

MOORE, W. G., of Birmingham, and CROMBIE, W. A. E., of Forest Hill, S.E.

No. 6966; Sept. 30, 1909.

This invention has for its object "to extract and reclaim more of the volatile matter from the fuel than hitherto possible, and at the same time to leave in the retorts carbon of a high degree of purity."

In apparatus of the class to which the invention relates, it has been previously proposed to cause the gases, after issuing from the retort, to traverse a condenser before entering the pump; but by the present invention the contents of the retort are subjected to the influence of a practically complete vacuum (as referred to in Simpson's patent No. 7732, of 1906). After issuing from the pump, the gases may be passed to a compressor and subsequently treated for the "reclamation" of an additional quantity of benzol. The retorts employed have "a new form of sectionally assembled refractory covering, according to which new form the sections of fire-brick, fire-clay, or other material are retained and adapted to entirely encase the metal retort."



Moore and Crombie's Fuel Distillation Plant.

The diagrammatic plan of the plant is accompanied by a sectional elevation of the retort chamber and regenerators, a sectional plan and elevation, and an enlarged view of the rebated blocks hereafter described.

It is proposed to erect a retort-chamber of suitable dimensions for the size and number of retorts required. The retorts may be taper, parallel, or any appropriate shape, and made from any suitable material, but preferably round, and from mild steel or wrought iron. They are provided externally with fire-bricks or rebated blocks with recesses to accommodate an "advantageously perforated covering," whereby the metal pipes are protected from oxidation and the dele-

terious effect of direct contact with the flame. The retorts may be placed horizontal or otherwise, but preferably at an angle of, or above, 40°. To allow the gases to pass unimpeded through the retorts, perforated tubes are placed in them; while each end of the retorts is formed by rebated blocks, and preferably the top ends of the retorts or perforated tubes (when incorporated) are connected with pipes coupled to a nearly horizontal main pipe for conveying the crude gas and by-products to the condensing and collecting portion of the plant. The retort-chamber is advantageously heated by producer gas and re-generated air.

The fuel is preferably charged into the retorts as follows: An elevator H raises the fuel up to a suitable height, and a swing adjustable shoot conveys it from the elevator into the retorts, where the fuel is so heated as to give out its volatile matter; and these gases are conveyed by pipes and treated as described below, while, by the practically complete vacuum of (say) 25 inches, for drawing the gases from the retort and aspirating them from it immediately they are evolved and before they are broken up into permanent gases, it is found that the "volatile matter is more easily split up into elements which are treated chemically with greater facility than heretofore by reason of their not having been subjected to an excessive temperature in the retort."

The gaseous or liquid products pass from the retorts to the vacuum pump J through a series of condensers—first air-cooled then water-cooled—each connected with catch-pots by which the more condensible vapours are fractionally separated, and the tar and heavier liquors are prevented from passing through the pump. A supplementary condenser may be provided through which the fluids pass before proceeding to the pump.

The pump then discharges the remaining gases and liquids at about the surrounding temperature into a receiver M, and the remaining vapours and gas are then greatly reduced in temperature to condense out as much as possible of the benzol and other vapours. These may be collected in a catch-pot, and the gases passing thence are utilized or stored. If desired, the gases, after discharge from the pump J, may be passed to a compressor N, and thence allowed to traverse a coil O and impinge upon perforated plates fixed in a metal box P for the purpose of obtaining an additional quantity of benzol. The gases may then be conveyed to a storage vessel, or utilized for combustion in the retort-chamber and other purposes.

When the distillation is complete, the connecting pipes are closed; the retort is opened up and discharged; and the carbon is immediately cooled by water or lime water, or is taken off hot and used as fuel at once or converted by heat and suitable treatment into other forms of carbon.

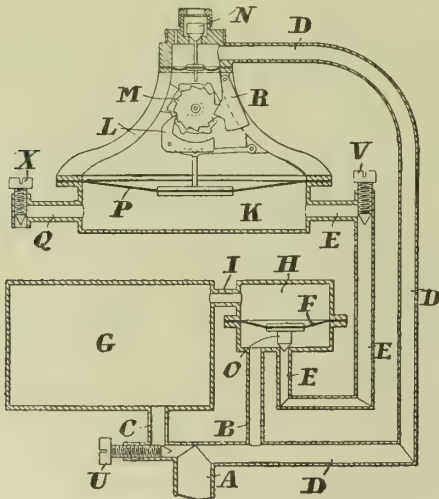
Controlling Gas-Burners from a Distance.

ROSSBACH-ROUSSET, F., of Tempelhof, near Berlin.

No. 8855; April 14, 1909. Date claimed under International Convention, May 26, 1908.

This invention relates to apparatus for controlling from a distance the valves of gas-burners—particularly lighting burners of the type wherein a temporary increase of pressure causes a yielding member to admit gas to the burner.

The auxiliary pressure member employed is in the form of a diaphragm, and is normally exposed to equal gas pressure on both sides. The auxiliary diaphragm carries a valve, which is opened when the pressure of gas is increased in the mains, but closes again as soon as the pressure has been balanced on both sides. The apparatus, it is said, overcomes the disadvantages experienced in previous constructions, since no liquid is employed and the auxiliary pressure member is exposed to an equal pressure of gas on both sides; "whereas the floats hitherto used have either normally been exposed to different pressures or to the pressure of the atmosphere on either side."



Rossbach-Rousset's Gas-Burner Controller.

In the arrangement of the apparatus for use with upright burners, the gas passes by the pipe A, through the pipe B, to the under-surface of the auxiliary diaphragm F. At the same time it flows through the throttle U by the pipe C into a gas-collecting chamber G, and thence, by the pipe I, into the space H above the auxiliary diaphragm. The gas further passes unimpeded through the pipe D to the burner-valve N. Moreover, when the valve O, controlled by the auxiliary diaphragm, is opened, gas passes through the throttle V by the pipe E to the under-surface of the main diaphragm P, the upper surface of which is open to the atmosphere. After entering the casing K of the main diaphragm, the gas escapes through the outlet pipe Q controlled by a throttle X,

which only permits the gas to escape very gradually into the atmosphere.

Under normal day or evening pressures (when any appreciable fluctuations take place gradually), there is the same pressure both above and below the auxiliary diaphragm. It is, therefore, depressed by its weight and presses the valve O against its seat, whereby the admission of gas to the working diaphragm P is shut off. This main diaphragm is therefore in its lowest position, as both above and below it there is the pressure of the atmosphere, since the casing K is in communication with the atmosphere by the pipe Q. When the various parts occupy these positions, the valve-actuating mechanism is ready to open the valve.

When the valve is to be opened, the pressure in the mains is raised as quickly as possible to an extent corresponding to the load on the auxiliary diaphragm F. This increase of the pressure is at once transmitted to the under-surface of the auxiliary diaphragm, and raises it, because the short time is insufficient for the transmission of the increase of pressure to the space H above the diaphragm, owing to the narrow pipes C, I, and (more particularly) the gas-collecting chamber G. The length of time required for equalizing the pressure on both sides of the auxiliary diaphragm is varied by the adjustable throttle U in the pipe C.

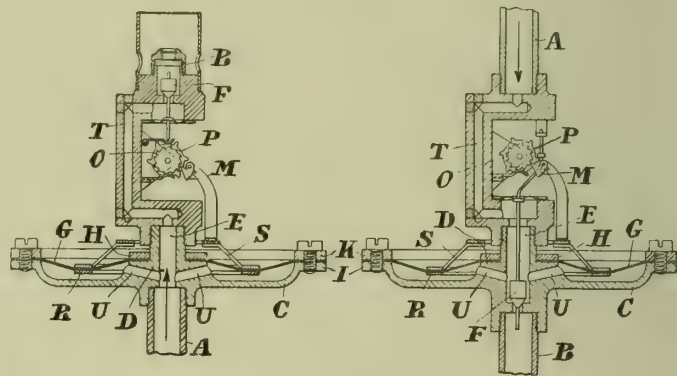
The raising of the auxiliary diaphragm opens the valve O. Gas passes then to the under-surface of the main diaphragm P more quickly than it can escape into the atmosphere, owing to the throttle X in the pipe Q, but only as quickly as is permitted by the position of the throttle V in the pipe E. The main diaphragm P is slowly raised, and effects (by means of the mechanism M, L, R) the movement of the gas-valve N; so that the latter is either opened or closed. After the pressures above and below the diaphragm F have become equalized, the main diaphragm P sinks again as the valve O closes the gas supply, and the gas escapes from the casing K through the branch Q. Both the diaphragms F and P are again exposed to equal pressure on both sides; and the valve is again ready for the next movement imparted to it.

Controlling from a Distance the Valves of Gas-Burners.

ROSSBACH-ROUSSET, F., of Tempelhof, near Berlin.

No. 8856; April 14, 1909. Date claimed under International Convention, April 16, 1908.

This invention relates to apparatus for controlling from a distance the valves of gas-burners of the type wherein, on a temporary increase in the pressure taking place, a diaphragm is moved so that ratchet mechanism is actuated to open or close the valve supplying gas to the burner. For this purpose, gas must be supplied both to the burner-valve and also to a chamber below the diaphragm on which the valve-operating mechanism is carried.



Rossbach-Rousset's Gas-Burner Valve Controller.

The illustration shows a longitudinal section through the device for incandescent gas-burners having upright mantles (the ratchet mechanism being outside the gas-chamber); also a corresponding view of the device adapted for inverted burners. The ratchet mechanism may in both cases be fitted in the gas-chamber.

In both constructions a cup-like casing C is secured to the inlet gas supply pipe A or B respectively. It is provided in its centre with a branch D, the longitudinal bore E of which is in open communication with the pipe A. Further, the conduit can be connected to the burner-pipe B by the gas-supply valve F. The diaphragm G, which, on the pressure being changed, actuates the gas-valve F, is of annular shape, and secured at its inner circumference to the branch D, in which it is, for instance, fixed between the branch and an annular disc H secured to it. At its outer circumference, the diaphragm G is preferably secured between the flange I of the casing C and a cover or ring K secured to the latter.

The movements of the diaphragm are transmitted by ratchet mechanism M, O, P to the gas-valve F. To that end, in the centre between the edges of the diaphragm, a narrow ring R is secured, provided with a bracket S on which is mounted the pawl M of the ratchet. The ring also is used for carrying the weights (not shown) required for adjusting the device.

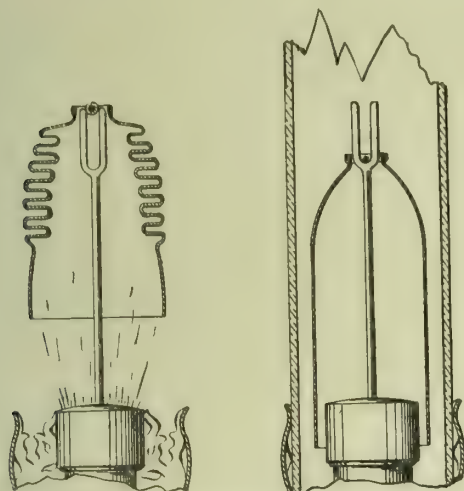
In the constructions shown (wherein the ratchet mechanism is arranged outside the gas-chamber), it is necessary to connect the gas-supply pipe A to the burner-pipe B by means of a pipe T, which is, according to this invention, disposed inside the casing surrounding the gas-valve F, the ratchet mechanism M, O, P, and the diaphragm G; so that any formation of naphthalene in the pipe or freezing are avoided. The gas passes through the bore E of the branch D and the pipe T to the valve F, and also through the conduits U, branching off from the bore E, under the diaphragm G; so that when the pressure changes, the valve F is either opened or closed.

Incandescent Gas Lighting Bodies.

WEICKERT, M., of Plauen, Saxony.

No. 10,745; May 6, 1909.

Patent No. 2572 of 1908 described a "method of burning-off unshellaced and uncalcined incandescence mantles on the burner, by means of an elongated fork, so as to afford to the asbestos eye of the mantle the freedom of motion which is necessary for obtaining a sufficiently long mantle, in view of the shrinkage caused by the calcination." It has been found, however, that, after the burning of the mantle, the lower part of the incandescence body obtained by the calcination of the mantle is not sufficiently hardened, and, consequently, is liable to break during the motion of the lamp, or through other mechanical shocks. The present invention has for its object to avoid these defects.



Weickert's Incandescent Mantle.

For this purpose, the asbestos eye of the mantle is enclosed in a sleeve of aluminium—preferably in the shape of a coil—which melts only in the heat of the flame, after the lamp cylinder has been mounted in its place. The width of the coil is such that it will be held fast in the upper end of the fork. Moreover, the mantle is considerably shortened before being mounted on the burner, by the formation of zig-zag folds in the fabric, similar to those of a concertina.

The illustration shows the folded mantle mounted on the burner before being incinerated or burnt; and the same mantle after incineration.

APPLICATIONS FOR LETTERS PATENT.

- 26,425.—HIBBERD, C. E., "Gas-meters." Nov. 15.
 26,428.—JONES, A. O., "Treatment of gases from coke-ovens or gas-retorts." Nov. 15.
 26,432.—PUDNEY, F., and SADLER, F., "Mantles." Nov. 15.
 26,459.—WHITE, M., "Gas-generating apparatus." Nov. 15.
 26,513.—GILLIE, W. S., "Pressure-raising apparatus for air or gas." Nov. 16.
 26,545.—TIERNAN, J., and GOLDBERG, A., "Collar and special pipe-end for making a faucet joint on gas, water, or other pipes." Nov. 16.
 26,561.—SMITH, W. P., "Incandescent burner." Nov. 16.
 26,624.—ROBILLOT, L., "Automatically actuating an alarm signal in cases of escape of gas." Nov. 16.
 26,640.—MIDDLETON, S. H., "Gas taps or cocks." Nov. 17.
 26,660.—HALLIWELL, F., and R. & J. DEMPSTER, LTD., "Tanks for gasholders." Nov. 17.
 26,702.—HANZER, C. & P., "Lighting and extinguishing burners." Nov. 17.
 26,719.—WILLIAMS, J., "Carburetted air." Nov. 17.
 26,737.—CALLOWAY, E., "Taps or cocks." Nov. 17.
 26,749.—SOUTHEY, A. W., "Generation of gas." Nov. 18.
 26,797.—LAWRANCE, W., "Incandescent burners." Nov. 18.
 26,843.—ANDERSON, D., "Lamps." Nov. 18.
 26,858.—STEWART, J. & W., "Gas-producers." Nov. 19.
 26,859.—BOYS, C. V., "Pumping water." Nov. 19.
 26,873.—STEVENSON, A. H., "Mantle boxes." Nov. 19.
 26,942.—PEARSON, J., "Attachment to money-box for prepayment meters." Nov. 19.
 26,964.—DEMPSTER, R., and SONS, LTD., and TOOGOOD, H. J., "Gas-holders." Nov. 20.
 26,990.—TWIGG, W. W., and MOORE, G., "Gas-taps." Nov. 20.
 26,993.—CROSSLEY, K. I., and RIGBY, T., "Internal-combustion engines." Nov. 20.

Rochdale Corporation Gas Workers' Wages.—At their meeting last Wednesday, the Gas and Electricity Committee of the Rochdale Corporation had again under consideration the application of various classes of employees at the gas-works for an increase in wages. Some time ago, the Works Sub-Committee recommended that the wages of the labourers be advanced 1s. 6d. per week, this to include holiday pay, and that certain others be granted an increase of 1s. and 2s. per week, according to the character of work done by them; but that no advance be conceded to the stokers and meter inspectors. These recommendations were referred back by the General Committee. Having reconsidered the matter, the Sub-Committee now recommended that a Joint Committee, representative of the various Committees employing labourers, be appointed to go into the whole subject, with a view to securing a uniformity of policy. After a long discussion, the General Committee last Wednesday, by eight votes to six, approved the suggestion of the Sub-Committee for the appointment of a Joint Committee, and rejected an amendment to the effect that the gas-works labourers be granted an immediate advance to 25s. weekly.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Proper Allowance for Depreciation of Gas Plant for Income-Tax Purposes.

SIR,—I have read Mr. William Cash's letter, published in your last issue, with very great interest, having constantly to deal with the public companies principally concerned, for poor-rate purposes.

In my judgment, the circular issued by the Board of Inland Revenue condemns itself by meting out different treatment to gas companies and electric light undertakings, thus:

GAS AND WATER UNDERTAKINGS.

18. No depreciation should be allowed in any circumstances in respect of any portion of these undertakings.

19. All expenditure on repairs and renewals, but excluding extensions and improvements, is to be charged and allowed as working expenses, as and when incurred.

ELECTRIC LIGHTING UNDERTAKINGS.

Cables.

21. In addition to repairs, allowance for depreciation may be granted at the rate of 3 per cent. per annum on the written-down value.

Plant and Machinery.

22. On all other plant, exclusive of loose tools, meters, and office furniture, depreciation may be allowed at the rate of 5 per cent. per annum on the written-down value, in addition to the cost of repairs.

I cannot find any justification for this difference of treatment, which is, of course, aggravated by the fact that gas companies and electric light undertakings are trade competitors.

If it is urged that electric lighting undertakings are much younger than gas-works, and that therefore their renewals have not reached the average level, I reply that the same remark applies to the particular portions of the gas companies' undertakings as to which Mr. Cash so strongly argues that an allowance should be made for depreciation. Everybody connected with gas companies knows that the supply of stoves, slot-meters, and fittings, has been undertaken by the gas companies within the life of electric lighting undertakings, and that not only do they require a depreciation allowance because they have not reached the normal expenditure, but there is the additional point to be considered that the supply of these articles has been in the nature of an experiment.

It seems to me also that the fact that slot-meters and stoves can now be bought at considerably lower prices than those ruling originally, has a bearing on the case. If the companies are only to be allowed the actual cost of renewals as they arise, they will have lost the difference between the original cost of the articles and what they can now be purchased for.

In my opinion, however, the gas companies' strongest point is that there is no reason for allowing electric lighting undertakings depreciation in addition to repairs, which does not equally apply to a considerable portion of the gas companies' plant.

A. L. RYDE.

49/50, Parliament Street, S.W., Nov. 26, 1909.

Fatality in Islington.—Last Saturday morning, three little girls, the daughters of a man named Turner, who with his family occupied the basement of a house in Stonefield Street, Barnsbury, were poisoned, as is supposed, by inhaling coal gas. It appears that after breakfast both parents left the house—the man in search of a job, the woman to do a day's work—the three girls remaining in bed in the front room of the basement, apparently safe. Later in the morning, it is stated, other occupants of the house, as well as of the one adjoining, detected a strong smell of gas, and messages were dispatched to the Gas Company requesting that they would send men to look into the matter. About twelve o'clock, a little girl, daughter of an upstairs resident, passed down the area steps, and afterwards, it is said, spoke to her mother about the strange appearance of the little girls below. This led to an investigation of the lower rooms, which resulted in the discovery of the three children in what appeared to be an unconscious condition. Medical men and the police were at once summoned; but it was found that the two younger children were dead. There were some signs of life in the eldest, and every endeavour was made to save the child; but she shortly afterwards died.

Exmouth Water Scheme.—The opponents of the scheme proposed by the Exmouth District Council for augmenting the water supply of the town are not losing any opportunity of putting forward their case. Last Tuesday they called a public meeting at which the arguments against the present proposals were stated once more by the members of the Council who have voted against them. The Rev. O. J. Reichel, who has led the opposition, contended that the Dotton scheme would cost £40,000, and that this sum, added to the existing debt, would be a serious burden for Exmouth. Mr. J. Carter urged that other means should be taken to provide a supply of water; and he advocated boring operations near the present filter-beds. Though this was prohibited by the Council's Acts of Parliament, he was quite of opinion that the Lord of the Manor would not take action to prevent the Council obtaining water from this place. Several other members of the Council and ratepayers spoke against the Dotton scheme. An amendment was proposed in favour of this proposal; and it was supported by the argument that a large sum of money has been spent upon the scheme, and that if it were again defeated heavy expenditure would fall on the town without contributing to the solution of the difficulty respecting the water supply. This, however, found practically no support; and a resolution calling upon the Council to drop the Dotton scheme was carried.

PARLIAMENTARY INTELLIGENCE.

NOTICES GIVEN FOR BILLS (SESSION 1910) RELATING TO GAS, ELECTRICITY, AND WATER SUPPLY.

Abertillery and District Water Board.—Authority will be sought for the constitution and incorporation of a Joint Water Board, with power to construct an impounding reservoir, aqueducts, and other works in the counties of Brecknock and Monmouth. The existing works of the Abertillery, Abercarn, and Risca Urban District Councils are to be vested in the proposed Board; but power is sought to enable the Risca Council, in the event of their not joining in the promotion of the Bill, to become a constituent authority. The limits of supply will be defined in the Bill, which will contain the usual water provisions, as well as others relating to the creation of stock and the borrowing of money.

Ammanford Gas.—Application will be made by the Ammanford Gas Company for an extension of their limits of supply as defined in the Act of the present session, so as to include the whole or parts of the parishes of Llanedy and Bettws, in the county of Carmarthen; and also for authority to enter into an agreement with the Great Western Railway Company for the construction of a siding at Tiryddail, and to purchase lands at this place and in the parish of Llandeibie and erect gas-works thereon. Provision will be made in the Bill that the purchase price or award to be paid for the undertaking of the Amman Valley Gas Company, Limited, may be paid by debentures, preference shares, or other securities of the Ammanford Company; and the latter Company wish to be empowered to take proceedings to ascertain the validity of the debentures of the Amman Valley Company, and to declare invalid all debentures or shares issued without payment in money—the expenses to be deducted from the purchase price of the undertaking.

Bishop's Stortford, Harlow, and Epping Gas and Electricity.—Authority will be sought for the amalgamation of the Bishop's Stortford, Harlow and Sawbridgeworth, and Epping Gas Companies, for the vesting in the Company so constituted of the undertakings of the Ogar, Newport (Essex), and Much Hadham Gas Companies, and for the purchase of the undertaking of the Dunmow Gas Company, Limited. The capital is to be defined and increased. Power will be required to supply gas and electricity, maintain and extend gas-works and erect generating stations, deal in gas and electric stoves, &c. The Bill will contain the usual provisions incidental to the manufacture and supply of gas and electricity, the pressure and testing of gas, and the regulation of pipes and fittings.

Bradford Corporation.—A General Bill to be promoted by the Bradford Corporation will contain a clause empowering them to purchase by agreement the private gas-works belonging to the Trustees of the late Sir Henry William Ripley. The Corporation will also seek authority to hold certain lands for the purposes of their water undertaking, or for protecting from fouling and pollution, the waters they are empowered to appropriate. It is proposed to define the expression "domestic purposes," and make various provisions as to the supply of water. Additional borrowing powers are required.

Brighton and Hove Gas.—In a Bill for which notice has been given by the Brighton and Hove Gas Company, provision will be made with reference to the use and disposal of certain lands; the issue of authorized capital, and the reduction of capital; the holding of the half-yearly meetings; dealing in stoves, machinery, and appliances; the exemption of fittings, &c., from distress; and the inspection and regulation of pipes and fittings. The Company wish for authority to make further provisions in regard to the pressure and quality of gas and the method and place of testing it.

Bristol Gas.—The Bristol Gas Company will apply for authority to raise additional capital, create a special purposes fund, redeem the existing debenture stock, and issue new stock of this character in substitution. The Company wish to be relieved from penalties for sulphur impurities. The Bill will alter the prescribed illuminating power of the gas, fix a uniform power for the whole undertaking, make new provisions with respect to the apparatus for, and mode of, testing, and define the conditions under which the Company are to be liable to penalties for deficiency. The Company will ask to be enabled, where pipes or fittings are calculated to allow of the escape of gas, or meters are liable to become incapable of registering correctly, to require the consumers to alter the position of their meters or to provide new ones, and in default of compliance with such requirements to cut off the supply and recover the expenses with any other moneys due from the consumer. Among the other provisions of the Bill will be one to the effect that fixed engines, &c., are to remain the property of the Company, and others dealing with the qualification of Directors, the appointment of a Managing-Director, and the mode of fixing the salary of the Secretary.

Cambridge Water.—Application will be made by the Cambridge University and Town Water Company to be empowered to sterilize or otherwise treat the water supplied by them, and construct additional works, comprising two wells and pumping-stations in the parish of Fulbourn, another in the parish of Cherryhinton, a reservoir in that parish, and two adits and two pipe-lines in connection therewith. Confirmation will be sought for the purchase of the lands and premises now belonging to the Company; and authority will be asked to increase, alter, and impose additional rates. Further capital and borrowing powers will be required.

Chipping Norton Gas and Electricity.—The sanction of Parliament will be sought for the incorporation of a company for the supply of gas and electricity in the borough of Chipping Norton and the parishes of Over Norton and Great Rollright. It is proposed to purchase, by compulsion or agreement, so much of the undertakings of the Mid-Oxfordshire Gas Company and the Chipping Norton and District Electric Light and Power Company as is situated in the borough or is connected therewith. The proposed company will ask for authority to erect and maintain gas-works and an electricity generating station on certain lands defined, levy and recover rates and charges, and make agreements with local authorities,

Clevedon Water.—The Urban District Council of Clevedon will apply for authority to purchase, by compulsion or agreement, the undertaking of the Clevedon Water Company, maintain and continue the existing works, and supply water within the urban district of Clevedon and the parishes of Tickenham and Kenn and part of the parish of Walton-in-Gordano, in the rural district of Long Ashton, in the county of Somerset, or within such other limits as may be prescribed by the intended Act. Borrowing powers will be required.

East Grinstead Gas and Water.—The East Grinstead Gas and Water Company will apply for the confirmation of their Hackenden works, and for authority to construct others, consisting of a well and pumping-station in the parish of Forest Row, in the rural district of East Grinstead, a service reservoir at the latter place, a water-tower, and three aqueducts or pipe-lines; also to acquire by agreement the well and works at Place Land. The Bill will contain provisions in regard to the protection of the Company's works and supply, and to the sale of water to or by adjoining authorities, companies, and others. Additional capital and borrowing powers will be required.

Egremont Urban District Council (Gas).—Authority will be applied for by the Egremont Urban District Council to manufacture gas, supply it in the urban district of Egremont and adjoining parishes, and acquire the undertaking of the Egremont Gas Company, for which an agreement has already been entered into. It is proposed to ask for the repeal of the provisions of the Cleator Moor Local Board Gas Act, 1892, in pursuance of which the Cleator Moor Urban District Council now supply gas within the urban district of Egremont. The promoters of the Bill wish for authority to acquire, by compulsion, or agreement, certain gas mains and plant of the Cleator Moor Council and of the Whitehaven Rural District Council, and to continue, maintain, and renew the existing gas-works and to construct others. The Bill will contain provisions in regard to the sale of gas in bulk and for power, the supply of meters, fittings, and apparatus, testing the quality of the gas, and the levying of rates and charges. Permission will be sought to apply existing funds for purposes of the undertaking; and an enlargement of the present borrowing powers will be sought.

Exmouth Gas.—The Exmouth Gas Company will seek authority to extend their limits of supply so as to include the parishes of Lymptone and Woodbury, in the rural district of St. Thomas. The Bill will contain provisions in regard to the price and quality of gas; and the reduction of its illuminating power will be applied for. The present capital is to be converted and consolidated, and power to raise more, to form a special purposes fund, and to make further provision for the payment of dividends under the sliding-scale, will be sought.

Exmouth Urban District Council.—Authority will be sought by the Exmouth Urban District Council for the construction of additional water-works consisting of a well and pumping-station in the parish of Colaton Raleigh, and two aqueducts, conduits, or pipe-lines, both commencing at the pumping-station, and one terminating in the River Otter, and the other at the Squabmoor reservoir in the parish of East Budleigh. Permission will be required to apply the Council's existing funds and to borrow more money for the purpose set forth.

Farnham Gas and Electricity.—Application will be made for the dissolution of the Farnham Gas Company, Limited, and the incorporation of a new company to carry on the undertaking, with power to supply both gas and electricity. Authority will be sought to maintain the existing gas-works and construct others, as well as a generating station and works for the supply of electricity. It is proposed to define and increase the capital, and form reserve and special purposes funds. The Bill will contain provisions in regard to the pressure and testing of gas, and also those incidental to the supply of gas and electricity. The Farnham Electric Lighting Order, 1905, is to be repealed.

Fylde Water Board.—The Fylde Water Board wish to be authorized to construct additional works, consisting of a covered service reservoir and a water-tower in the borough of Blackpool, an equilibrium basin in the township of Barnacre-with-Bonds, a number of aqueducts or pipe-lines, and a road diversion. The Bill will contain further provisions in regard to the conduct of the undertaking, the borrowing and repayment of money, making the Board's stock a trustee security, suspending payments into the sinking fund, and the appointment of a Secretary to the Board.

Garnant Gas.—Parliamentary sanction will be sought for the incorporation of a company to supply gas in parts of the parishes of Bettws and Llandilofawr Rural, in the county of Carmarthen, part of the parish of Llangwig, in the county of Glamorgan, and adjoining places. Authority will be asked to purchase lands and erect and maintain gas-works thereon; and the general powers conferred in respect of the supply of gas will be required.

Gas Companies (Standard Burner) Bill.—The notice given for this Bill was published in full in the "JOURNAL" last week (p. 548).

Gowerton Gas.—Application will be made by the Gowerton and District Gas Company, Limited, for authority to supply gas within the parishes of Gowerton and Longhor, and elsewhere, in the County of Glamorgan, and within so much of the parish of Llandeilo, Talybont, as is not in the area of the Pontardulais Gas Company, Limited. The Company require power to purchase lands, construct and maintain gas-works, supply fittings, and levy rates and charges.

Great Grimsby Gas.—The Great Grimsby Gas Company intend to apply for an extension of their limits of supply so as to include the whole or parts of the parishes or townships of Ulceby and North and South Killingholme, in the rural district of Gt. Grimsby, and of the parishes of Aylesby, Habrough, Healing, Immingham, and Stallingborough, in the rural district of Grimsby, all in the county of Lincoln, and for authority to exercise within the extended limits all the powers conferred by their existing Acts. In the Bill to be promoted, provisions will be included in regard to the raising of additional capital, the formation of special purposes and other funds, the fixing of a standard price for gas, the supply of stoves and other appliances, and the sale of gas in bulk.

Hastings Corporation.—In a General Bill to be promoted by the Hastings Corporation, they will ask for authority to purchase compulsorily the lands upon which their existing pumping-stations and works at Forwood, Crowhurst, and Pebsham have been constructed, also lands adjoining them and at Westfield, and to construct thereon

additional works for improving the water supply to the borough. These comprise three pumping-stations, to be situated respectively in the parishes of Catsfield, Crowhurst, and Bexhill, a service reservoir in the first-named parish, wells and adits, and three conduits or pipe-lines. Further borrowing powers will be required.

Havant Gas and Electricity.—The Havant Gas Company, Limited, desire to be dissolved and re-incorporated with general powers for the supply of gas and electricity in their existing area. The Bill will contain provisions in regard to the capital and borrowing powers of the Company, the maintenance and extension of their gas-works, the manufacture and storage of gas and residual products, the generation and supply of electricity, and the levying of rates and charges.

Hoyland Nether Urban District Council (Gas Purchase).—The Urban District Council of Hoyland Nether, in the West Riding of York, intend to seek authority to supply gas within the township or urban district of Hoyland Nether, the portion of Brampton Bierlow which is not included within the limits of supply defined in the Wath-upon-Deane and District Gas Order, 1900, part of the township or urban district of Worsbrough, and the parish or township of Tankersley; and also to purchase the undertaking of the Elsecar, Wentworth, and Hoyland Gas Company. Power will be sought to confirm and make all necessary provision for carrying into effect any agreement between the Company and the Council already made, or to be made prior to the passing of the intended Act, for the sale and purchase of the Company's undertaking, and to provide for maintaining and carrying it on until its transfer to the Council. The Bill will contain the usual powers conferred upon gas companies; and provision will be made in it for the winding-up and dissolution of the Company. The Council will apply for authority to borrow money for all or any of the purposes of the intended Act.

Kingswood Water.—Authority is sought for the incorporation of a company with power to supply water within the parish of Kingswood, in the county of Surrey, and to acquire the undertaking of the Kingswood Water Company, Limited. It is proposed to ask for the confirmation of the existing works, situated in the parishes of Reigate and Kingswood, and for authority to construct others, consisting of a pumping-station, a service reservoir, a water-tower, two rising mains, and two pipe-lines. General powers in regard to the supply of water are required, as well as sanction for the raising of capital on the security of the undertaking.

Little Hulton Urban District Council.—The Urban District Council of Little Hulton require authority to supply gas within their district, purchase, by compulsion or agreement, portions of the gas undertakings and plant of the Salford Corporation and the Farnworth and Kearsley Gas Company, and construct new works. They will ask for authority to take a supply of gas in bulk from the Earl of Ellesmere, and for the confirmation of any agreement entered into with him for the supply of gas from the existing coke-ovens on lands in his possession and occupation. The Bill will contain provisions making it obligatory upon the above-named Corporation and Company to supply gas to the Council, in bulk or otherwise, until the completion of the proposed new works, whereupon their rights and obligations will cease. The necessary borrowing powers will be required. The other provisions indicated in the notice will be more fully dealt with when a print of the Bill is available.

Mallow Gas.—Authority will be sought for the dissolution and re-incorporation of the New Mallow Gas Company, Limited, with power to manufacture gas, and supply it in the whole of the urban district, and in certain specified places in the rural district, of Mallow. It is proposed to maintain and extend the existing works, define and increase the capital, and make provisions in regard to the price, quality, pressure, and testing of gas. The Company will ask for power to apply for a Bill or Order to enable them to supply electrical energy.

Mallow Urban District Gas.—The Urban District Council of Mallow will apply for authority to purchase, by compulsion or agreement, the undertaking of the New Mallow Gas Company, Limited; maintain, improve, and extend the existing works; and supply gas in the urban district of Mallow and in parts of the surrounding rural district. The Bill will contain the usual provisions incidental to the supply of gas, as well as for the raising of money for the gas undertaking, and the application of the revenue derived from it.

Maltby and Tickhill Water.—Application will be made for the incorporation of a company with power to supply water in the parish of Maltby, the urban district of Tickhill, and certain other parishes in the West Riding of the county of York.

Maltby Gas.—Authority will be sought for the incorporation of a company for the supply of gas within the parishes or townships of Maltby, Braithwell, Bramley, Hooton Levett, Dinnington, Laughton-en-le-Morthen, Stainton, and Wickersley in the West Riding of York, and for the purchase of land and the erection of gas-works thereon. The general powers granted to a gas company will be required, as well as permission to purchase, by compulsion or agreement, the works and undertaking of any company not possessing statutory powers supplying gas within any part of the above-named parishes.

Matlock Bath and Scarthin Nick Urban District Council.—The Urban District Council of Matlock Bath and Scarthin Nick will apply for the repeal of certain provisions of the Matlock Bath Gas Act, 1895, and the Matlock Bath Improvement Act, 1905, with regard to the removal of the gas-works, and for authority to maintain and improve the works on the present site. They will also ask for some additional powers relating to the supply of gas, such as the construction and placing of pipes and fittings between mains and meters, the allowance of discounts and rebates, and the making of charges for gas taken through prepayment meters.

Middlesbrough Corporation.—In a General Bill of which the Middlesbrough Corporation have given notice, they will apply for further powers with regard to their gas and electricity undertakings. They wish for authority to supply prepayment meters, cookers, and fittings, require consumers to provide anti-fluctuators for gas-engines, regulate the size and material of pipes and fittings, exempt from distress cookers, &c., let on hire, reduce the illuminating power of the gas, and allow discounts on charges. Additional borrowing powers will be required.

Middleton Corporation.—A General Bill for which notice has been given by the Middleton Corporation will contain further provisions concerning their gas and electricity undertakings. They will fix the standard quality of gas, and provide for the better testing of it. They will also ask to be empowered to undertake the free wiring of houses for electric lighting and other purposes, and make such charges therefor as they may fix or as may be prescribed. Authority will be sought for supplying, fixing, repairing, and removing gas and electrical fittings, and for selling electricity in bulk. Permission will be required to raise money for the purposes of the Bill.

Mountain Ash Water.—The Mountain Ash Urban District Council require authority to construct additional works, comprising a reservoir in the parish of Penderyn, an intercepting dam in the same parish, and several aqueducts and other works. Permission will be sought for covering in the Darranlas reservoir. It is proposed to alter the existing rates and charges. Borrowing powers will be required.

Pontypridd and Rhondda Joint Water Board.—Authority will be sought by the Pontypridd and Rhondda Urban District Councils, or one of them, for the constitution and incorporation of a Joint Water Board for the purchase of the undertaking of the Pontypridd Water Company, which it is proposed shall be dissolved and wound up. The Bill will provide for the transfer to the Board of the water undertaking of the Rhondda Council; and extension will be required of the time specified in the Company's Act of the present session for the acquisition of land and the construction of certain works. It will also contain the usual provisions in regard to the supply of water, as well as authority for the borrowing of money.

Pontypridd Water.—The Pontypridd Water Company intend to apply for power to extend the period limited by the Pontypridd Water-Works and Tramroads Act of 1908 for making a substantial commencement with the Llia reservoir and the purchase of lands for the construction of the remaining works authorized by that Act other than the tramroad and works abandoned under the Act of the present session. They also seek power to extend the periods limited by that Act for the compulsory purchase of lands necessary for the construction of the railway, reservoir, and other works authorized by it.

Rhondda Urban District Council.—In a General Bill to be promoted by the Rhondda Urban District Council, they will apply for further powers in respect of their gas undertaking, including authority to prescribe the charges to be made for gas supplied through prepayment meters, and to require any person who has a separate supply of gas for power or other purposes, or of electricity, to pay a minimum charge for gas, and to impose other terms and conditions in connection with such supply.

Salford Corporation.—The Corporation of Salford will apply for various powers in connection with their gas undertaking. They wish for authority to acquire, hold, and use certain lands, called the Earl of Ellesmere's Brick-Works, in Salford, for manufacture and storage of gas. The Bill will contain new or altered provisions with respect to the application of the revenue arising from the gas undertaking and to the allocation of the profits, and others for the amendment or repeal of the portions of the Acts of the Corporation relating to the illuminating power, purity, and testing of gas, and the recovery of moneys. Other provisions will relate to the hire of gas and electric stoves, engines, meters, &c. Authority to raise more money will be required.

Shirebrook Gas.—Application will be made by the Shirebrook and District Gas Company for an extension of their limits of supply so as to include the parishes of Cuckney and Norton, in the county of Nottingham, the remainder of the parish of Warsop not already included in their area of supply as defined by their Act of 1899, and portions of the parish of Bolsover, in the county of Derby. It is proposed to ask for the amendment of the Mansfield Commissioners' Gas Act, 1878, and the Corporation Act of 1901; the repeal of the Corporation's powers of supply in Warsop, and of those of the Bolsover Gas Company in regard to parts of the parish of Bolsover; and the amendment of the Bolsover Gas Order of 1894. Confirmation will be required for any agreement already made or to be hereafter entered into between the applying Company, the Mansfield Corporation, and the Bolsover Gas Company, or any other body, company, or person, in relation to any of the objects of the intended Act; and sanction will be asked for the employment of the existing funds for the purposes indicated.

Slough Water.—The Slough Water Company intend to apply for an extension of their limits so as to include a portion of the parish of Fulmer, for confirmation of their existing works, and for authority to construct others in connection with them. The Bill will contain provisions in regard to the acquisition of lands, springs, and waters, the supply of fittings, the sale of water in bulk, and the levying of rents, rates, and charges. Permission will be sought to apply their funds for the purposes of the intended Act.

Southend Water.—Application will be made by the Southend Water Company for an extension of their limits of supply so as to include the parish of Buttesbury, in the rural district of Chelmsford, for the confirmation of the existing works, and for authority to construct others, comprising no fewer than fourteen pumping-stations. The Bill will contain provisions as to the supply of water beyond the limits, waste of water, making and supplying fittings, maintaining the pipes and apparatus of consumers, &c. Additional capital and borrowing powers will be required.

South Hants Water.—The South Hants Water Company will ask Parliament to sanction and confirm the existing works and the expenditure of capital thereon, and to authorize the purchase of land and the construction of additional works, comprising a covered service reservoir in the parish of West End, another in the parish of Hedge End, both in the rural district of South Stoneham, and five aqueducts or pipe-lines in connection therewith. The Company wish to be empowered to extend their limits of supply so as to include Owslebury, Upham, East Wellow, Dimwood, and Minstead, in the rural districts respectively of Winchester, Droxford, Romsey, and New Forest, in the county of Southampton; and to raise more capital.

South Lincolnshire Water.—Further powers are required by the South Lincolnshire Water Company. They wish to have their limits

extended so as to include the urban district of Holbeach, and to be authorized to raise additional capital, and to issue as preference or preferred ordinary shares any portion of the ordinary capital of the Company sanctioned by their Act of 1906.

Staffordshire Potteries Water.—Application will be made by the Staffordshire Potteries Water Company for authority to construct additional works, comprising a pumping-station in the parish of Eccleshall, another in the parish of Draycott-in-the-Moors, a service reservoir and other works in the parish of Swinnerton, all in the county of Stafford, and five aqueducts or pipe-lines in connection therewith. The Company will also apply for the confirmation of the existing works, and for authority to raise further capital.

Thorne and District Water.—Application will be made for the incorporation of a company with power to supply water within the rural district of Thorne, in the West Riding of York, and in the urban district of Crowle, in Lincolnshire. It is proposed to construct two wells and pumping-stations at Thorne, and one at Crowle, with a water-tower in connection with each, and several conduits or pipe-lines. The Bill will contain provisions in regard to capital.

Tipperary Gas.—Authority will be sought for the dissolution and re-incorporation of the Tipperary Gas Company, Limited, with power to manufacture gas, and supply it in the whole of the urban district, and in certain townlands in the rural district of Tipperary. The general provisions of the Bill will be similar to those of the Mallow Bill already noticed.

Warrington Corporation.—A General Bill for which notice has been given by the Warrington Corporation will contain several provisions in connection with their gas, electricity, and water undertakings. They relate (*inter alia*) to increasing the discounts on gas accounts, the erroneous registration of meters, the conditions under which gas shall be supplied to premises having electricity laid on, free wiring, the supply of electricity in bulk, the charge for gas in and beyond the borough, the framing of bye-laws with respect to pipes and fittings, and the improvement of the water supply. More money will be required.

Wells and Fakenham Water.—Application will be made for the incorporation of a company with power to supply water within the urban district of Wells-next-the-Sea and in the parish of Fakenham and certain other parishes in the county of Norfolk. It is proposed to construct a well, pumping-station, and water-tower in the parish of Sculthorpe, and two conduits or pipe-lines in connection therewith. The capital powers required will be defined in the Bill.

Whitland Water and Gas.—Parliamentary sanction is to be sought for the incorporation of a company for the supply of water and gas in the rural districts of Whitland, in Carmarthenshire and Narberth, in Pembrokeshire, and for the purchase of the undertaking of the Whitland and District Water and Gas Company, Limited. Authority will be required for the construction of water and gas works, and for the usual powers in regard to supply.

Wicklow Gas.—Authority will be sought for the dissolution and re-incorporation of the Wicklow District Gas Company, Limited, with power to manufacture gas, and supply it in the whole of the urban district of Wicklow and in certain townlands in the rural district of Rathdrum, in the county of Wicklow. The general provisions of the Bill will be similar to those of the Mallow Bill already noticed.

Workshop Urban District Council.—Application will be made by the Workshop Urban District Council for authority to purchase the undertaking of the Workshop Water Company. In the Bill to be promoted with this object, the Council will provide for the application to them of the provisions of an agreement, dated the 24th of March last, made between the Company, the Duke of Newcastle, and the Wigan Coal and Iron Company, Limited. Power will be sought to maintain the works and supply water within the Company's limits, make further provisions in regard thereto, levy rates and charges, and raise money for carrying on the undertaking; and the Council will apply for exemption from the enactments limiting the profits arising from the business.

PROVISIONAL ORDER APPLICATIONS (SESSION 1910).

Board of Trade, under Gas and Water Works Facilities Act, 1870.

Barnstaple Water.—The Barnstaple Water Company will apply for an extension of their limits so as to include the parish of Instow, or some part of it. Additional capital will be required.

Brownhills and District Gas.—Application will be made by the Ogley Hay and Brownhills Gas Company, Limited, for authority to maintain and continue their existing works at Walsall Wood, construct and maintain additional works, and manufacture, store, and supply gas and residual products in the parishes of Walsall Wood, Norton-under-Cannock, Ogley Hay, and Shire Oak, all in the urban district of Brownhills; also in the parish of Ogley Hay Rural, in the rural district of Lichfield. The present capital is to be regulated, and authority will be sought to increase it.

Builth Wells Gas.—The Builth Wells Gas Company, Limited, will seek authority to maintain and continue their works, and supply gas in the urban district of Builth Wells and the neighbourhood; also to make provisions in regard to their capital and borrowing powers, the amount of dividend and interest to be paid, and the formation and application of reserve and renewal funds.

Burnham Gas.—Authority will be sought by the Burnham Gas Company, Limited, to maintain, continue, and construct gas-works, and to conduct a gas undertaking in the parish of Burnham, and parts of the parishes of Burnham Without, Brent Knoll, and Berrow, in the county of Somerset. The Order will contain provisions similar to those in the Highbridge Order, noticed later.

Chelsham and Woldingham Water.—Application will be made by the Chelsham and Woldingham Water Company for power to maintain and continue their existing water-works, and supply water in the parishes of Chelsham and Woldingham and parts of the parishes of Oxted, Limpsfield, and Titsey, in the rural district of Godstone, in the county of Surrey.

Chertsey Gas.—The Chertsey Gas Consumers' Company, Limited, will apply for authority to define and regulate their existing capital,

apply it for the purposes of the intended Order, and raise more money for carrying on their undertaking. The Order is to confer further powers in regard to the price, pressure, quality, and testing of gas, the rate of dividend to be paid, the supply of fittings and apparatus, and the sale of gas in bulk.

Cranleigh Gas.—Application will be made by the Cranleigh Gas Company, Limited, for authority to construct and maintain additional works on certain lands described, and to raise more capital. Further powers are required in regard to the supply and consumption of gas, including, pressure, quality, and testing; and provision is made for the adoption of a sliding-scale of price and dividend.

East Kent District Water.—The East Kent District Water Company will apply for an extension of their limits so as to include Wootton, Swingfield, Acrise, Poulton, and Hougham Without, all in Kent, or some part or parts of them. Additional capital will be required.

Highbridge Gas.—The Highbridge Gas Company, Limited, will apply for power to maintain, continue, and construct gas-works, and supply gas in the parish of Highbridge and parts of the parishes of Burnham Without and Huntspill, in the county of Somerset. In the Order to be applied for, provisions will be inserted in regard to the price, quality, pressure, and testing of gas, its sale in bulk, the supply of fittings and apparatus, and the erection of dwelling-houses for the employees. Authority will be sought to capitalize money expended out of revenue on extension and improvement of the works, to raise more capital, and form reserve, renewal, and special purposes funds.

Llanidloes Gas.—The Llanidloes Gas Company, Limited, intend to apply for authority to maintain and continue their works and supply gas in the borough of Llanidloes and in the parish of Llanidloes Without, in the rural district of Newtown and Llanidloes. In the Order to be applied for, provisions will be included in regard to the capital and borrowing powers of the Company, the amount of dividend and interest, and the formation and application of reserve and renewal funds.

Ripley Gas.—The Ripley Water-Works, Gas, Light, and Coke Company, Limited, purpose applying for authority to maintain and continue their existing works, and supply gas in the portion of the parish or township of Ripley which is not included within the limits of the Riddings District Gas Company, and also in part of the parish or township of Pentrich, in the county of Derby. The usual powers granted to gas companies will be applied for.

Rowley Regis and Blackheath Gas.—Authority will be sought by the Rowley Regis and Blackheath Gas Company to extend their limits so as to include the township of Cakemore, in the rural district of Halesowen, and to exercise therein all their present powers with respect to the supply of gas. The Order will include further general provisions, and others to sanction raising additional capital.

Sheffield Gas.—The Sheffield Gas Company will apply for authority to make further provision in regard to the quality and testing of gas, reduce the illuminating power, and prescribe the burner for testing it. It is proposed to hold in future only one ordinary meeting in each year, to make provision as to the retirement of the Directors, the payment of interim dividends, the preparation and audit of the Company's accounts, and the issue of debenture stock.

South Kent Water.—Application will be made by the South Kent Water Company for power to raise additional capital, and to apply the auction clauses to it, as well as to any of the existing capital that has not been issued. Authority will be sought to supply fittings, &c., to exempt them from distress, and to make agreements for the sale of water in bulk.

Sudbury and District Gas.—The Sudbury Gas Company, Limited, will apply for authority to maintain and continue their works, and supply gas in the borough of Sudbury and in the parishes of Great Cornard and Chilton; also to make provisions with regard to their capital and borrowing powers, the amount of dividend and interest to be paid, and the formation and application of reserve, renewal, and special purposes funds.

Sutton District Water.—The Sutton District Water Company intend to apply for an extension of their limits of supply so as to include the parish of Kingswood, in the rural district of Reigate, in the county of Surrey; for the confirmation of their existing works; for authority to construct a line of pipes and a water-tower; and for permission to use for the purpose any of the capital they may have already been authorized to raise.

Swansea Gas.—The Swansea Gas Company will apply for an extension of their limits of supply so as to include so much of the parish of Llansamlet as is not within the authorized limits of any statutory gas company, and certain portions of the parishes of Claise Rural, Penderry, and Cockett, in the county of Glamorgan. They will also seek permission to sell gas in bulk.

Local Government Board, under the Public Health Act, 1875, and the Gas and Water Works Facilities Act, 1870.

Oxford Water.—The Corporation of Oxford intend to apply for the confirmation of the acquisition by them of a piece of land at Shoot-over Hill, and for authority to hold and use it for the purposes of their water undertaking; also for sanction and confirmation of the construction of a service reservoir and other works, and the expenditure incurred in connection with it. Additional borrowing powers are required.

Warsop Gas.—Authority will be sought by the Warsop Urban District Council to supply gas within part of their district, and to erect, on a piece of land described, the necessary works and plant. Confirmation is required for any agreement made with the Mansfield Corporation relative to the transfer to the Council of the rights, powers, and privileges of the Corporation in respect of the supply of gas within the district, and for the repeal of so much of the Mansfield Commissioners' Gas Act, 1878, and the Mansfield Corporation Act, 1901, as relates to the area comprised within the limits of the intended Order. The Corporation wish for authority to purchase gas in bulk, and supply it beyond the district. The other provisions of the Order will relate to the purchase, sale, and hire of stoves, fittings, &c., the recovery of rents, rates, and charges, exemption from penalties, &c. Borrowing powers will be required.

Secretary for Scotland, under the Private Legislation Procedure (Scotland) Act, 1899.

Aberdeen Corporation Water.—The Corporation of Aberdeen will apply for authority to construct a reservoir on the River Avon, and various aqueducts and other works. Where lands are obtained by compulsory purchase, the amount of compensation is to be determined by a single arbitrator. Existing funds are to be applied to the purposes of the Order; and sanction to the borrowing of more money will be asked for.

Clydebank and District Water.—The Clydebank and District Water Trustees wish to be empowered to construct additional works, comprising an enlargement of the Burn Crooks reservoir and the making of a catchwater conduit, a pipe-line, an access road, and a road diversion, and to abandon two reservoirs, a catchwater conduit, a pipe-line, and an access road authorized by an Order granted in 1906. The existing borrowing powers are to be applied in carrying out the proposed works.

Dunblane Gas.—The Dunblane Gas Company, Limited, seek authority to maintain and continue their existing works, construct others, and manufacture and supply gas in the parish of Dunblane, in Perthshire, and also to sell it in bulk. The present capital is to be regulated, and it is proposed to increase it.

Falkirk Corporation Gas.—Application will be made by the Corporation of Falkirk for authority to borrow money for the purposes of their gas undertaking, reduce the illuminating power of the gas, prescribe and regulate its testing, charge differential rates, and allow discounts. The Corporation seek to be relieved from penalties for insufficient pressure or illuminating power of gas, for excess of impurity in certain circumstances, and for unavoidable interruptions in the supply.

Fraserburgh Water.—The Fraserburgh Corporation will apply for authority to construct additional works, consisting of an embankment or dam on the Water of Fedderate, a service reservoir in the parish of Strichen, filters in the parish of Fraserburgh, three conduits, and a road diversion. Permission will be sought to prescribe and regulate fittings and supply them, to make agreements with regard to the sale of water in bulk, to apply existing funds to the purposes of the Act, and to borrow more money.

Glasgow Gas Consolidation.—The Corporation of Glasgow will apply for the consolidation, repeal, and amendment of their Gas Acts, and for the maintenance, improvement, enlargement, or discontinuance, of the gas-works, and the continuance of the supply in the city, suburbs, and adjoining places. Power will be sought to divide the limits of supply into two districts, to be called respectively the "City" district and the "Supplementary" district; to fix the maximum price to be charged for gas; to provide gas-pipes and other apparatus, and repair them; to manufacture and supply gas for non-illuminating purposes; to make provisions in regard to the pressure, illuminating power, and testing of gas, &c. The Corporation wish to be authorized to apply for the benefit of the gas undertaking any surplus revenues arising therefrom, or to place them to the Common Good fund of the city; also to pay superannuation allowances to employees in connection with the gas undertaking, and to acquire gas-works in the area of supply or in adjoining districts. The Bill will contain provisions in regard to the borrowing of money temporarily for the purposes of the undertaking, the creation of sinking, reserve, and depreciation funds, and other financial matters.

Kirkcaldy Corporation.—The Corporation of Kirkcaldy will apply for an extension of the burgh, and consequently of their compulsory limits of water supply. They will also seek to amend or repeal the existing provisions of the Acts relating to the Kirkcaldy Gas Company (whose undertaking it is intended to acquire) with respect to the illuminating power and testing of gas, and make others in lieu thereof. The Corporation wish to be authorized, should any surplus remain on the revenues of the gas undertaking, to carry it, or such part of it as they think fit, to the general assessment of the burgh.

Montrose Water.—Application will be made by the Montrose Corporation for authority to consolidate their powers with reference to their water-works, to provide an additional supply to the borough and districts and the adjacent places, and to construct further works, consisting of a storage and a service reservoir in the parish of Montrose, and various aqueducts, &c. Confirmation will be sought for existing works. The limits of supply will be defined in the Order, in which sanction will be asked to the borrowing of more money.

Wishaw Burgh Extension.—The Corporation of Wishaw notify their intention of applying for an extension of the burgh so as to include the area within the parishes of Dalziel and Cambusnethan; and they wish to have the annexed districts included within their limits of compulsory water supply.

Double Fatality at Southampton.—Two working men, named Peter Reid and Charles Beer, who lodged at Southampton, were poisoned by gas in their bedroom under circumstances which the Coroner's Jury found to be purely accidental. The gas-fittings were in good order; but from the evidence of one witness it appeared that she found the tap of the bracket turned on. In the case of one of the men artificial respiration was tried for some time, and the Gas Company sent along a cylinder of oxygen; but though he was breathing when removed from the room, all the efforts made were without avail.

Mr. J. G. Newbigging's Address.—The current number of the "Municipal Journal" contains the major portion of Mr. J. G. Newbigging's recent address to the Manchester Association of Students of the Institution of Civil Engineers, which was given in the "JOURNAL" for the 16th inst. (p. 466). Our contemporary says the address "contains one of the strongest protests and best-reasoned arguments against the policy of relieving the rates out of municipal trading concerns that have yet been offered." The writer points out that the policy of rate relief from gas profits is to Mr. Newbigging no mere matter of opinion. It is "one of the greatest evils of municipalization," and "a pernicious system of indirect taxation which has been allowed to eat itself like a canker into this branch of the public service in such a manner as to be well-nigh incurable in these days of advancing rates."

LEGAL INTELLIGENCE.

INTERCHANGE OF THAMES WATER BETWEEN DISTRICTS

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Thursday, Nov. 25.

(Before Mr. Justice PHILLIMORE.)

Conservators of the River Thames v. Metropolitan Water Board.

This was an action to obtain a declaration of the rights of the parties as to the amount of water taken by defendants through the intakes of the old Southwark and Vauxhall Water Company.

Mr. ELDON BANKES, K.C., and Mr. C. B. MARRIOTT appeared for the plaintiffs; Mr. DANCKWERTS, K.C., and Mr. A. B. SHAW represented the defendants.

Mr. BANKES said the question, broadly put, was whether or not the defendants had a right to "interchange" water between districts; the actual question being whether they were authorized to pass water which was drawn through the intakes of the old Southwark and Vauxhall Water Company into the district of either the Lambeth or New River Companies. The Water Companies were constituted under Acts of Parliament; and the Lambeth and Southwark and Vauxhall Companies drew their water from the Thames. The Conservancy gave their consent to the water being taken subject to a certain payment from time to time by agreement; and by Acts of Parliament the quantities of water which might be abstracted from the river had been defined, as well as the amounts to be paid. Each Company was allowed to take a certain quantity. In the case of the Lambeth and Southwark and Vauxhall Companies, it was 24½ million gallons per day for a specific payment. Then came a period when the Companies were allowed to take excess quantities. Certain rights were given to some of the Companies to interchange water; and the question for the Court was whether or not the defendants, as successors of the Southwark and Vauxhall Company, had a right to pass any of this water, or alternatively any quantity of the excess water, from their old district into the Lambeth and New River Companies' districts.

The learned Counsel having called attention to the provisions of the various Acts of Parliament and the agreements under which the Water Companies drew water from the Thames, considerable discussion ensued as to whether, upon the pleadings as they stood, the question was as to all water taken, or merely excess water; Mr. Danckwerts strongly maintaining that it was merely the latter, and that he had never objected to a declaration that the Board could not send excess water from one district to another. His Lordship thought the section bearing upon this question related to all water; but Mr. Bankes said he was quite willing the decision should be confined to excess water, and that another action should be brought as to the other water.

Mr. BANKES then proceeded to argue that, under the agreement of 1852, the Southwark and Vauxhall Company could only supply their own customers; section 15 of the Act of 1878 gave them no right to supply any portion of their water to any other Company, though the agreement of December, 1886, conferred the right to supply any of the other five Companies. But, on the true construction of the Act of 1894, they had no right to supply such water. The Act of 1898 drew a clear distinction between the parliamentary limits and their actual district. Even if section 19 applied to excess water, defendants could not supply water to Lambeth; and it was useless to say that part of Lambeth was within the statutory limits of the old Southwark and Vauxhall Company.

Mr. R. A. Swarbrick produced a record, made from the returns furnished to the Conservancy by the defendants, of the quantity of excess water taken by them. He said these returns did not afford any information to the Conservators as to what happened to the water after it was taken. Beginning with May, 1905, it appeared that during every month to the end of the year water in excess of 24½ million gallons per day was taken. The records showed substantially the same result during each subsequent year. It was not till the Conservators received the third annual report of the Board that they became aware of water being supplied from the Southwark and Vauxhall district to the Lambeth and New River districts. A plan produced showed the connections between the districts.

Cross-examined: He assumed that the "total gallons per day" in the returns referred to the number of gallons drawn at the intake, and not the quantity pumped out of the reservoir into the district. He was not aware that in the returns made to the Local Government Board the word "Thames" included other water than that drawn from the river. If this were so, his figures would require amending.

Mr. H. J. Froome said it had been the practice of the Conservancy Board to render accounts half yearly for excess water. These accounts were paid up to 1906, after which the Metropolitan Water Board commenced to make payments on account.

Friday, Nov. 26.

Mr. DANCKWERTS, in opening the case for the defendants, said the action was a most important one; for if the plaintiffs succeeded, it meant an additional expenditure by the Water Board of more than £18,000 a year. He explained that the water supplied by the Board was taken from three intakes on the Thames, pumped into reservoirs and thence into filter-beds, from which it was distributed partly by gravitation. But some was pumped to Nunhead, from which reservoir it could be sent into the Southwark and Vauxhall district and part of the Lambeth district. The Lambeth Company also had service reservoirs which were capable of supplying both of these districts. In addition, there were gravel beds on the north side of the river from which water was intercepted; and this was not included in the return of water taken from the Thames. It made practically little difference whether a certain quantity of water was drawn out of the Thames at the Lambeth or the Vauxhall intake, though the advantage to the Conservancy was that it should be drawn at the latter. Similar remarks might be made about

the Chelsea intake—in fact, it was true as to all the other intakes. The Vauxhall scale for excess water was higher than the Lambeth; so that it was clearly to the advantage of the plaintiffs that the water should be taken at Vauxhall.

Justice PHILLIMORE: Then why not accept the view they set up?

Mr. DANCKWERTS: Because of physical necessities. If the Court accepted the view put forward by the plaintiffs, the defendants would have to send the water a distance of 22 miles instead of only 2, which would involve a cost of £18,000 a year for pumping. Counsel went on to say that under sundry Acts of Parliament the Water Companies were authorized to supply each other; but this power *ex necessitate* disappeared under the Act of 1902. As illustrating what he meant, he would suppose that there was an area which belonged to Lambeth and also to Vauxhall; as they both now belonged to the Water Board, why should that area not be supplied from either intake?

Justice PHILLIMORE: No doubt if you were laying down pipes in a new district you might take the water from the nearest point.

Mr. DANCKWERTS thought this might be done. The Vauxhall Company, besides the intake from the Thames and gathering water from gravel beds, had wells which were so situated that water from them could not be delivered into the New River district. The water from the wells was sent from the Hampton filter-beds to Nunhead, and a good deal of it was distributed while on its way. There was no fetter on gravel water; the only fetter was on water drawn at the intakes. He had had a table prepared showing the average quantity of water obtained daily from the gravel, and the average daily supply to the Southwark and Vauxhall district from the gravel, and it appeared from it that there was a margin of more than a million gallons; and the contention of the defendants was that, in any view of the case, they were entitled to use this water anywhere they pleased.

Justice PHILLIMORE pointed out that he was not asked to decide whether gravel water was Thames water.

Mr. DANCKWERTS said the defendants had never sent into the New River district any water drawn at the Thames intake.

Mr. MARRIOTT observed that this statement was inconsistent with the pleadings, as it was stated that the defendants had not done so since 1907; and they now made no claim to do so. No point was raised about gravel water.

Justice PHILLIMORE said he was willing to decide anything the parties wished him to decide; but it might end in his giving a decision as to gravel water which neither party might like.

Mr. DANCKWERTS did not agree that the point was not raised on the pleadings. The defendants said no excess water had been sent to the New River district, and that they had never supplied to it any representative of water drawn from the intakes. He would suggest that the case should be adjourned and the pleadings amended, so that the exact point to be determined might be raised.

Justice PHILLIMORE: Do the Water Board mean to say that they did not send some Southwark and Vauxhall water, not being gravel or well water, into the New River district before 1907?

Mr. DANCKWERTS: No human being, however able, can say whether or not drops of water coming from the intake of the Thames go outside the Southwark area. Under the Acts of Parliament, the water from all sources is commingled in the reservoir.

Mr. BANKES said if the defendants had pleaded that they did not claim, and never had claimed, to send any water out of the Southwark supply district, and that all they had done was to use gravel water, the case would have been different.

After some further argument,

Justice PHILLIMORE said perhaps Mr. Danckwerts would say what it was he wished to raise.

Mr. DANCKWERTS: We take up this position—that all the waters are commingled. We admit that, so far as the water distributed is representative of water other than the 24½ million gallons and other than gravel and well water, it cannot be used except in the old Southwark and Vauxhall district; and, apart from that, we say we can use all the water where we like.

Mr. BANKES: The question my friend wishes to raise is whether he is entitled to exclude gravel water from Thames water. I think it better to amend the declaration, and allow the case to proceed.

Mr. DANCKWERTS asked for leave to amend his defence, so that the real issue might be raised.

Mr. BANKES said he had reconsidered the matter, and, seeing that two public bodies were concerned, it would be better to have the real question determined. He understood the defendants wished to raise the following points: (1) Whether they were entitled to interchange the 24½ million gallons; and (2) whether they were entitled to treat the gravel water as being water other than Thames water.

Mr. DANCKWERTS: Other than water drawn from the intake of the Thames.

Justice PHILLIMORE: Other than water under the section.

Mr. DANCKWERTS: Does my friend contend that gravel water comes within the limits prescribed by the Act of 1898?

Mr. BANKES: I do.

Mr. DANCKWERTS: Then I will contest that.

His LORDSHIP ordered the case to stand over generally, so that the pleadings might be amended.

ALLEGED WRONGFUL APPROPRIATION OF WATER.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, Nov. 17.

(Before Mr. Justice PARKER.)

Borough of Portsmouth Water-Works Company v. London, Brighton and South Coast Railway Company.

This was an action brought by the plaintiffs to prevent defendants from taking water from a spring, termed the "Railway" spring, yielding 600,000 gallons a day, on their land at Bedhampton, near Portsmouth.

Mr. BUCKMASTER, K.C., and Mr. TOMLIN (instructed by Messrs. Bramsdon and Childs, of Portsmouth) appeared for the plaintiffs; and

Sir ALFRED CRIPPS, K.C., Mr. YOUNGER, K.C., and Mr. PRIOR (instructed by Mr. P. V. Rose) represented the defendants.

Mr. BUCKMASTER, in opening the case, gave a history of the circumstances which led to the present dispute. In 1845, the defendants' predecessors obtained an Act for making a railway from Chichester to Portsmouth, and for this purpose acquired, in the parish of Bedhampton, a piece of land 18 perches in extent, which was entirely covered with water. The conveyance, which was dated in 1848, contained a reservation to the vendors of all water rights. The vendors were owners of two estates known as the Upper and Lower Bedhampton Mill Estates, which, by deeds in 1855 and 1877, were conveyed to the plaintiffs. [Maps were put in showing a very considerable expanse of water, from which the two mills were operated; and it was fed by various springs, rising under the surface—two on the north of the railway line, known as the Bidbury springs, Wyatts' spring, and, as, the plaintiffs alleged, by the Railway spring. There was also a stream coming from St. Chad's well, and two springs known as the Blue Hole, which latter were, in fact, the main sources of supply. By the head of water, or millpond, thus formed the two mills had been worked from time immemorial down to and after the date when they were acquired by the present plaintiffs.] Having purchased the land on each side of the pond right down, the plaintiffs had full power to deal with the water as they thought fit; and they set about using it for the purpose of their undertaking. The first thing they did was to enclose in a brick cylinder Wyatts' spring, so as to preserve the water from pollution by surface drainage, and lay pipes from it to their pumping-station. This was done in 1880. In 1898, they enclosed the two Bidbury springs in a similar way; connecting them with the pumping-main from Wyatts' spring, and there being also an overflow-pipe to carry any surplus water into the pond—these pipes running underneath the railway. In 1900, the defendants wanted to extend the sidings on which their coal-trucks ran; and for this purpose they made an embankment across the head of the pond, but south of the Railway spring. Through this embankment a 42-inch pipe was laid to carry the water rising to the north of it, which would have been entirely unnecessary but for the existence of the spring. While this embankment was being constructed, the plaintiffs, by agreement with the defendants, laid a 32-inch main from their pumping-station to the reservoir at Havant. Correspondence took place between the two Companies as to what should be done with the portion of the millpond above the embankment; and an agreement was at first come to under which a retaining-wall was to be built round the Railway spring. This, however, was not carried out; but early in 1903 it was suggested that a cylinder should be sunk where the spring rose, and that the water should be taken away from it to the works. Ultimately this was agreed to, and the work was done; the cylinder being sunk about 15 feet—a wall being built round it for protection, and the water being carried away into the 42-inch main by a 20-inch pipe. The rest of the area north of the embankment was thus left dry, and the Railway Company's land was dry, instead of being covered with water. The rights under the agreement continued until September, 1907, when they determined in consequence of a notice served by the defendants, in March. After this, the defendants proceeded to put a pipe into the cylinder, and by means of a small windmill pumped the water out, and carried it away for their own use; and this led to the present action. The defendants now said there never was a spring there from which water flowed into the millpond; and, being on their own land, they had a right to the water. They also said the plaintiffs had no right to the water, either *jure nature* as flowing water, or by virtue of the reservation of all water rights in the conveyance of 1848.

Sir ALFRED CRIPPS said one point in dispute was whether this was really a spring; and, secondly, if one did originally exist, whether it had not been destroyed by what the plaintiffs had done elsewhere.

Mr. BUCKMASTER said he thought the contention was that the plaintiffs created the spring rather than destroyed it. He then proceeded to put in the various conveyances and agreements bearing on the question. In the conveyance of 1848, the defendants agreed in no wise to obstruct the full flow of water "in the said stream to the said millpond." But this was the first time the word "stream" occurred in the deed; and he submitted that it could only mean the stream in the pond itself, which was kept flowing by the various springs he had mentioned, including the Railway spring. The law with regard to flowing water was well known, apart from any special reservation in the deed. No man had a right to underground water, unless it flowed in a channel, both defined and known. If a man had a well or a pond fed by an underground stream, if a right to the underground water could not be claimed, the water while underground could be intercepted. It was equally plain that when once the water emerged and flowed in a defined stream, the right to it arose; and if a man had a pond fed by such a stream, no one above him had a right to intercept it.

Sir ALFRED CRIPPS said he should not dispute either of these propositions.

Mr. BUCKMASTER said he should also contend that if a man had a pond fed by springs beneath the surface, another man owning the upper part of the pond where the spring rose was not at liberty to drain the pond and stop the springs. There was not much authority on this; but there was one case—*Ennor v. Barnwell*, which came before Vice-Chancellor Stuart in 1860—which would support the conclusion.

Evidence was then given on behalf of the plaintiffs.

Mr. William Whitaker, F.R.S., said he knew the district in question well, having been over it for the Geological Survey. He handed in a geological map and explained the nature of the strata. He said the water in the springs alluded to was forced up to the surface by the pressure of the water impounded in the chalk deposits to the north. It flowed out first at the lowest weak place, which happened to be at Bedhampton and the neighbourhood. The ground around the Railway spring was fairly firm, not marshy. The water came up with pressure enough to overflow.

Cross-examined: He knew the Bidbury springs before they were enclosed by the Water Company. He could not say, without testing, whether these springs affected the Railway spring. He did not remember ever seeing the millpond dry; but he had heard of it. He knew the 36-inch main which passed near the Railway spring. He knew there was an overflow at times from the Bidbury springs; but he could not say to what extent. He inspected the whole of the plaintiff

Company's works with reference to the Bill of 1896; and he was there for nearly a day about a fortnight ago. He had also seen them at various other times going back before 1896, before the upper part of the millhead was filled up. The cylinder at the Railway spring was put down 15 feet below the level of the water in the pond. He did not know the exact depth of the 36-inch pumping-main. Such a main might have the effect of forming a channel for the water from the chalk. The Bidbury east spring was at a higher level than the pond. Before they were enclosed, the water flowed under the railway into the pond. If they were pumped, it would affect other springs in the vicinity. The natural exit of the Railway spring was into the pond. The cylinder was an artificial work; and he did not see how it could affect the quantity of flow. He was not aware that the quantity of water drawn from the cylinder had increased. A few weeks' or months' experience would be of no value, as so much depended on the rainfall. Perfectly dry chalk would hold about 25 per cent. of water; but one could not get it out except by heat or the pressure of other water upon it.

Re-examined: The Railway spring had no relation to an artesian well. There were no mechanical means used at the spot to take the water away; it flowed away naturally. The presence of the cylinder would not increase the flow to any appreciable extent. He did not think the existence of the rising main near the Railway spring could affect it. The millpond could be emptied at any time by opening the weir at the bottom. When he first knew the Bidbury springs, the Company were not taking water from them. Pumping at the springs would decrease or entirely stop the flow at the Railway spring.

Mr. E. M. Eaton said he had visited the *locus in quo*, and had known it for many years. The key to the situation was the ridge known as Portsdown Hill. To the north of this was a large area of exposed chalk, which received the rainfall that flowed to the south after being absorbed. But for this hill, the outflow from the chalk would pass into the sea through a multitude of little channels and streams, as it did all along the Sussex coast; but the existence of Portsdown Hill constituted a barrier, and prevented the water passing direct into the sea, and deflected it until it reached the weak spot through which it could pass, as it did at Bedhampton and Havant, and poured out in copious streams. He could not conceive it possible that the Railway spring had been sealed up, as it were, for a long time, and then had suddenly developed. There was nothing to suggest that it ever existed in any other position. In his opinion, it broke out originally in the bed of the pond; now it came out on the siding, about 6 feet higher, so that there was sufficient head to force it up through that depth of gravel.

Cross-examined: The water must come up from the chalk, which was about 32 feet below the surface. It must come through a fissure in the more or less impervious stratum above the chalk. He examined the spot critically in connection with the Bill of 1906; and it was then in substantially the same condition as now. Probably the water would rise in a cylinder placed anywhere in the immediate vicinity.

Mr. Joseph Hawksley, Manager of the Great Yarmouth Water-Works, said he was from 1895 to 1899 Assistant-Manager to plaintiff Company. He was familiar with the position of the various springs at Bedhampton, including the one now in question. In 1898, the water was run off from the millpond for the purpose of laying the pipes from the Bidbury springs, and he remembered perfectly seeing the water bubbling up from the Railway spring over an area of about 3 feet in diameter—a small group of springs. It rose continuously the whole time; but he made no estimate of the quantity of water. His only object then was to get rid of it. The ground all round it was hard and firm. He saw no sign of boggy or marshy land there; but the ground was rather loose just where the spring rose.

Cross-examined: The water was run off from the pond for about four or five weeks. He did not remember the water being drawn off entirely after that, so as to expose the spring; but when the pond was low, he had seen the water bubbling up from the bottom.

Thursday, Nov. 18.

Mr. Hawksley, in further cross-examination, gave a detailed account of what was done in the summer of 1898, when the millpond was run off, and pipes were laid from the Bidbury springs. He said there was a considerable flow of water from the Railway spring; but he did not make any gaugings, and would not attempt to estimate the quantity. He put a mark on one of the plans to indicate the site of the spring in question. The level of the water in the pond might have varied from time to time; but he could not say to what extent.

Re-examined: The 24-inch pipe was just buried beneath the surface of the bed of the pond. When the water was drained off, there were streams running through the pond from the Bidbury springs and the Railway spring. The summer of 1898 was very dry, and this led to the need for enclosing the Bidbury springs and utilizing the water from them. The surface of the pond was varied by the use of the hatches for the purposes of the mill.

A number of local witnesses were then called. Later,

Mr. Charles Pettit said he was Resident Engineer under Sir John Aird and Sons when they were laying the 36-inch main. He was on the works almost daily from May to December, 1901. When he first went, the pond had been drawn off. He examined the bottom as far as he could, and found the Railway spring in the spot where it now was. There was a considerable flow of water from it, but he could not state the quantity. The main was laid on piers, just above the bottom of the pond. There was no sign of boggy land. No other spring was found; and he did not think any pumping was required. If he had had to carry away the water from the Railway spring, he should have put in a 9-inch—possibly a 12-inch—pipe. Nothing they did affected the spring in any way.

Cross-examined: In making the subway under the railway to carry the main, they did not find any spring; nothing beyond surface water which could be baled out with shovels. He did not remember telling Mr. Morris, of the defendant Company, in September, 1901, that he had discovered a valuable spring of water—enough to fill a 2-foot pipe—and asking him to come and see it. He had no recollection of anything of the sort. He first saw the spring on May 16 as shown by his diary, before any work was done. The 42-inch pipe was put in before he had anything to do with the work.

Re-examined: If he had any conversation with Mr. Morris about a spring, it must have referred to the Railway spring, as they came across no other.

Mr. H. R. Smith said he entered the plaintiffs' service in 1867, in 1872 became Resident Engineer, and continued to hold this office until 1902, when he retired. He knew the spring in question as far back as 1867, and he had known it officially since 1878. In 1867, the millpond did not belong to the Company, but when they acquired it he made an official examination of all the springs. He could see the water rising, even when the pond was full; but when the water was down it was more prominent. There was a considerable volume of water; but he could not give the quantity. There were many occasions when the hatches were raised and the water was run off from the pond. During the whole of his time nothing was done to this spring. Wyatts' spring was enclosed in the summer of 1889. His opinion was that the spring had existed from time immemorial.

Cross-examined: The Railway spring was 20 feet or more from the stream running down the bottom of the pond from the Bidbury springs. It was a large spring, yielding, he should think, not less than half-a-million gallons a day. The 1896 Act authorized the enclosure of the Bidbury springs. He had no records of the quantity they yielded; but they were each more powerful than the Railway spring.

Re-examined: The spring was very near the camp sheeting, and practically abutted upon it. The main spring was 3 or 4 feet from it; but a little water dribbled through.

Mr. Joseph Quick said he and his father had been Consulting Engineers to the plaintiff Company since its formation; and he was thoroughly acquainted with their various sources of water. In the millpond there were Wyatts' spring and the Railway spring. He knew the latter 25 years ago. He had seen the pond emptied on various occasions, and particularly when the 36-inch main was being laid. [Mr. Quick described the appearance of the spring in much the same way as previous witnesses had done.] He prepared the plans for the 36-inch main, which was laid on 4 ft. by 3 ft. piers 2 feet above the bottom of the pond. The foundations went down about 3 ft. 9 in. The main passed under the railway in a subway, in constructing which no springs were found, and nothing was charged by the Contractors for pumping or the hire of pumps. The work on the main was finished before the embankment was completed.

Cross-examined: He could only make a guess at the quantity of water yielded by the spring; but he should not differ from Mr. Smith. Witness was examined in some detail on his plans for carrying the main under the railway. He said that he superintended the work, and visited it from time to time.

Mr. A. E. Stallard, Surveyor to the Havant District Council, said the Hermitage stream came under his attention. It rose about 2 miles above the *locus in quo*, and consisted chiefly of surface and soakage water. Sometimes it was nearly dry; and not much reliance could be placed upon it for mill purposes.

Justice PARKER suggested that this evidence was not material.

Sir ALFRED CRIPPS assented, and the witness withdrew.

The further hearing of the case was adjourned.

Tuesday, Nov. 23.

When the case was resumed this morning,

Mr. Herbert Ashley, M.Inst.C.E., the Chief Resident Engineer of the plaintiff Company, was the first witness. He said he did not know the *locus in quo* before his appointment in 1902. The condition of things was shown in a plan which he prepared at the time. There was water then running under the embankment through the 42-inch pipe; it came from the Railway spring, and a little through the camp-sheeting. There was no other source for it; and the quantity was considerable. The overflow from the Bidbury springs entered the millpond below the embankment; and the hatches were raised so that the bed of the pond was exposed. In the early part of 1903, he proceeded to put down the cylinder round the Railway spring. It was put down in January, 1903; and its total length was about 16 ft. 6 in.—some 18 inches being above the bottom. The cylinder was in four sections—first a cutting edge, and then a length of 6 feet bolted on to it. The soil within was removed, and the cylinder then sank by its own weight. Its internal diameter was about 4 feet; and the lower portion (about 7 ft. 6 in.) was perforated. The result was that the supply of water was concentrated, and it drew in the water which formerly came through the camp-sheeting; but the total quantity was not affected, so far as could be judged without accurate measurement. A brick wall was built round the cylinder, and from the enclosure thus made a pipe was taken to the 42-inch pipe under the embankment. The soil removed from inside the cylinder was loose gravel.

Cross-examined: He agreed with the evidence of Mr. Eaton as to the character of the springs. Assuming the enclosure of the Bidbury springs increased the flow, he did not see that it would affect the Railway spring. In September, 1902, the upper part of the pond, above the embankment, was dry, except for the water coming from the Railway spring. Water for drinking purposes was taken from the place shown on the plan as "part of the old mill-head." It was not contaminated with surface drainage, which was carried off by pipes. Before Wyatts' spring was enclosed, the water from the Hermitage stream mixed with the body of water in the pond; and he gathered that this was the reason for enclosing the spring, which was before his time. The line of camp-sheeting ran from the boundary of the Railway Company's property up to the bridge. His recollection was that the volume of water from the spring in 1902 was the same as at present. In his opinion, the sinking of the cylinder had not affected it. The spring was 70 feet from the level crossing. A photograph showed the Bidbury west spring. The outside wall was merely a boundary; inside this was another wall, the depth of which he did not know. There was no cylinder. The water was taken direct to the pumping-station from the level of the bottom of the pond, about 2 feet below the top of the spring. In 1902, negotiations were proceeding between the two Companies as to how the water from the Railway spring should be dealt with. Some of the correspondence was read, and witness explained what he meant by the expression "if I am successful in tapping the main spring." He said he did not mean that

he expected to find a new spring; but to concentrate various runnels within the cylinder. Another expression, "It is, of course, problematical if we can tap the spring in this manner or not," had the same meaning. He understood the Railway Company intended filling in the part of the site of the old pond which belonged to them. A letter was sent from the Secretary of plaintiff Company to the defendants in September, 1905, suggesting that the former should purchase any rights the latter had in the spring; and in the Bill of 1909 a provision was inserted for purchasing the land on which the spring rose, and also the water rights. This was opposed by the Railway Company, and was rejected, with many other portions of the Bill. The witness's evidence before the House of Lords Committee was referred to, in which he mentioned a boring at the Bidbury spring, 118 feet deep, and said it affected the flow of water from the adjoining springs. The subway in which the 36-inch main was carried under the railway was nearly constructed before he took office; it was done entirely under the supervision of Mr. Quick.

Re-examined: He attached great importance to the Railway spring as a source of supply. He had experimented with the boring at the Bidbury spring, by cutting it off; and in this way he ascertained that it affected the other springs in the vicinity.

Mr. W. O. Bailey, Works Superintendent to plaintiff Company since 1891, said on entering the Company's service he made himself acquainted with the whole of the sources of supply, as well as the works. The Railway spring was then as shown in the photograph and as described by the previous witnesses. He described the laying of the 36-inch main and the 42-inch pipe over which the embankment was afterwards put. With regard to the puddle being less in quantity on one side of the main than the other in the subway, this was very simply explained. There was a leak in the main, to repair which some of the puddle had to be removed; and it had not been replaced. The only trace of water in the subway was close to the camp-sheeting, and came from small feeders of the spring.

Cross-examined: There was no change in the Railway spring after the Bidbury spring was enclosed. The clay was put in 18 months after the subway was constructed, partly at his suggestion, in order to preserve the main. At that portion it was a steel tube; and it was deteriorating from the damp atmosphere.

This concluded the evidence for the plaintiffs.

THE WELSBACH COMPANY'S TRADE MARK.

Clerkenwell Police Court.—Saturday, Nov. 20.

(Before Mr. BROS.)

As briefly recorded in the "JOURNAL" last week, the hearing of this case was continued on the above-named day. It will doubtless be remembered that it was a summons taken out by the Wolfram (Tungsten) Metal Filament Lamps, Limited, against the Welsbach Incandescent Gaslight Company, Limited, for selling and exposing for sale goods to which, as was alleged, a false trade description had been applied. [See *ante*, pp. 265, 332, 413.]

Mr. RUFUS ISAACS, K.C., M.P., Mr. H. A. COLEFAX, and Mr. ERNEST LUNGE appeared in support of the summons; Mr. A. J. WALTER, K.C., and Mr. BODKIN represented the defendants.

Dr. Otto Oberlander, a consulting chemist and engineer, examined by Mr. RUFUS ISAACS, stated that for a number of years he had followed the development of electric lighting and was familiar with the manufacture of metal filament lamps. He had previously seen the two lamps produced, each of which was marked "Welsbach Auer." His examination of another lamp produced enabled him to say it was made of tungsten or wolfram. The osmium electric lamp was invented by Dr. Welsbach, and patented in 1898. These lamps were introduced into England on a commercial scale about 1903 or 1904. They were put on the market by the German Company, which he had seen called by several names in English publications—the "Auer Gesellschaft," the "Auer Company," and the "Auer Society;" and it was so known in this country. In 1904, a filament of wolfram or tungsten was proposed. The German Auer Company made lamps in accordance with this invention; and they were introduced into England by the General Electric Company. It would be right to describe a lamp of which the filament was made of osmium as the invention of Baron von Welsbach, but not one with a filament of tungsten; the two metals being totally different. He had never heard of the defendants making metal filament lamps.

In cross-examination by Mr. WALTER, witness said he knew that tungsten or wolfram was patented in 1889 for metallic filament lamps; but this did not lead to the tungsten lamp. Asked if he was aware that the name "Auer Gesellschaft" was dropped because of the complaint of the defendant Company, witness replied that it was dropped at the request of the General Electric Company, and the letters "G.E.C." were substituted. He did not know of any lamp, prior to the one now complained of, that had ever been put upon the market with the word "Welsbach" or with the letters "AUR" on it. The word "Welsbach" on merchandize in this country commonly meant goods of the Company, but it did not include electrical goods.

Mr. WALTER: Are you prepared to deny that the letters "AUR" upon merchandize commonly mean merchandize of the Welsbach Company?

Witness: I deny it in connection with electrical goods.

Do you suggest that Dr. Welsbach's inventions with regard to filament lamps were confined to osmium?—I do.

Have the defendants, to your knowledge, ever described the wolfram-tungsten lamp as the Welsbach lamp?—I have seen it so described in many publications; but it was wrongly described.

Mr. Duncan Watson said an advertisement he read conveyed to him the impression that the lamp referred to must be the osmium lamp under the Welsbach name. He formed this opinion because it had on it the words "Welsbach Aur."

In cross-examination by Mr. WALTER, witness said he had not known before he heard it in Court a fortnight ago that the trade mark of the

Welsbach Company was "AUR." He had never seen a lamp labelled "Welsbach" except the one that was put on the market by the defendant Company.

The further hearing of the case was adjourned until next Saturday (Dec. 4).

Water-Works, Lighting, and Power Investment Corporation.

A case came before Mr. Justice Joyce last Tuesday as a "short cause," upon a motion for judgment in a debenture holder's action. Mr. Burgess stated that in September last a Receiver was appointed by way of equitable execution in the King's Bench Division, and on the 8th of October Mr. Justice Neville, sitting as the Vacation Judge, appointed a Receiver of the Company's assets. The plaintiff asked for the usual judgment in a debenture holder's action for accounts and inquiries. Counsel for the Company consenting, his Lordship made the usual order.

Convictions for Stealing from the Gaslight and Coke Company.

At the Old Street Police Court, last Tuesday, Henry Stephen Reynolds and Alfred Ward, both described as "fitters' labourers," employed by the Gaslight and Coke Company at their Haggerston station, were charged before Mr. Biron with being concerned together in stealing and receiving a gun-metal cock, value 15s., the property of the Company. Mr. Humphreys, who prosecuted, said Reynolds had previously been charged with the theft and been remanded. Ward, who had run away from the works as soon as he heard of Reynolds's arrest, had subsequently surrendered himself, and, after being formally charged, was also remanded, in order that the two men might be brought up together. Evidence having been given by employees of the Company, both prisoners now pleaded guilty, and elected to be dealt with. Mr. Humphreys said thefts of a similar description to the one before the Court had proved a source of annoyance and loss to the Company for some time, and an endeavour to find the perpetrators had resulted in the present charge. From inquiries it had been learned that the prisoner Ward had been suspected in a previous situation, and that things had ceased disappearing since he had been discharged. The Company, however, blamed the prisoner Reynolds in this case, as he was a stronger-minded man than Ward, and had, they thought, led him into committing the theft. Mr. Biron said it was deliberate; and he sentenced both prisoners to six weeks' hard labour.

The Barnet Appeal Case.—When referring to this case in the "JOURNAL" for the 16th inst., it was mentioned that it would, in all probability, be taken to the House of Lords. This has been done; and the appeal was presented and read last Tuesday, and the respondents were ordered to lodge a printed case in answer thereto on or before the 5th of January next.

Assessment of the Plymouth Gas Undertaking.—The Plymouth and Stonehouse Gas Company have decided not to proceed with their appeal against the new assessment of the gas undertaking. Referring to the matter at the meeting of the Company last June, Sir Joseph Bellamy stated that the rating authority had advanced the assessment of the undertaking from £5000 in 1901-2 to £10,000, though in the meantime there had been an increase of not more than 25 per cent. in the volume of their business. The Company gave notice of appeal, and the matter was mentioned at the Midsummer and again at the Michaelmas Quarter Sessions; but by consent the hearing was postponed until the January Sessions. At last Tuesday's meeting of the Plymouth Board of Guardians, the Clerk reported that he had received an intimation from the Gas Company that they did not intend to proceed further with the appeal. Mr. Lewis, the Chairman of the Assessment Committee, thought they were to be congratulated on the result of their action. The sum involved was one of £5500, and by dealing with such monopolies the Committee were doing something which should be commended. The income from the amount in question was equivalent to a rate of 1d. in the pound; and the increased assessment of other monopolies would probably yield another halfpenny.

Death from Gas Poisoning.—At Hornsey, a verdict of "Death by misadventure" was returned in the case of William Turner, aged 89 years, an iron puddler and an old-age pensioner. It was stated that it was deceased's custom to have a gas-jet lighted in his bedroom during the night. He was found in bed unconscious, suffering from coal gas poisoning; and he did not recover. The Coroner said that no doubt the man thought he had turned off the gas.

Improved Public Lighting in Southwark.—At the meeting of the Southwark Borough Council last Wednesday, the Works Committee reported that instructions were given in July last to the Borough Engineer to fix, by way of experiment, a number of new inverted gas burners (brought under their notice by the South Metropolitan Gas Company) on the lamps in Borough High Street. The experiment had proved satisfactory. With the exception of a very few cases, all the lamps of the Company in the Borough were fitted with No. 4 burners. The cost of these at present for light and maintenance was £3 2s. 10d. If the new inverted burner was fitted, the cost would in future be £2 19s. 6d., or a reduction of 3s. 4d. per lamp per annum. To obtain this result, however, it would be necessary to expend 3s. 1d. on each lamp for the purpose of conversion; so that, in the first year there would be a saving of only 3½d. per lamp. The present illuminating power of the lamps was 80 candles; but with the new burner it would be 120 candles. The Committee also proposed to do away with the compressed gas-lights at the London Bridge Approach, and substitute double inverted burners with an illuminating power equal to 240 candles. The cost of the compressed-gas system at the present time was £7 2s. 6d. per lamp per annum; whereas that of the double inverted burner lamp would be £5 5s. The Council resolved that all the lamps in the borough should be fitted with the new inverted burners, and that double inverted burners should be substituted for the present compressed-gas lights at the London Bridge Approach.

MISCELLANEOUS NEWS.

THE EXPLOSION AT THE GENEVA GAS-WORKS.

Restoration of the Works and Gas Supply—Cost of the Explosion.

Our readers may remember that towards the end of August last a serious explosion, unhappily attended by the loss of a number of lives, occurred at the Geneva Gas-Works. The extent of the damage done was partially shown in the reproduction of a photograph which accompanied the few particulars of the accident we were able to give at the time, and more fully in the "JOURNAL" for the 14th of September. Further light is thrown on the disastrous affair by the following extracts from a report which was recently submitted to the Municipal Council of Geneva, and which is contained in the current number of the "Journal de l'Eclairage au Gaz et à l'Electricité."

The work of clearing away the ruins of the demolished building [the purifier-house] was commenced on the very evening of the accident, and pushed on with the utmost activity. Great care had to be exercised, as the remains of the ferro-concrete ceiling of the house had to be taken down without damaging the purifiers and pipes beneath. As soon as this work was sufficiently advanced, attention was directed to the repair of the broken pipes; and these were joined up so that gas could be sent out without passing through a station meter or governor. The repair of the travelling crane for raising the purifier lids and the purifiers themselves was next undertaken; and then the roofing, doors, and windows were looked to. While this was going on, the retort furnaces were kept hot, though no gas was made; and the carburetted water-gas plant was examined and put into working order.

As soon as the repair of one of the purifiers had progressed sufficiently to allow of it being available in three or four days, gas making was resumed. On the 9th of September, the furnaces were heated up to their normal temperature, the water-gas plant was started, and the small holders (of 140,000 and 176,000 cubic feet capacity respectively) were filled. In the afternoon of that day, the governors for two of the districts were opened, and as soon as the pipes had been cleared of the air they contained, the supply of gas was restored, and the public lamps lighted. Next day gas was available for all the consumers in the city and suburbs; and the following morning (Sept. 11) it could be sent to the outlying communes. The stoppage of the works had lasted seventeen days. The work of setting the plant in order and conveying the gas to the consumers was difficult, and caused considerable anxiety to those who carried it out. Fortunately, thanks to the precautions taken, to the number of notices sent to the consumers, and to the prudence exercised by them in consequence, no accident, so far as is known, occurred in this connection.

Though the supply of gas has been restored, the situation is still critical. At the time the report was presented, great difficulty was experienced in carrying on the works, because from 1½ to 2½ million cubic feet of gas had to be supplied daily with the aid of the two small holders. This could only be done by carefully regulating the make of both coal and water gas as far as possible to the consumption. Since working has been resumed, a new governor has been fitted up and brought into use, and a new station meter installed. Things will not, however, have been restored to their normal condition until the large holder, of 530,000 cubic feet capacity, is in working order.

With regard to the cost of the accident, the damage done to the buildings and plant that were insured against fire and explosion, with the expense incurred in clearing the ruins, is estimated at 108,842 frs. (£4354). The city is its own insurer for half the damages, and the other half was in the hands of three Insurance Companies, who have paid 51,421 frs. (£2057) without raising the least difficulty. The remainder will be taken from the funds of the industrial fire insurance services of the Municipality. The cost of repairing the large holder, which was not insured, will also be paid out of these funds. The amount required will be about 70,000 frs. (£2800); and it will have to be gradually paid back into the fund. As to the other damages to the works and plant not covered by insurance, their repair will be charged to the maintenance account; and it is expected that the cost will be defrayed in one or two years.

Apart from the damage to the works, there was the regrettable loss of life. With respect to the families of the victims of the explosion, the law of employers' liability exacts payment of compensation to them. Claims were made in five cases, amounting to 6000 frs. (£240) per workman; but at the date of the report all had been, or were about to be, settled. In addition to the payment of the amounts legally due, and defraying the expenses of the funerals, attending the injured, and other incidental charges, everything necessary was done to assist the bereaved families. Thanks to the spontaneous outburst of public sympathy which followed the disaster, a sum of about 68,500 frs. (£2740) was placed at the disposal of a Committee specially appointed to deal with the requirements of the distressed families; and they are now engaged in administering these funds. There are five widows and eighteen children (twelve under eighteen years of age) to be assisted; and something will have to be done for the families of the men who were not actually connected with the gas-works. All these will receive their due share of the amount voluntarily subscribed.

The claims made in respect of damages to buildings outside the works, as well as for compensation for injuries sustained by persons more or less directly as the result of the explosion, were, at the date of the report, under investigation by legal experts, whose decision was then awaited before the claims were dealt with.

Water-Works at Baku.—The British Vice-Consul at Baku reports that the Russian Government have authorized the Baku Municipality to negotiate a loan of 26,500,000 roubles (about £2,797,000), bearing interest at 5 per cent., over a period of 49 years, for the purpose of bringing fresh water to the town.

ROCHDALE AND THE TEST BURNER.

The proposal of the Rochdale Corporation to amend by Provisional Order the Rochdale Improvement Act of 1872, so as to provide, in regard to the testing of gas, for the substitution of the "Metropolitan" No. 2 argand burner for that now in use, formed the subject of a Local Government Inquiry held at the Town Hall last Thursday.

The TOWN CLERK (Mr. W. H. Hickson), in his statement, pointed to the changes and improvements that had been made in gas manufacture and lighting, and added that it was not proposed to reduce the candle power to 14, as was now becoming common. The increased use of gas for heating, cooking, and motive power, and the extensive use made of the incandescent mantle, rendered calorific power more important to the consumer than illuminating power. The change of burner for testing would be of assistance to the Corporation in providing gas of higher calorific power at possibly slightly reduced expenditure.

Mr. BLOMLEY asked if the Order could abrogate an Act of Parliament.

Mr. F. J. WILLIS (the Local Government Inspector) replied that a Provisional Order had the same authority as an Act of Parliament.

Mr. BLOMLEY inquired if the Corporation could reduce the candle power by the Provisional Order to any minimum they liked.

The INSPECTOR replied in the negative; adding that there was no proposal to reduce the candle power, but only to alter the testing burner.

No further points were raised, and the inquiry closed.

INCREASED STORAGE AT BURNTISLAND GAS-WORKS.

Inauguration of a New Gasholder.

Last Thursday afternoon, a new holder, of 100,000 cubic feet capacity, which has been erected by the Barrowfield Iron-Works, Limited, of Glasgow, at the gas-works of the Burntisland Corporation, was inaugurated. The tank, constructed of mild steel, is 75 ft. 6 in. diameter, and 25 ft. 6 in. deep. The holder is 72 feet in diameter, and 25 feet high, and is on the Gadd and Mason spiral-guided principle. The cost of the holder and tank has been £1840. The work has been under the supervision of Mr. A. Ross, the Manager, who also did the excavation and the laying of the concrete foundation. The storage accommodation at the works is now 150,000 cubic feet. The need of a new holder will be apparent when it is stated that hitherto the storage capacity has been only 50,000 cubic feet, and that the maximum daily make has been 95,000 cubic feet. The provision is now so ample that there will be no longer any fear as to the supply of gas running short, as was the case last winter. It is estimated that, taking into account the extra demands for gas for cooking and heating purposes, the new holder will be sufficient to provide for the wants of the burgh for twenty years. There is reason for gratification that the cost of the holder will not add to the price of the gas.

The members of the Town Council met at the gas-works, and after a round of inspection, in which everything was found to be in a satisfactory condition, Mr. Ross called upon Provost Ferguson to turn on the gas. Provost Ferguson expressed the pleasure of the Town Council, as the Gas Commissioners, at seeing the new holder so efficiently and expeditiously completed, in time for the winter's necessities; but as the work had been mostly executed during the term of office of his predecessor, ex-Provost Wallace, he thought the opening ceremony should also be performed by him; and he chivalrously called upon that gentleman to turn on the gas. Mr. Wallace thanked the Provost and the Council for the honour thus conferred upon him, and expressed the hope that the new holder would relieve the anxiety which had been so often experienced during the winter months of there being a shortage of gas. This fear was now at an end; and the Contractors were to be congratulated on having made a most excellent job of the holder, and having carried it out within the specified time. Mr. Wallace then turned on the gas. Mr. Laidlaw, the representative of the Contractors, expressed the great satisfaction they had in completing their contract with the Commissioners, and referred to the kindly help and assistance they had received from Mr. Ross, the energetic Gas Manager, who had done much to help them to complete their work so expeditiously. He presented Mr. Wallace with a souvenir of the occasion in the shape of a bioscope and a piece of jewellery for Mrs. Wallace, remarking that it gave him great pleasure to do so, as the work had been carried out under the most pleasant conditions, and with perfect harmony and good feeling.

THORIUM NITRATE AND MONAZITE SAND.

[From the "Sunday Times."]

A few months ago we stated that the thorium and monazite market had been completely ruined. Since then prices have still further receded. Thorium nitrate, which two years ago was quoted at 53s. per kilogramme, a year ago at 32s., and last spring at 26s., is now dealt in at 22s. No improvement is in sight, for this article is manufactured by about a dozen competing firms, instead of four, as formerly. In addition, sales to the United States have ceased, for the duty has been raised from 25 to 40 per cent. There are large monazite deposits in the States, so that even at the present low European prices competition in America is practically impossible. The cause of this condition is the superfluity of monazite sand, which used to come exclusively from Brazil, where Mr. Gordon, an American, owned all the mines. Later on the Hamburg firm of A. C. de Freitas took over some monazite mines from the Brazilian Government. Finally, a Paris company obtained large monazite deposits in Brazil. In the result, there are 11,000 tons of monazite sand in Europe—sufficient for five years' consumption, or, if we exclude America, for seven years.

The Federal Government of Brazil some time ago imposed a 50 per

cent. tax on monazite sand. Mr. Gordon declined to pay this tax, and began an action at law. He recently won his case, and is now free of tax. The Paris company also began an action; and they have now so far won their case that they have to pay only a very small tax. This enables monazite sand to be exported cheaply. The cost of production of a ton of monazite, containing 5 per cent. thorium, is £7 to £8. To this must be added the tax, which, however, is only heavy for Messrs. de Freitas.

Two new big monazite deposits have been discovered within the last year—one in the North Transvaal, the other in German East Africa. The Transvaal deposits have so far not been worked, owing to transport difficulties, which, however, are being removed. The East African deposits are near Morogoro, which is just being reached by the railway, and where, consequently, work will now begin. A third deposit has recently been located in the Transvaal, where monazite sand is found in conjunction with tin. Monazite will be won as a bye-product.

The demand for monazite sand is limited. It is principally used for incandescent gas mantles; but this branch of manufacture is not progressing, owing to the competition of the electric metal incandescent lamps. The result is the decline of the thorium nitrate production. One large producer—an Austrian factory—has discontinued the sale of thorium owing to the low prices; and the largest concern, the Deutsche Gasglühlicht Company, in its last annual report, confirms the severe depression prevalent in the thorium industry.

LONDON COUNTY COUNCIL AND SMOKE ABATEMENT.

Proposed Amendment of the Public Health Act.

The London County Council have given notice of their intention to apply to Parliament next session for various powers; and the Bill to be promoted will contain a section dealing with the smoke nuisance. They will ask for the amendment and extension of section 24 of the Public Health (London) Act, 1891, and for the application of its provisions to chimneys sending forth smoke of any colour, and to define the expression "chimney" in the section (as proposed to be amended by the intended Act) as including any opening through which smoke is emitted from any building or place. The Council also wish to extend and apply all or some of the provisions of the above-named Act relating to smoke consumption and the abatement of the smoke nuisance (with such variations as may be specified in the Bill) to chimneys, fireplaces, and furnaces used in buildings or places in which operations are carried on under statutory powers, or which belong to, or are used by, the Crown, and to the premises in or upon which the same are used. Authority will be sought for the Council, at the request of any sanitary authority, to enforce or assist in enforcing (either by contributing to the cost of proceedings or by joining in or taking proceedings) all or any of the provisions referred to, as varied under the intended Act. The Council will also ask Parliament to extend and apply (if and so far as may be necessary) these provisions, or some of them, as varied to chimneys, fireplaces, and furnaces belonging to, or used by, sanitary authorities, and the premises in or upon which the same are used; and to empower the Council, whether by extending section 22 of the Act of 1891 or otherwise, to enforce and carry into effect the provisions against such sanitary authorities. Authority will be required for the Council to take proceedings in cases of nuisance from smoke arising outside the county; and to expend moneys in the investigation and advancement of measures for the abatement of the smoke nuisance.

THE SMOKE PROBLEM IN GLASGOW.

The attention which is being directed to the subject of the smoke pollution of the atmosphere in Glasgow, referred to in "Notes from Scotland" recently, has not been allowed to drop. There have been letters published in the "Glasgow Herald," a leading article by the Editor, special articles by Mr. Henry M. Sayers, M.Inst.E.E., and Mr. R. M. Neilson, A.M.I.Mech.E., and a discussion in the Town Council upon it.

As to the letters, they are, as letters which are mostly anonymous always are, somewhat erratic, though some of them—those which are signed particularly—contain information and ideas which are quite worthy of attention. The correspondence, in the earlier period, was remarkable for the unanimity with which the writers supported the view that the gas-stove is destined to play a large part in the improvement of the condition of the atmosphere. The repeated assertion of this view seems to have had the effect of bringing the advocates of electricity into the discussion, for there have been, within the last few days, several letters advocating the adoption of electricity for all household purposes. One writer suggests the use of gas for firing the steam-boilers in electric-stations; and his reflection upon the subject is quite refreshing. He states that "the first cost of using gas for this purpose would be higher than coal; but the saving in labour and the clearer atmosphere would repay us, and would help to solve the problem which will before long trouble our civic rulers, of 'what to do with our gas.'"

In one of the letters, signed by Mr. D. M. Stevenson, who is a coal merchant, has been in the Town Council for many years, a Magistrate of the city, the City Treasurer, and who is a member of the Gas Committee, it was stated that in 1898-99 he got the Corporation to establish and organize a Chemical Department. The two main reasons he gave for having a highly qualified chemist entirely at their disposal were: (1) The need for an expert to assist the Sanitary Department's efforts for the abolition of smoke and the purification of the atmosphere; and (2) the reduction of the loss involved in the purification of the river by the utilization of the manurial properties of the sewage. The Committee have, the writer goes on to state, pointed out again and again the advantages in this connection of using gas-fires and gas-cookers; and a large number of these are already in use, thanks to the efforts of the

Gas Department. The improvements in these appliances have been so great in recent years that he considers it is time that the Corporation gave another exhibition of the latest inventions; and this would be proposed at the next meeting of the Gas Committee. He suggested to the late Mr. Foulis the desirability, when erecting the new works at L'ovan, of giving facilities to small manufacturers to establish works in the neighbourhood, to which power gas would be supplied at a low rate. He had called his successor's attention to the matter on various occasions; and last year he was instructed to look into the whole subject and report. He learned from him that he had gathered much information regarding it, which would be put before the Gas Committee on an early date.

In the leading article by the Editor, there is the startling reference to "the sixty or so tons of deleterious solids which some 1200 factory chimneys and innumerable domestic flues are daily shooting into our atmosphere." As an argument in favour of smokeless fuel, it would be difficult to find anything finer than the passage in which the writer states that: "By absorbing nearly all the actinic quality of daylight, smoke and fog deprive the body of the only possible antidote to their poisonous effects, and the vitality is still further reduced by the difficulty of keeping the person and apparel perfectly clean. The low bodily tone affects the mind, which, still further depressed by a dingy environment and the consciousness of surrounding squalor, not only reacts upon the body, but insidiously affects the moral sense by weakening the stimulus of optimism. And thus we have a vicious circle of enervating influences, which plainly reduce both the economic efficiency and the healthy joy of life, and which have certainly not a little to do with the resort of many of our people to pernicious or degrading excitements."

The special article by Mr. Sayers was entitled "Clean Industrialism—Forecast of a Smokeless Future." The writer condemned the use of raw coal, and went on to state that the fact that gas and coke can be burned smokelessly is a commonplace of three generations, but that it has not done very much yet towards replacing raw coal. The reasons why it has not done so are founded on the original idea of using coal gas as a convenient and even luxurious lighting fuel, and in the consequent statutory regulations for ensuring high illuminating power, low and regular supply pressure, and a high standard of purity in certain respects. Consequently, illuminating gas as supplied in cities and towns is not a cheap fuel, although a very clean and convenient one. He goes on to state that a gas manufacturer has no inducement to study the quality of the coke produced. It is gas that is wanted; and maximum gas production is not conducive to certain qualities valued in coke. Hence gas coke is of no value for foundry or blast-furnace purposes, and is not so good a domestic fuel as it might be made if it answered someone's purpose to do it. It is, he considered, to the modern coke-oven near the pit's mouth that the industrial city of the near future will owe its advantages of smokelessness and cleanliness. Mr. Sayers went on to state that the gas-engine is now a reliable and effective machine up to quite large sizes; and for a given consumption of coke-oven gas it will give out at least twice as much power as any set of steam boilers and engines. So the full power value can be got from gas-engines distributed electrically; and assuming a colliery coking the whole of its output, it was reasonably certain that the whole power needed for the colliery, on the surface and underground, could be supplied from the coke-oven gas. Therefore, on a colliery, no raw coal need be consumed nor smoke produced. The colliery output would then be coke; and with it the whole of the power, heating, and lighting might be produced electrically in factories, houses, and streets, as required. To the advantages of clean air and a smokeless sky would be added those of no coal dust, no ashes, and no ugly chimneys. If actual fuel were wanted for certain manufacturing operations, water gas, enriched if necessary, and supplied at an economical pressure, could be locally produced from the coke. He concluded that, "with a properly organized use of our existing resources on some such lines as indicated, it was quite possible that this country could be made and kept as good a place to live in as any part of the civilized world, and that its industries and activities might be purged of the greater part of the squalor, dirt, disease, and physical discomfort which now seem inevitably attached to them."

In the last Glasgow Town Council, a motion was submitted by Bailie Paxton, the Sub-Convener of the Gas Committee, proposing a remit for a report on the practicability of all Corporation departments being instructed to adopt in rooms and offices smokeless means of heating. After discussion, in which the merits of heating by gas were favourably commented on, the motion was adopted.

THERMAL VALUES OF COAL, GAS, AND ELECTRICITY.

There appeared in the "Glasgow Herald" on Monday of last week the following article by Mr. R. M. Neilson, A.M.I.Mech.E., written in view of the smoke abatement discussion.

The argument is often put forward that coal in a domestic fire-place is most wastefully burned. Grates vary among themselves. Some types are such bad agents for room-heating purposes that it is difficult to imagine how they have been evolved; others are very much better, and reflect great credit on their designers. Gas and electricity lend themselves to a more efficient use for house heating and cooking purposes—especially the latter. It is not the purpose of this article to discuss the design of coal-fires, gas-stoves, or electric radiators, or even to sum up the advantages and disadvantages of them, but to deal with only a small portion of the subject—a portion, however, about which there appears to be much want of knowledge, if not misconception. Leaving aside cooking and other special domestic heat-consuming operations, which require more elaborate treatment, it is desired, firstly, to point out how much more efficiently must coal gas and electricity respectively be used than coal before each can, at present prices, compete with coal in point of cost for house-warming purposes.

A special correspondent of the "Glasgow Herald" has written three articles upon the subject, and sums up with the remark that it appears to him that the problem of smoke abatement in the city is

capable of practical solution in the following ways, consistent with reasonable economy: (1) For steel and iron manufacturers and large steam users for power purposes, the manufacture and use of producer gas; (2) for moderate steam users and for all heating in comparatively small establishments, the use of Corporation gas at a flat-rate of not more than 1s. 8d. per 1000 cubic feet, or for power purposes alone, electrical energy at a flat-rate not exceeding 0.67d. per kilowatt hour; and (3) for cooking purposes and for domestic and office warming, Corporation gas or other gaseous fuel at a flat-rate of not more than 1s. 4d. per 1000 cubic feet. Under these conditions, the writer considered, the authorities should be able to abolish the practice of burning raw coal, or at all events have power to compel all coal users to keep a smokeless chimney top. The Sub-Committee on air purification of the Corporation Health Committee had before them on a recent occasion a report by Mr. F. W. Harris, the Corporation Analyst; Mr. P. Fyfe, the Sanitary Inspector; and A. Wilson, the Gas Engineer, on the effect which a more general adoption of gas-firing in dwellings and premises in the city would have on the atmosphere. The report was altogether favourable to the use of gas, in respect of efficiency, cleanliness, and cost. The report is to be submitted to the Corporation. Mr. D. M. Stevenson has given notice in the Gas Committee of his intention to move "that, with a view to the diminution of the smoke nuisance, it be remitted to the Sub-Committee on the Hire and Sale of Gas-Stoves to make arrangements for the holding of an exhibition for the purpose of showing the public the most up-to-date appliances for the utilization of gas for heating, cooking, and shop-lighting purposes, and that the Electricity Committee be asked to co-operate."

Comparative Statistics.

Table I. gives in the first column the cost of coal in shillings per ton, and in the second column the corresponding number of British thermal units contained in a pennyworth of coal. The coal has been taken as having a heat value of 13,000 B.Th.U. per pound. Coal, of course, varies in thermal value; if it is desired to consider the case of coal having a thermal value greater or less than 13,000, a modified table can easily be constructed.

TABLE I.—THERMAL COST OF COAL.

Cost of Coal per Ton.	B.Th.U. per Penny.
10 shillings	243,000
14 shillings	173,000
18 shillings	135,000
22 shillings	110,000
26 shillings	93,000

Table II. corresponds to Table I., but refers to coal gas. The first column gives the cost in cubic feet, and the second column the heat units obtained for a penny. The gas has been assumed to have a calorific value of 600 B.Th.U. per cubic foot.

TABLE II.—THERMAL COST OF COAL GAS.

Cost of Gas per 1000 Cub. Ft.	B.Th.U. per Penny.
1s. 6d.	90,000
1s. 6d.	90,000
2s. 6d.	45,000
2s. 6d.	45,000
3s. 6d.	30,000
3s. 6d.	30,000

Table III. refers to electricity, and is self-explanatory.

TABLE III.—THERMAL COST OF ELECTRICITY.

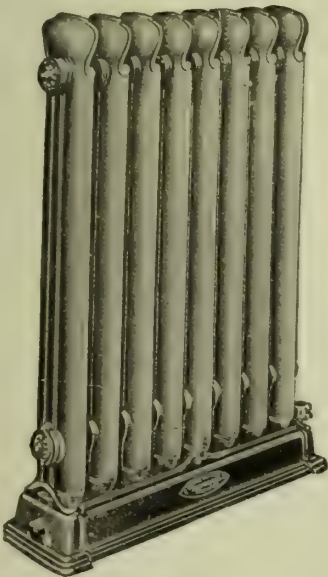
Cost of Electricity per B.T.U.	B.Th.U. per Penny.
3d.	1397
1d.	4191
1d.	4191
2d.	2145
3d.	1430
4d.	856
6d.	571

It will be seen that, in order that heating by coal, gas, and electricity respectively may be equally costly, the heating by coal must be extremely inefficient. Comparing, for example, coal at 2s. per ton with gas at 2s. per 1000 cubic feet, and electricity at 1½d. per unit, it will be seen that the heat value of a pennyworth of coal is 4¼ times as great as that of a pennyworth of gas, and 48 times as great as that of a pennyworth of electricity.

For cooking—or, at least, in certain cooking operations under certain conditions—and for some other domestic purposes, the waste with a coal-fire, considering the heat from the latter as wasted except as far as it is utilized for the particular purpose in question, may be enormous; and gas often, and electricity occasionally, may be advantageously employed for reasons of pure economy, as well as for convenience. Such cases are not, however, being considered. For house warming purposes it will be seen that the efficiency of a coal-fire must, at the prices assumed, be only 2 per cent. of that of an electric radiator, and only 23 per cent. of that of a gas-stove, to have equal running costs.

To express much the same idea in other words, it may be said that if the coal, gas, and electricity were made to produce their heat under similar conditions, the cost of the electric heating would be about fifty times, and that of the gas heating between four and five times as great as that of the heating by coal. It may be said that this statement is not confirmed by practice. The figures, however, are indisputable; but in practice the conditions are usually not the same in the case of the three heating agents. There is generally much more ventilation with a coal-fire than occurs when gas or electricity is employed. The same ventilation could be obtained with either of the two latter; but the cost of doing so is usually grudged. The hygienic question cannot be discussed here.

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The Davis Gas Stove Co., Ltd., LUTON.

Future of Gas.

The next question to be considered in this article is that of the possibilities in the future. Coal will probably never fall in price much below—though it may rise above—the average of the last few years. What can be expected as regards reduction in cost of gas and electricity? The gas obtained from coal by the usual process adopted in gas-works contains about 15 to 25 per cent. of the heat units contained in the coal. For example, in the Glasgow Gas-Works in the working year 1908-09, 10,000 cubic feet of gas were made, and 9000 cubic feet sold, per ton of coal carbonized; and the calorific value of Glasgow gas is about 600 B.Th.U. per cubic foot.

Moreover, the coke which is left in the retorts after the gas has been driven off—minus that portion of the coke which is thereafter required for firing the retorts—has a thermal value equal to about 40 to 50 per cent. of the original thermal value of the coal. The process of coal-gas manufacture is, therefore, good from a thermal point of view, as comparatively little heat is wasted. The price of coal gas is, however, determined not only by the necessary thermal losses in the manufacture, but also by the labour and plant required in the manufacture, purification, and distribution of the gas. There are possibilities in the matter of reduction in the price of gas due to lowering these expenses; and, as is well known, the price of gas has been gradually coming down. If the expenses of manufacture, distribution, &c., could be reduced till they were covered by the receipts obtained from the coke and other bye-products, then the 9000 cubic feet of gas which are available for sale for every ton of coal carbonized could be sold for the price of the coal—viz., 11s.—that is, at the rate of 12s. (say, 1s. 3d.) per 1000 cubic feet.

Whether coal gas can ever be sold in the district at this price may be questioned; but it would certainly be foolish to hope for any reduction much below this figure. If, however, coal gas, having a thermal value of about 600 B.Th.U., could be sold at 1s. 3d. per 1000 cubic feet, 40,000 B.Th.U. would be obtained for a penny—the gas on a calorific basis being thus only 2·75 times as dear as coal at 22s. a ton, or 3·37 times as dear as coal at 18s. a ton—and, with the greater adaptability of gas, the latter could probably be substituted very effectively for coal for the heating of rooms. In the matter of cooking and for certain other domestic work, gas has, of course, special advantages over coal, which it is not the purpose of this article to deal with.

Electrical Possibilities.

Now consider the case of electricity. In the production of electricity in steam electric-power stations, the heat energy in the coal is employed to generate steam, which is then employed to operate engines—now usually steam-turbines—which drive electric generators, which, in their turn, supply electric current. Before, however, this electric current is given to consumers, it is frequently transformed to a lower pressure. To obtain heat from the electric current, the latter is passed through an electric radiator.

All these processes involve loss, even if the plant and appliances have good efficiencies. Some modern electric-power stations are run very efficiently; but the inherent losses during the several steps or energy-conversions are such that, even with the best plant, most economically worked, only a small fraction of the original heat energy in the coal appears again as heat in the radiator.

A steam-boiler at the best cannot be expected to generate more than about 9 lbs. of steam per pound of coal of (say) 13,000 B.Th.U. thermal value; and from each pound of steam only about 400 B.Th.U. could be converted into useful work in a steam-turbine, even if there were no loss whatever in the latter, and 250 B.Th.U. would represent very good practice. Therefore, we cannot expect the electric generator to receive

more than $\frac{9 \times 250}{13,000}$ = about 17 per cent. of the heat energy of the coal; and we have further losses in the generator, the mains, and the radiator, and possibly also a substantial loss in conversion to a lower electrical pressure, to allow for. We cannot, therefore, at the very best, expect to obtain more than about 10 per cent. of the heat value in the coal to be given off as heat in the electric radiator.

As a matter of fact, the Glasgow Electricity Department the last working year used 5·25 lbs. of coal per B.T.U. of electricity sold (this coal consumption comparing favourably with other electrical undertakings). A unit of electricity is equivalent to about 3425 B.Th.U.; so that, if the coal had a thermal value of 12,000 B.Th.U. per pound, the heat obtained from an electric radiator would be less than 5½ per cent. of the heat in the coal used to produce the electricity. It will be seen from this that, even if the costs in connection with the generation and distribution of electricity could be considerably reduced, electric house-warming would still be extremely expensive compared with house-warming by coal.

Table IV. gives a comparison of gas and electricity, based on the last annual reports of the Glasgow Gas and Electricity Departments.

TABLE IV.—THERMAL COMPARISON BETWEEN COAL GAS AND ELECTRICITY.

	Electricity.	Gas.
Coal to produce 1000 B.Th.U. (lbs.)	1·53	0·417
Cost of the coal (pence)	0·073	0·0245
Thermal value of the coal (B.Th.U.)	18,400	5420
Percentage of heat of this coal which appears in electricity or gas (per cent.)	5·45	18·5

[In gas manufacture there is, of course, also the large heat value in the coke to be taken into account.]

It will thus be seen that, while gas offers good prospects of taking the place of coal for house-warming purposes, the employment of electricity for such uses must always be very expensive; and electric heating, though useful in special cases, will never be sufficiently economical to justify its extensive use.

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PORTSMOUTH WATER COMPANY.

The Railway Spring Litigation.

The Half-Yearly General Meeting of this Company was held last Thursday—Mr. W. GRANT, J.P., in the chair.

The report presented showed that the revenue for the six months ended the 30th of September was £37,946, and the expenditure £14,989; leaving £22,957 for transfer to the profit and loss account, bringing it up to £28,303. Full statutory dividends were recommended, the payment of which would leave £8676 to be carried forward. There had been the usual extension of street service mains and of consumers; making a total of 63½ miles of trunk mains, 162½ miles of service mains, and 49,671 premises under constant supply.

The CHAIRMAN, in moving the adoption of the report, expressed regret at the recent death of Sir John Baker, one of the Directors. Referring to the new filtration and service reservoirs, which the Directors had every hope would be completed by the 31st of December, in compliance with the terms of their Act of 1906, he said they had already paid £54,500 out of the contract price of £73,000. The works were making excellent progress; and they believed the extras would be only a very moderate sum. As to their action against the London, Brighton, and South Coast Railway Company,* on which Mr. Justice Parker had reserved judgment, in regard to the right to a certain spring at Bedhampton, they had already paid £750; but the shareholders must not think the matter was now settled, though if they obtained judgment in their favour the Railway Company would have to pay a large proportion of their costs. They had also had to provide a steel main sewer and make other provisions at their Bedhampton works to conduct the surplus water along the Hermitage stream, where the flow from the hilly surrounding country had been no less than 270 million gallons in 24 hours. But the work was imperative for the purity of their springs.

The DEPUTY-CHAIRMAN (Colonel C. Lanyon Owen, J.P.) seconded the motion.

Mr. BALL hinted that some remuneration ought to be made to Mr. Ashley, the Engineer, for his design of the filtration scheme.

The CHAIRMAN pointed out that, though the Directors were not unwilling to recognize the services of Mr. Ashley, the plans of the latter had at the outset been submitted to Mr. Charles Hawksley.

The motion was carried unanimously; and the usual complimentary vote of thanks to the Chairman, Directors, and staff brought the proceedings to a close.

* A report of the case will be found in our "Legal Intelligence."—ED. J.G.L.

Owing to a breakdown at the borough electricity works yesterday week, a great part of Woolwich was plunged in darkness at about 7.30 in the evening. All the street-lamps were extinguished, and many business premises had to be closed.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

In the Glasgow Town Council on Thursday, the Gas Committee reported that, at a meeting of the Committee on the 19th inst., Mr. D. M. Stevenson moved that, with a view to the diminution of the smoke nuisance, it be remitted to a Special Committee to make arrangements for the holding of an exhibition for the purpose of showing the public the most up-to-date appliances for the utilization of gas for lighting, heating, and cooking purposes, and that the Committee on Electricity and the Sub-Committee on Air Purification be invited to co-operate. The Committee approved of Mr. Stevenson's motion, and recommended that the Special Committee should consist of 15 members—six from each of the Gas and Electricity Committees, and three from the Committee on Air Purification. In the Town Council, Mr. M. W. Montgomery moved the approval of the minute. He stated that the question of air purification had excited great interest among the citizens, and the recent visitation of fog had increased it to a considerable extent. He hoped the Corporation shared this interest, because it was to the Corporation that the community looked very largely for the solution of the problem. They proposed to hold an exhibition somewhere in the centre of the town, where they would have a display of all kinds of exhibits and appliances for smokeless fuel. The Corporation would agree, he thought, that such a display was desirable. There could be no doubt that a great deal of information could be supplied on this question, which at present was not available to the citizens. He did not think that the expense would amount to much. In any case, they proposed to divide the expense between the Gas and Electricity Committees. Indeed, he did not think the expense would amount to very much more than the gas and electric current they would require for the display. He was quite sure that an exhibition of this kind would go far to solve many of the questions which were at present occupying a place in the Public Press and in public discussion elsewhere. It was said there was great rivalry between the Gas and Electricity Committees. He hoped there was, because only by such rivalry could they obtain the best results on the question. Mr. D. M. Stevenson, in seconding, suggested the deletion of the words "for the utilization of gas." Correspondence in the newspapers showed that there were possibilities in the use of anthracite and Coalite which were worthy of consideration, and they should be free to adopt suggestions. The minute was adopted. Treasurer Graham agreed that something should be done to try to diminish the smoke nuisance; but he thought that the fog of the previous week, and the difficulty of getting gas, had put the question back for a considerable time. He had heard of people having to dispense with gas-fires because of the insufficiency of the supply of gas.

Lord Salvesen, in the Court of Session yesterday, gave his decision in counter-actions relating to a gas-engine, which contained so many points that to recount them all would require more space than the

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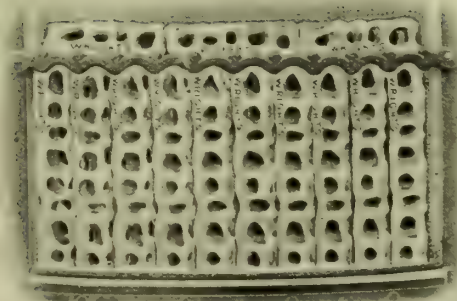
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question at issue is worth for readers of the "JOURNAL." The engine was by a M. Cateau, a Frenchman. In 1904, Mr. Hubert Graham, who had had considerable experience with gas-engines, entered into negotiation with Messrs. D. Stewart and Co. (1902), Limited, of Glasgow, for the manufacture and sale of the engine in the United Kingdom. A 12-H.P. engine was subjected to certain tests with the view of satisfying Messrs. Stewart of the merits of the invention; and these resulted in two agreements being entered into. Under the one Messrs. Stewart acquired the right to the patent rights in the United Kingdom, and under the other Motor Plants, Limited, of London, whose business, Lord Salvesen said, was substantially conducted by Mr. Graham, were appointed agents for the sale of the engines. In the leading action, Motor Plants, Limited, sued Messrs. Stewart and Co. for £15,000 as damages for breach of contract; and in the counter-action Messrs. Stewart sued Motor Plants, Limited, for £3950 as the price of engines supplied to Messrs. Derry and Toms, of Kensington. As his Lordship read the record, the claim of the pursuers in the leading action seemed to be made on the footing of there having been a continuous breach of contract, resulting, as was now alleged, in such loss to the pursuers that they were ultimately forced into liquidation. It was true, Lord Salvesen said, that Cateau engines had been commercially successful on the Continent; but all these engines were of small size, and not such as the defenders in their agreement with the vendors of the patent ever proposed to manufacture, and there was no evidence at all that Cateau engines above 35 H.P. had been made which had been commercially successful. That loss and disappointment were caused to both during the subsistence of the agency was manifest; but, so far as the pursuers were concerned, it seemed to have been mostly due to their own unbusiness-like conduct, and to the ultimate failure of the Cateau engine to fulfil the expectations which the patentees cherished. Lord Salvesen arrived at the conclusion that the pursuers (Motor Plants, Limited) had failed to prove a single instance in which the defenders had failed to implement any contract which they made with the pursuers. In the leading action, he therefore gave Messrs. Stewart absolvitor. In the counter-action, in respect that one of the four engines had been taken back by Messrs. Stewart, he deducted the price of it—£865; and making a deduction of £300 for parts of another engine undelivered, he gave decree for £2735. Messrs. Stewart were found entitled to expenses in both actions.

The Gas Committee reported to the Falkirk Town Council last week that an offer had been received for the site of the old gas-works. The subject was remitted to the Committee for consideration. Bailie Dillon said he regretted very much to have recourse to such a step as to make a public statement in regard to being almost insulted at that Board through one of their officials. They were discussing the reduction of the staff at the gas-works, and the Engineer said he could not do without a certain man, as was proposed by some members who were good authorities. A member of the Committee said that if Mr. Wilson had made such a statement there was no use discussing it; but he thought differently, because he said that Mr. Wilson had made a statement before that a number of men could not be done without at the

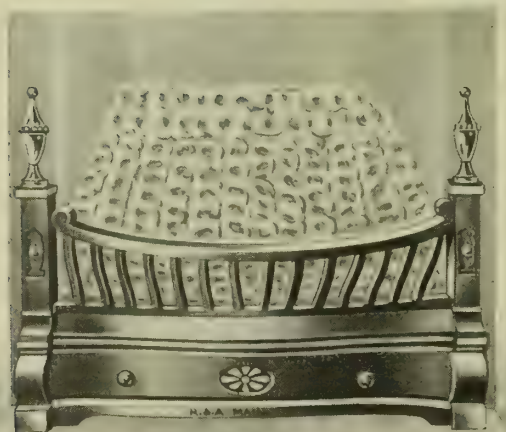
gas-works, and when a Committee had been appointed to investigate the matter, the staff had been largely reduced. Mr. Wilson then jumped up and called him to order. He left it to them to decide if it were the thing for any member of the Council to be treated so by an official, especially when that member was making a true statement. He did not wish to make matters worse, but the Chairman—Bailie Bogle—called him to order also. He retorted; and the Chairman told him to sit down. Provost Christie said he saw the matter referred to in the Public Press, and thought it his duty to inquire if such a thing had occurred. He was told that it had happened that an official so far forgot himself at the moment that he certainly almost involuntarily jumped up and used the words that Bailie Dillon had said. But he was also informed that the official in question apologized. If this were the case, he took it that Bailie Dillon was satisfied. Bailie Dillon said he was quite satisfied. Dean of Guild Neilson thought it most unfair that such explanations should be allowed to be made without any member being permitted to make a statement in defence of the official. Bailie Dillon made the statement that the Gas Manager had said there were 27 men he could not do without. There was no doubt that there were 27 men less last year than the year before; but that was because those men were required to handle coke at the works, on account of the coke-conveyor having broken down. The Manager, on his own recommendation, got the furnace altered for the handling of this coke; hence the reason that he could do with 27 men less. There was a limit to the patience of any official; and he did not blame the Gas Manager for losing his head when that statement was made by Bailie Dillon.

I mentioned last week that the Kirkcaldy Town Council had passed the second resolution in favour of the adoption of the Burghs Gas Supply Act of 1876. In moving the resolution, Mr. Wright said that the matter had been before the ratepayers for twelve months, and the consensus of opinion was that the Council were taking the right course in acquiring the gas-works. They had had no opposition in Kirkcaldy to the acquiring of the gas undertaking with one single exception, which emanated from the Town Council, and which, in his opinion, was founded upon the erroneous view that the price would be fixed upon a 28 years' purchase. This was an antiquated notion. That mode of valuation was tried in Dunfermline. On the basis of it the price was given as £149,000; whereas the award of the Arbiters was only £80,000. In Falkirk, on the same principle, the price was made out at £115,000; whereas the Arbiters' calculation came out at £77,000. They did not know what the price in Kirkcaldy would be. They could only judge by what had been done in other towns. He based his whole case upon the fact that there was a good paying business in Kirkcaldy; and any increase there might be in the consumption of gas would be entirely profit. He did not say that they would be able at once to reduce the price of gas; but, judging from experience in other towns, they would not have to come on the rates to support the gas undertaking. Mr. Mackinnon repeated his dissent to the adoption of the Act. His argument was founded on the 28 years' purchase only. He calculated that the maintainable profits being £4528, at 28 years' purchase, with 10 per

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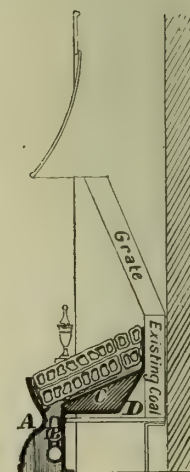


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cent. added for compulsory purchase, the cost of the undertaking would amount to nearly £140,000. There was very little difference between the maintainable profits and the interest to be paid on the borrowed money necessary to the purchase. As to the case of Dunfermline, he had already pointed out that there the works were entirely new; whereas the works they were asked to acquire in Kirkcaldy were eighty years old, and, looking to the accounts of the Kirkcaldy Gaslight Company, they would find that it took, year in and year out, something like £3500 to keep them in repair and renewal. The share capital of the Kirkcaldy Company was about £65,000, while the Dunfermline Company's share capital was £50,000; yet, before Dunfermline could acquire the gas-works, it cost them upwards of £100,000. In Kirkcaldy, on the same principle, the figure would be about £130,000, and, with nearly £10,000 for depreciation and maintenance funds, they would find that the sum of £140,000 was very near the mark. Mr. Mackinnon did not move disapproval of the resolution; and it was consequently adopted.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, Nov. 27.

At the commencement of the week the same dull tone was still apparent in the market; but towards the close there was more buying, which brought about a somewhat better feeling, and to-day's values are £11 2s. 6d. to £11 3s. 9d. per ton f.o.b. Hull, £11 3s. 9d. to £11 5s. per ton f.o.b. Liverpool, and £11 5s. to £11 6s. 3d. per ton f.o.b. Leith. Manufacturers have evidently not been quite so firm in their views as regards making sales in the forward position, and it is reported that a considerable amount of business has been done for delivery January-June next year at £11 7s. 6d. per ton f.o.b. shipping ports.

Nitrate of Soda.

There is rather more pressure to sell this article; but so far holders maintain spot quotations at 9s. 3d. per cwt. for ordinary, and 9s. 6d. for refined quality.

Tar Products.

LONDON, Nov. 29.

There has been little alteration in the market for tar products during the past week. Pitch remains steady, and there has been very little further business reported. Buyers do not seem particularly keen to purchase, especially at the prices at present being asked by makers. Creosote is quiet. The demand for solvent naphtha for forward delivery and prompt is particularly good.

The average values during the week were: Tar, 13s. to 17s., *ex works*. Pitch, London, 26s. to 26s. 3d.; east coast, 25s. 3d. to 25s. 9d.; west coast, 24s. to 25s. f.a.s. Mersey ports, 25s. f.o.b. other ports. Benzol, 90 per cent., casks included, London, 6½d. to 6¾d.; North, 5¾d. to 6d.; 50-90 per cent., casks included, London, 7½d.; North, 7d. Toluol, casks included, London, 9½d. to

10d.; North, 9d. to 9½d. Crude naphtha, in bulk, London, 3¾d. to 4d.; North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 1s. 0½d. to 1s. 1d.; North, 11½d. to 1s.; heavy naphtha, casks included, London, 10½d. to 11½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. Carbolic acid, 60 per cent., casks included, east coast, 10½d. to 10¾d.; west coast, 10½d. to 10¾d. Refined naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

There is practically no change in this article, although in some quarters it is found that dealers are paying considerably higher than the stated marked prices. This is probably covering in for the month, as prompt sales could not be made at such figures. To-day, the actual Beckton quotation is £11 5s.; and for January-June, £11 8s. 9d. Ordinary makes upon Beckton terms are £10 18s. 9d. In Hull, the figures quoted are £10 18s. 9d. to £11; and in Liverpool, £11 to £11 1s. 3d. In Leith, £11 5s. is asked, and for January-June, £11 8s. 9d.

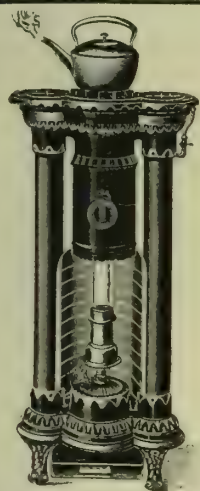
COAL TRADE REPORTS.

Northern Coal Trade.

A rather better demand is experienced in the coal trade of the North; and with steamers arriving more freely, there have been fuller shipments. In steam coals, best Northumbrians are from 10s. 3d. per ton f.o.b. Second-class steams are 9s. to 9s. 3d.; while steam smalls are not so abundant at from 5s. to 6s. The output of the collieries is not quite at its heaviest, and thus is well taken up. In the gas coal trade, the demand is now a very full one, and the deliveries on the long contracts are large, especially of the best classes. Durham gas coals vary in price. For the usual kinds, from 10s. to 11s. per ton f.o.b. is quoted, according to quality; and for best "Wear specials," about 11s. 6d. is the current quotation. The tenders for the supply of Gothenburg for next year are placed. The quantity is about 25,000 tons, and the price for second-class gas coal is believed to be equal to about 10s. per ton f.o.b. Tenders are also asked for some 120,000 tons for Stockholm's gas supply for next year, which tenders will be received up to Dec. 6. A contract has also been booked for a small lot of "Wear special" gas coal for export at a price which should leave about 11s. 3d. per ton f.o.b. Coke is firm; and gas coke, though in heavy output, is steady at from 12s. 6d. to 13s. per ton f.o.b.

Scotch Coal Trade.

The severe weather led to an improved demand for coal; but the fog which was experienced in the west greatly interfered with transit, and neutralized the improvement. Foreign orders are fairly satisfactory. The prices now quoted are: Ell 9s. 3d. to 10s. 6d. per ton f.o.b.



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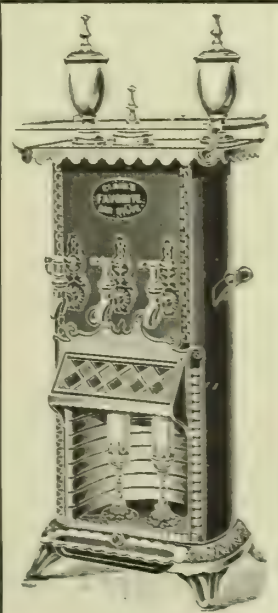
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No. 15. Bar Stove.

Glasgow, splint ros. to ros. 3d., and steam 9s. to 9s. 3d. The shipments for the week amounted to 296,039 tons, a decrease of 18,252 tons upon the previous week, but an increase of 9936 tons upon the corresponding week of last year. For the year to date, the total shipments have been 13,720,349 tons—an increase of 627,183 tons upon the corresponding period.

Producer Gas for Pumping Sewage.—We learn from the Engineering Supplement to "The Times" that, on the advice of their Surveyor (Mr. G. W. Lingwood), the Joint Committee, of the Stowmarket Urban and East Stow Rural District Councils have decided to instal a gas-producer at their sewage-pumping station to supply an engine which has hitherto been working on coal gas.

Auto-Lighter, Limited.—This Company was registered on the 20th inst., with a capital of £10,000 in £1 shares. It is a private Company; and its objects are to purchase or otherwise acquire and take over the British patents relating to the invention of George Robson for automatically turning on and off the lights of gas-burners and the apparatus therefor, and any subsequent improvements upon same, &c., and to enter into an agreement with the Pressure-Clock Lamplighter, Limited.

New Joint-Stock Companies.—The Cedford Gas Process Company, Limited, has been registered with a capital of £5750 in 5000 £1 shares and 15,000 rs. shares, to enter into an agreement with C. E. Williams, F. Bedford, and E. Erdmann. It is a private Company. The Merlin Gas and Engineering Company, Limited, has been registered with a capital of £1000, in £1 shares, to carry on the business of ironfounders, mechanical engineers, manufacturers of machinery, &c. This is also a private Company.

The Resignation of the Town Clerk of Brighouse.—At the close of the business at the monthly meeting of the Brighouse Town Council, the Mayor (Alderman Robert Thornton) referred to the fact that it was the last occasion on which the Town Clerk (Mr. James Parkinson)—who until recently also occupied the position of Gas Engineer—would be present in that capacity. Mr. Parkinson had served the borough for over thirty years, which was a long time in a man's life. He (the Mayor) felt sure that he would voice the feeling of every member of that Council when he said that they wished to tender to him their best wishes for his future welfare. Other members having spoken in the same strain, Mr. Parkinson said he had slaved for the town, and no effort of his had been wanting to promote the good of the community. When he went to Brighouse in 1878, gas was sold at 3s. 4d. per 1000 cubic feet. By 1892, the price had been reduced to 2s. 2d.; and then he was told that he had no ability to manage a gas-works. He had given the best years of his life to the town; and now, at nearly sixty years of age, he was turned out into the street. He had been in this business most scandalously used, and most unjustly accused. When he was before the Gas Committee, he told them that he knew nothing of what had been going on wrong in any shape or form.

Crickhowell Gas-Works Sold.—Some days ago, the Crickhowell Gas-Works, established over 50 years ago by the late Mr. William Christopher, were sold at auction by Mr. Thomas Lewis for £1400; the purchaser being Mr. William Williams, of Crickhowell.

A Dangerous Emetic for "Gassed" Persons.—An inquest was held at Crewe last week on the body of Samuel Dean, a London and North-Western Railway gas inspector. It appeared from the evidence that he was fixing a gas-meter when there was a slight explosion. He afterwards complained of gas poisoning, and lapsed into unconsciousness, and died. It was further stated that it was the custom of gas men when poisoned to take ginger beer as an emetic; and Dean drank a bottle after the explosion. Dr. Hodgson, who made a post-mortem examination, said this was the worst possible emetic. It increased the tension of the blood, instead of decreasing it. The Home Office advised oxygen. Death was caused by rupture of a blood vessel on the brain, due to disease of the cerebral artery, but accelerated by carbon monoxide poisoning. The Jury returned a verdict accordingly.

Sales of Stocks and Shares.—At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards placed some further issues of new capital, in accordance with instructions received from Directors. The first lots consisted of an issue of £4085 of consolidated ordinary stock of the Worthing Gas Company, carrying 5 per cent. dividend from the 7th prox.; and it was all sold at from £102 ros. to £103 5s. per £100. Some £10 ordinary shares (7 per cent.) in the Bognor Water Company were next offered, and were all sold at £16 to £16 7s. 6d. each. A large issue of £32,000 of 4 per cent. perpetual debenture stock of the Alliance and Dublin Consumers' Gas Company realized from £95 to £99 per £100. Next day, Messrs. King and King sold two £50 "C" shares in the Portsea Island Gas Company, carrying 12 per cent. dividend, for £124 ros. apiece; and some £5 shares (7 per cent.) in the Portsmouth Water Company at prices ranging from £8 7s. 6d. to £8 ros. each. At a recent sale, 400 new "C" shares in the Littlehampton Gas Company, limited to 5 per cent. dividend, were sold at an average price of £5 18s. 9d. each. At the Duke of York Hotel, York Town, Messrs. Sadler and Baker offered for sale 470 additional ordinary shares of £10 each in the Frimley and Farnborough Water Company. Competition was brisk; and the shares were all disposed of at a satisfactory premium—the prices varying from £15 12s. 6d. to £15 17s. 6d. per share. The total amount realized was £7368 15s.; being an average of £15 13s. 6½d. per share.

After discussion in committee, the Bilston Urban District Council have decided to accept an offer of the local Gas Company to illuminate the Market Hall under a contract for ten years. The hall is at present lit by electricity.

Last week's fog brought about a greatly increased consumption of gas in Manchester. On Tuesday, 24,870,000 cubic feet were measured out; the normal consumption at this period of the year being about 22,000,000 feet per day.

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MILES PLATTING,
MANCHESTER.

RADFORD ROAD,
NOTTINGHAM.

Scotch Agent: JNO. D. GIBSON, 2, Causeyside Street, Paisley.

At to-morrow's meeting of the Manchester City Council, Mr. Jennison will revive his resolution on the price of gas to penny-in-the-slot consumers. In effect, his motion is that the same price be charged to such customers as that obtaining for quarterly consumers.

At the meeting of the London County Council last Tuesday, the Main Drainage Committee reported, in regard to the supply of protosulphate of iron to the Barking outfall, that it would be to the advantage of the Council to accept the tender of the Gaslight and Coke Company, as, though it was 1s. 3d. a ton higher than the lowest tender, the Company proposed to supply the chemical in solution in tanks direct to the works instead of in crystals, with the result that the Council would save the cost (1s. a ton) of unloading the crystals from barges into store, and also the expense of dissolving the material before it is added to the sewage. It was agreed that the Company's tender for 3300 tons, at 18s. a ton, should be accepted.

Messrs. Firth Blakeley, Sons, and Co., Limited, of Thornhill, Dewsbury, have recently completed at Warrenpoint a new gasholder 45 feet diameter by 16 feet deep and steel tank 46 ft. 6 in. diameter by 16 ft. 6 in. deep. The holder has been working since Sept. 30 without a single hitch, and has been most satisfactory to the Company and to the Engineer (Mr. Gibson), to whose instructions the work was carried out. At Tullamore, a double-lift gasholder and steel tank were taken in hand. The inner lift is 40 feet diameter and the outer lift 42 feet; both being 16 feet deep, with steel tank 44 ft. 6 in. by 16 ft. 6 in. deep. This order was carried out successfully under the supervision of the Manager (Mr. F. T. Eustace), but to the instructions of Mr. W. F. Cotton, of Dublin. A contract with the Renton Gas Company for converting an existing columnless gasholder into a standard-guided one has also been completed in a perfectly satisfactory manner, and in a short time, under Mr. Frank Carlow, the Manager of the works.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

DRAUGHTSMAN. W. J. Jenkins and Co., Retford.
GAS STOVE TRADE. No. 5159.
WORKING MANAGER (PAZAKFREY Gas-Works).
Applications by Dec. 13 to Liverpool Corporation.

Situation Wanted.

HOUSEKEEPER (Daughter of a Gas Engineer). No. 5156.

Agencies.

GAS INCANDESCENT LIGHT MANUFACTURE ANKER,
Adalbertstrasse, 94, Berlin.
INVERTED GAS BURNERS. No. 5158.

Plant, &c. (Second-Hand), for Sale.

COMPLETE GAS-WORKS, &c. Mr. Henry Gibbings,
North Tawton, Devon. Tenders by Dec. 20.

Stocks and Shares.

BRENTFORD GAS COMPANY. Dec. 15.
HARROW AND STANMORE GAS COMPANY. Dec. 7.
LOWESTOFT WATER AND GAS COMPANY. Dec. 7.
SOUTHEND WATER COMPANY. Dec. 7.

TENDERS FOR

Fire-Clay Goods.

NOTTINGHAM GAS DEPARTMENT. Tenders by Dec. 4.

General Stores—

(Cocks, Meter Boxes, Castings, Retort Fittings,
Scrap Iron, Brass, &c., Iron and Steel, Lime,
Paints, Oils, Tools, Lead Lead Pipe, &c., &c.)
NOTTINGHAM GAS DEPARTMENT. Tenders by Dec. 4.

Oxide.

RADCLIFFE AND PILKINGTON GAS COMPANY. Tenders by Dec. 3.

Meters.

NOTTINGHAM GAS DEPARTMENT. Tenders by Dec. 4.

Pipes, &c.

NOTTINGHAM GAS DEPARTMENT. Tenders by Dec. 4.

Tar and Liquor.

SHOTLEY BRIDGE AND CONSETT GAS COMPANY. Tenders by Dec. 9.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 591.

Issue	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Oct. 14	10	Alliance & Dublin 10 p.c.	17-18	..	5 11 1	195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
298,955	10	"	7	Do. 7 p.c.	124-13	..	5 7 8	561,000	Stk.	"	10	Liverpool United A.	223-225	..	4 8 11
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	100-102	+2	3 18 5	718,100	"	"	7	Do. B.	166-168	..	4 3 4
200,000	5	Oct. 28	6	Bombay, Ltd.	53-6	..	5 8 4	306,083	"	June 25	4	Do. Deb. Stk.	104-106	..	3 15 6
40,000	5	"	6	Do. New, £4 paid.	43-43	..	5 9 1	75,000	5	Nov. 26	6	Malta & Mediterranean.	44-57	..	6 0 3
50,000	13	Aug. 26	15	Bourne- 10 p.c.	28-28	..	5 5 3	560,000	100	Oct. 1	5	Met of 5 p.c. Deb.	59-102	..	4 18 0
311,810	13	"	7	mouth Gas B 7 p.c.	104-104	..	4 3 7	250,000	100	"	4	Melbourne 4 p.c. Deb.	100-102	..	4 8 3
75,000	10	"	0	and Water Pref. 6 p.c.	154-154	..	3 16 2	541,920	20	Nov. 11	3	Monte Video, Ltd.	124-13	..	5 7 8
380,000	Stk.	Aug. 12	12	Brentford Consolidated	253-256	..	4 17 8	1,775,892	Stk.	July 29	4	Newcastle & Gateshead Con	106-108	..	4 3 4
300,000	"	"	9	Do. New	190-192	..	4 19 0	518,795	Stk.	June 25	3	Do. 3 p.c. Deb.	93-94	..	3 14 6
50,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13-13	..	5 3 8
206,250	"	June 11	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	300,000	Stk.	Nov. 26	8	Oriental, Ltd.	136-138	..	5 15 11
220,000	Stk.	Sep. 10	1	Brighton & Hove Orig.	208-213	..	5 3 3	60,000	5	Sep. 10	8	Ottoman, Ltd.	64-64	..	6 5 6
246,320	"	"	8	Do. A Ord. Stk.	150-152	..	5 5 3	31,800	53	Aug. 26	13	Portsea Island A.	137-139	..	4 19 0
460,000	27	Oct. 14	10	British	424-434	+3	4 11 11	60,000	50	"	13	Do. B.	129-131	..	4 19 3
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c.	118-120	..	5 0 0	100,000	50	"	12	Do. C.	120-123	..	4 17 7
165,700	"	"	4	Do. B 3 p.c.	88-90	..	5 0 0	114,800	50	"	10	Do. D and E.	101-103	..	4 17 1
82,278	"	"	5	Do. C 5 p.c.	106-108	..	5 1 10	398,490	5	Oct. 28	7	Primitiva Ord.	61-72	..	4 18 3
55,000	"	June 25	3	Do. 3 p.c. Deb.	88-90	..	3 17 9	796,883	5	July 29	5	Do. 5 p.c. Pref.	54-54	..	4 13 0
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	134-14	..	5 0 0	488,901	100	June 1	4	Do. 4 p.c. Deb.	95-97	..	4 2 6
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	96-98	..	4 1 8	1,000,000	10	Oct. 14	8	River Plate Ord.	164-164	..	4 15 7
100,000	10	"	—	Cape Town & Dis., Ltd.	24-34	..	—	312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	97-99	..	4 0 10
100,000	10	"	—	Do. 4 p.c. Pref.	54-54	..	—	250,000	10	Sep. 29	8	San Paulo, Ltd.	144-145	..	5 6 8
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	474-484	..	6 3 9	64,500	10	"	6	Do. 6 p.c. Pref.	114-124	..	4 18 0
100,000	Stk.	June 25	4	Do. 4 p.c. Deb. Stk.	82-84	..	5 7 2	125,000	50	July 1	5	Do. 5 p.c. Deb.	51-52	..	4 16 2
157 152	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	1084-1104	..	4 10 6	135,000	Stk.	Sep. 10	10	Sheffield A.	230-232	..	4 6 2
1,193,280	Stk.	Aug. 26	5	Commercial 4 p.c. Stk.	109-111	..	4 13 8	209,984	"	"	10	Do. B.	230-232	..	4 6 2
560,000	"	"	5	Do. 3 p.c. do.	104-106	..	4 14 4	523,500	"	"	10	Do. C.	232-232	..	4 6 2
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	70,000	10	Oct. 14	10	South African	124-124	..	7 16 11
800,000	Stk.	"	7	Continental Union, Ltd.	97-99	..	5 1 0	6,429,895	Stk.	Aug. 12	5	South Met., 4 p.c. Ord.	119-121	..	4 8 1
200,000	"	"	7	Do. 7 p.c. Pref.	138-140	..	5 8 0	1,895,445	"	July 14	3	Do. 3 p.c. Deb.	81-83	..	3 12 3
492,270	Stk.	"	4	Derby Con. Stk.	121-123	..	4 1 4	209,821	Stk.	Aug. 26	8	South Shields Con. Stk.	156-158	..	5 1 3
55,000	"	"	4	Do. Deb. Stk.	103-105	..	3 16 2	605,000	Stk.	Aug. 12	5	S'th Suburb'n Ord. 5 p.c.	119-121	..	4 10 11
148,995	"	Oct. 2	5	East Hull 5 p.c. Ord.	97-99	..	5 1 8	60,000	"	July 14	5	Do. 5 p.c. Pref.	120-22	..	4 2 0
480,090	10	July 14	12	European, Ltd.	244-25	..	4 16 0	117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	122-124	..	4 0 8
351,060	10	"	12	Do. £7 10s. paid.	184-19	..	4 14 9	502,310	Stk.	Nov. 11	5	Southampton Ord.	109-111	..	4 10 1
15,141,545	Stk.	Aug. 12	4	Gas 4 p.c. Ord.	1034-1034	..	4 10 1	120,000	Stk.	Aug. 12	6	Tottenham A 5 p.c.	131-135	..	5 1 0
2,000,000	"	"	3	light 3 p.c. max.	87-89	..	3 18 8	453,940	"	"	5	Do. B 3 p.c.	111-113	..	4 15 3
3,799,735	"	"	3	and 4 p.c. Con. Pref.	103-105	..	3 16 2	149,470	"	June 25	4	Edmonton 4 p.c. Deb.	100-102	..	3 18 5
4,193,975	"	June 11	3	Coke 3 p.c. Con. Deb.	92-94	..	3 11 5	132,320	10	July 11	5	Tuscan, Ltd.	9-9	..	5 8 0
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3 p.c.	94-94	..	5 6 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	100-102	..	4 18 0
62,500	"	Sep. 10	6	Do. do. 5 p.c.	117-119	..	5 9 3	236,476	Stk.	Aug. 14	3	Tynmou h. 5 p.c. max.	110-112	..	4 0 3
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	174-174	..	6 4 0	255,6 6	Stk.	Aug. 26	6	Wants-1 B 3 p.c.	120-121	..	4 12 0
131,000	Stk.	Sep. 10	6	Ilford A and C	144-146	..	4 10 11	79,410	"	June 25	3	worth 3 p.c. Deb. Stk.	70-75	..	4 0 0
65,782	"	"	5	Do. B	108-110	..	4 10 11	825,872	"	Aug. 12	5	West Ham 5 p.c. Ord.	123-125	..	4 6 0
65,500	"	June 25	4	Do. 4 p.c. Deb.	102-104	..	3 16 11	210,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	3 18 2
4,040,000	Stk.	Nov. 11	8	Imperial Continental	175-177	-1	4 10 5	253,300	"	June 25	4	Do. 4 p.c. Deb. Stk.	08-110	..	5 12 9
1,235,000	Stk.	Aug. 12	3	Do. 3 p.c. Deb. Red.	94-96	-1	3 12 11								

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K. & A. WATER-GAS COMPANY, LTD.

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SULPHATE OF AMMONIA

SATURATORS and all LEAD and TIMBER
WORK in Connection with Sulphate Plants.

We guarantee promptness, with efficiency for Re-
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JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS,
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Albert Chemical Works, BRADFORD,
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Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent
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RETORT SETTINGS, COAL-TESTING PLANT,
BOILER FIRING.

UNDERWOOD HOUSE, PAISLEY.

FIDDES-ALDRIDGE**SIMULTANEOUS Discharging-Charger.**

The one Machine which Discharges and Charges
at One Stroke.

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"MOTORPATRY, LONDON,"

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GAS PLANT for Sale—We can always

offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

GAS COKE.**THE G. J. Eveson Coal and Coke Com-**

pany, Limited, Birmingham, will be glad to re-
ceive OFFERS of GAS COKE free into Trucks on Rail
from Gas Companies having Surplus Quantities for
Disposal.

APPLICATIONS FOR APPOINTMENTS.**DO you appreciate how much success**

depends on well-considered and lucid present-
ment of your qualifications? I make a Speciality of the
preparation of Applications, and am continually re-
ceiving Complimentary Letters from clients.

Write now for Particulars.

HERBERT GREATORX, Hackney, MATLOCK.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
and ELEVATING and CONVEYING PLANT, ROSE
MOUNT IRON-WORKS, ELLAND.

YOUNG Lady, daughter of a Gas En-
gineer, is desirous of meeting with a Situation
as HOUSEKEEPER or any Position of Trust in a
Family.
Address No. 5156, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

THE Gas Incandescent Light Manu-
facture Anker, Adalbertstrasse, 94, Berlin,
require a well INTRODUCED AGENT.

DRAUGHTSMAN wanted well up in
Coal and Coke Handling Plants, and Structural
Work in Connection with Gas-Works.
Apply, stating Age, Experience, and Wages required,
to W. J. JENKINS and COMPANY, LIMITED, Engineers,
RET福德.

GAS STOVE TRADE.

REQUIRED, Experienced and Reliable
Man for FOLLOWING UP important Inquiries.
Apply, by letter, giving full Information regarding
Qualifications, including Age, Experience, &c., to No.
5159, care of Mr. King, 11, Bolt Court, FLEET STREET,
E.C.

CORPORATION OF LIVERPOOL.

FAZAKERLEY GAS-WORKS.

WANTED, a Working Manager. Ap-
plicants must be good Carbonizers, thoroughly
Experienced, and able to perform the usual Works
Routine, together with keeping ordinary Gas-Works
Day-Books, and have practical knowledge of Main and
Service Laying and Internal Gas-Fitting; also able to
read Gas-Meters, as well as Advise Gas Consumers.
Capacity of Works, about 20,000,000 Cubic Feet per
Annum.
Salary, £100 per Annum, with House, Coal, and Gas
free.
Applications, endorsed "Working Gas Manager," to be
addressed to the Town Clerk, Municipal Offices,
Liverpool, and must be received not later than the
13th of December next.

IMPORTANT.

INVERTED GAS-BURNERS.

WELL-KNOWN Makers, just bringing
out an Improved Burner of First-Class Quality
for Indoor and Outdoor Lighting, are desirous of re-
ceiving APPLICATIONS from Wholesale and Export
Houses WILLING TO PUSH SALE. Firms able to
Guarantee a large Turnover will have Preference, and
will receive every facility. Illustrated Catalogue just
ready for Distribution.
Apply to Principals, No. 5158, care of Mr. King, 11,
Bolt Court, FLEET STREET, E.C.

GASHOLDERS—Splendid, 45 feet dia-
meter, and New STEEL TANK fixed complete,
to Plan and Specification. Also 50 feet Single-Lift
and 50 feet Double-Lift. Cheap, with STEEL TANKS.
Can be seen temporarily erected.
FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

PIPES—Stock of 4-inch Cast-Iron Spigot
and Socket PIPES at Manchester (new). Coated
with Dr. Smith's Composition. Special Low Price to
Clear.
Address No. 5157, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

NORTH TAWTON, DEVON.

IMPORTANT SALE OF FREEHOLD GAS-WORKS, &c., &c.

To be Sold by Private Contract from
the 31st of December next, as a Going Concern
all that Valuable Property known as the "NORTH
TAWTON GAS-WORKS, &c.," including all Stock-in-
Trade, Mains, Services, Meters, 27 Public Lamps, 16
Stoves on Hire, and Three others in Stock, Piping and
other Gas Requisites, with all Gas, Coal, Coke, and Tar
remaining on the Premises at that date.
Further Particulars may be obtained from the owner
Mr. HENRY GIBBINGS, NORTH TAWTON, to whom Sealed
Tenders should be sent on or before the 20th of December
next.

SHOTLEY BRIDGE AND CONSETT DISTRICT GAS COMPANY.

TENDERS FOR TAR.

THE Directors of this Company invite
TENDERS for the Purchase of the TAR pro-
duced at their Works from the 1st of January to the
31st of December, 1910. Quantity about 80,000 Gallons.
Contractor to find his own Casks, and to accept De-
livery at Blackhill Station.
Tenders to be sent to the undersigned, not later than
Thursday, Dec. 9, 1909.

M. RICHLEY,
Secretary.

Gas Offices, Front Street,
Shotley Bridge.

RADCLIFFE AND PILKINGTON GAS COMPANY.

SPENT OXIDE.

THE Directors of this Company invite
TENDERS for the Purchase of about 200 Tons
(more or less) of SPENT OXIDE.
Samples for Testing may be taken from the heap by
any intending Purchaser, or will be sent, together with
Particulars, on Application to the undersigned.
Tenders will be received until Friday, the 3rd of
December.

JAMES BRADDOCK,
Manager and Secretary.

Gas-Works, Radcliffe,
Manchester, Nov. 25, 1909.

CORPORATION OF NOTTINGHAM. (GAS DEPARTMENT.)

TENDERS FOR THE SUPPLY OF GOODS AND MATERIALS.

THE Gas Committee are prepared to
receive TENDERS for the Supply of the Whole
or a Portion of their Requirements of the following
GOODS and MATERIALS, for delivery during the
ensuing Year, Carriage Paid, at their various Gas-
Stations, Chemical Works, or Stores, or at any Railway
Station within the Nottingham Gas Supply District:—

- Cast-Iron Pipes and Specials.
- Pig Lead, Lead and Compo. Pipe, White, Red,
and Chemical Sheet Lead.
- Wrought Iron and Steel.
- Retorts and Fire Materials.
- Meters (Wet and Dry, and Prepayment); also
Repairs.
- Brass Cocks, and Malleable Iron Levers.
- Small Iron Castings, Retort Fittings, &c.
- Purchase of old Cast and Wrought Scrap Iron,
Old Copper, Brass, &c.
- Lime for Chemical Works purposes.
- Paints.
- Oils.
- Rope Yarn.
- Tallow, &c.
- Cotton Waste.
- Coke Forks, Shovels, Buckets, Files, &c.
- Meter Boxes, Platforms, and Shelves.
- Timber.
- Plumbing.
- Tools for Distribution Department.

Specifications and Forms of Tender may be obtained
and Samples seen on Application to the Engineer and
General Manager, at the Gas Offices, George Street,
Nottingham.

Tenders to be addressed to me and delivered at the
Guildhall, Nottingham, not later than Saturday, the
4th of December, 1909.

The Gas Committee do not bind themselves to accept
the lowest or any Tender.

By order,
J. A. H. GREEN,
Town Clerk.

Guildhall, Nottingham,
Nov. 23, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to
notify that their SALES BY AUCTION OF NEW
CAPITAL ISSUED UNDER PARLIAMENTARY
POWERS, and of STOCKS and SHARES belonging to
EXECUTORS and other PRIVATE OWNERS in LON-
DON, SUBURBAN, and PROVINCIAL GAS and
WATER COMPANIES, take place PERIODICALLY
at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing New Capital, and also for including
other Gas and Water Stocks and Shares in these Periodi-
cal Sales, will be forwarded on Application to MESSRS.
A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 500 NEW ORDINARY FIVE PER
CENT. MAXIMUM £10 SHARES

AND
£5000 FOUR PER CENT. PERPETUAL
DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Dec. 7, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the HARROW AND STANMORE GAS COMPANY.

NEW ISSUE OF 500 £10 "C" SHARES.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Dec. 7, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

LOWESTOFT WATER AND GAS COMPANY.

45 £10 ORDINARY TEN PER CENT. SHARES

AND

47 £10 ADDITIONAL ORDINARY SEVEN
PER CENT. SHARES.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Dec. 7, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

BRENTFORD GAS COMPANY.

SALE BY TENDER OF £30,000 NEW STOCK, 1881.

IN pursuance of the Brentford Gas
Order, 1881, Notice is Hereby Given, that it is the
intention of the Directors of this Company to SELL, BY
TENDER £30,000 OF NEW STOCK, 1881, of the
Company, to be paid up in full on or before the 15th day
of January, 1910; such Stock being a portion of Ad-
ditional Capital Authorized to be raised by Resolutions
passed at an Ordinary Meeting of the Proprietors held
on the 11th day of February, 1888, under the powers of
the above-mentioned Order.

Particulars and Conditions of Tender may be ob-
tained on Application at this Office; and Sealed Tenders
must be sent in not later than Ten o'clock on the
Morning of Wednesday, the 15th day of December next.

By order,
WILLIAM MANN,
Secretary.

Office: Brentford Gas Company,
Brentford, Nov. 1, 1909.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the
TRANSFER BOOKS of this Company, so far
as they relate to DEBENTURE STOCK and BONDS,
WILL BE CLOSED at Four o'clock p.m., on Friday,
the 10th prox., for the Half Year ending on the 31st
prox., and WILL BE RE-OPENED on the Morning of
Saturday, the 11th prox.

The Interest for the Half Year will be payable on the
1st of January next to the Proprietors registered on
the closing of the Books.

By order,
HENRY RAYNER,
Secretary.

Chief Office: Horseferry Road,
Westminster, S.W., Nov. 26, 1909.

Price 5s. 6d. Post Free.

REPORTS OF DISTRICT GAS ASSOCIATIONS FOR 1908.

London: WALTER KING, 11, Bolt Court, Fleet St., E.C.

MUNICH INCLINED CHAMBERS.

Sole Agents and Licensees for Great Britain
and Colonies:

The Coke Ovens & By-Products Co.,
Palace Chambers, LTD.,
Westminster, LONDON, S.W.

MIRFIELD GAS COAL. UNEQUALLED.

Sperm Value 878.85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

MIRFIELD COLLIERY COMPANY,
RAYENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.

LUX'S Gas Purifying Material

is now used in many Gas-
Works throughout Scotland
with gratifying success.

FRIEDRICH LUX
Ludwigshafen-am-Rhein

Sole Agent for Scotland:

DANIEL MACFIE

1, North Saint Andrew Street, EDINBURGH

Telegrams: "GASLUX, EDINBURGH"

Descriptive Pamphlet on Application.

TROTTER, HAINES, & CORBETT, BRETELLE'S ESTATE, LIMITED, FIRE-CLAY & BRICK WORKS, STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS. Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN & Co.,
LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.


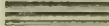
THOMAS DUXBURY & CO., 16, DEANS GATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

*  **BRASS AND STEEL**
*  **PINION WIRE**
*  *any lengths.*

*  **John Rigby & Son,**

*  **Rawfolds Wire Mills,**
*  **CLECKHEATON.**

Also IRON and STEEL WIRE of all descriptions.

HEATHCOTE GAS COAL

from the

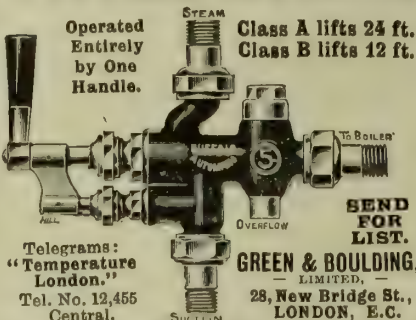
GRASSMOOR COLLIERIES, CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality
of Coke.

Maintains a High Standard in Residuals.

'BUFFALO' INJECTOR



JOHN HALL & CO. OF STOURBRIDGE, LIMITED,

STOURBRIDGE,
Manufacturers of
**FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,**

And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED
FOR SHIPMENT.

JAMES OAKES & CO., ALFRETON IRON-WORKS, DERBYSHIRE,

Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works
(also large Stock in London)

PIPES and CONNECTIONS, $1\frac{1}{2}$ to 48 inches
in diameter, and make and erect to order
RETORTS, PURIFIERS, and TANKS, with
or without planed joints, COLUMNS,
GIRDERS, SPECIAL CASTINGS, &c., re-
quired by Gas, Water, Railway, Telegraph,
Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS.
These are cast in one piece, without Chap-
lets; doing away with Bolts, Nuts, and Covers,
and rendering Leakage impossible.

NEW EARTH BORERS.

15 Patents. Highest Awards.
Work easily and quickly. Reliable.

For Earth-Working, Boring, Soil-
Testing, Planting, Sinking Fences,
Posts, and various other uses.

Borers from 60 to 400 mm. ($2\frac{1}{2}$ in.
to 16 in.) diameter.

Great Saving of Labour. Low Prices

Catalogue Gratis.

E. JASMIN,
Hamburg 30. Lehmweg 30.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
**THE LOTHIAN COAL COMPANY,
LIMITED,**
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF
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FOR ENGINEERS.**

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
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ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

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8vo., in Stiff Paper Cover. Price 1s.

THE EARLIEST WORKS ON GAS LIGHTING.

A List of Books, Pamphlets, and Important References
prior to the Year 1840.

By F. SOUTHWELL CRIPPS, Assoc.M.Inst.C.E.

LONDON: WALTER KING, 11, BOLT COURT, FLEET ST., E.C.

S. S. STOTT & CO.,

ENGINEERS,
HASLINGDEN, nr. MANCHESTER.

LIME & OXIDE ELEVATORS & CONVEYORS.

COAL AND COKE STORAGE PLANTS.

Coal and Coke Elevators and Conveyors.

STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.

DETACHABLE CHAINS AND SPROCKET WHEELS.

HIGH-CLASS STEAM ENGINES. BEAM PUMPING-ENGINES, &c.

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COKE is selling at . . . 11s. 8d. a Ton
COALEXLD is selling at . 20s. 0d. a Ton
IN THE SAME TOWN.

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COALEXLD LTD., LANCASTER.

Special Pressure and Pressure & Exhaust Registers.

For RETORT-HOUSE GOVERNORS.
For EXHAUSTER HOUSES.
For OFFICES AND DISTRICTS.

Fuller particulars on application to—

T. G. MARSH,
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ENGINEERS & CONTRACTORS.

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COLONIAL AGENTS.
ETC.

LARGE CAST IRON
OR STEEL OIL LIQUOR
OR WATER TANK.

CONDENSERS
VARIOUS
TYPES.

GAS AND
WATER
VALVES.

ROOFING STRUCTURAL WKS
M.S. & C.I. PURIFIERS.

GAS EXHAUSTER
& GAS ENGINE
COMBINED.

ROTARY
GAS EXHAUSTER.

GASOMETER AND
C.I. OR STEEL TANKS.

GRAETZIN LIGHT

Important Improvements.



BURNERS.

- 1. 20-Candle Power more light without increase in the consumption of gas.
- 2. Patent Gas Adjuster; cannot get out of order.
- 3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
- 4. Accurate Regulation of the Air Supply.
- 5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
- 6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

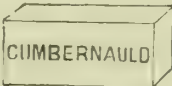
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

THE GLENBOIG UNION FIRE-CLAY CO., LTD.

GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

TRADE MARKS.



The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices. The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

GAS-RETORTS, FIRE-BRICKS,
BLOCKS, &c., &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.



Works: GLENBOIG, LANARKSHIRE.
Offices: 48, West Regent St., Glasgow.

56 Prize Medals and Diplomas of Honour.

Highest Award wherever exhibited.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price. Undernoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analysis where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET, LONDON, E.C.3, September 21st, 1909.

DEAR SIRS, I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3.03	3.49
Silica, combined	43.20	49.77
Alumina	36.55	42.10
Ferric oxide	1.80	2.08
Titanic oxide	1.30	1.50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0.92	1.06
Loss on Ignition	13.20	—
	100.00	100.00

PHYSICAL RESULTS.

Density	2.65
Volume weight	1.90
Porosity	15.4 %
Linear shrinkage at 110° C.	3.70 %
" " 1050° C.	4.76 %
" " Total	8.46 %
Volume shrinkage at 100° C.	10.7 %
" " 1050° C.	12.6 %
" " Total	23.3 %
Plasticity	20.0 %
Fire Stability	1550 C. equiv. to 3362 F.

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,

JOHN T. NORMAN.

CASES FOR BINDING
QUARTERLY
VOLUMES OF THE "JOURNAL"
PRICE 2s. EACH.

GAS COAL AND CANNEL.

WILSON CARTER & PEARSON,
LIMITED,
Gas, Steam, and other Fuel for Home and Export.
GAS COKE CONTRACTORS.

CHIEF OFFICES:
50, NEW STREET, BIRMINGHAM.

"NUGEPE"
GAS PLANT
CEMENT

For
AMMONIA JOINTS:
For TAR JOINTS.

Makers: JOHN E. WILLIAMS & CO., Lower Moss Lane, MANCHESTER, S.W.

WATER SUPPLIES.
ARTESIAN BORED TUBE WELLS,

Norton's Patent "Abyssinian" Tube Wells.
Deep Well Pumps and Patent Air Lift Pumps.

LE GRAND & SUTCLIFF,
Artesian Well and Waterworks Engineers,
MAGDALA WORKS, 125 BUNHILL ROW, LONDON, E.C.

MOBBERLEY & PERRY, LTD., STOURBRIDGE,

Proprietors of large areas of Old Stourbridge Fire-Clay, are enabled to supply First Quality of every description of Gas Retorts and Fire-Clay Goods.

R. LAIDLAW & SON (EDINBURGH), LTD.

GAS METER
MAKERS.

**STATION
METERS**

IN

Ornamental
Square & Round
Cast-Iron Cases.

ALL SIZES.

*Drawings, Specifications, and
Prices on Application.*

SIMON SQUARE WORKS,
EDINBURGH,
AND
6, LITTLE BUSH LANE,
LONDON, E.C.



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ORTON
& CO.,
LEEDS.

Telegrams:
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Horizontal Retort
Benches.

CONTRACTORS TO
The Vertical Retort
Syndicate, Ltd., London,

FOR ALL THE
BRICKWORK

IN THE
DESSAU
VERTICAL RETORT
INSTALLATIONS.

COAL CONVEYING
PLANTS

COMPLETE WITH
ELEVATORS,
CONVEYORS,
BREAKERS, &c.

THOMAS PIGGOTT & CO., L^D.,
BIRMINGHAM.



LAPWELDED AND RIVETED STEEL PIPES.

HUMPHREYS & GLASGOW'S
CARBURETTED WATER-GAS PLANTS.

Aggregate Capacity of Plants supplied
227,800,000 cubic feet Daily.

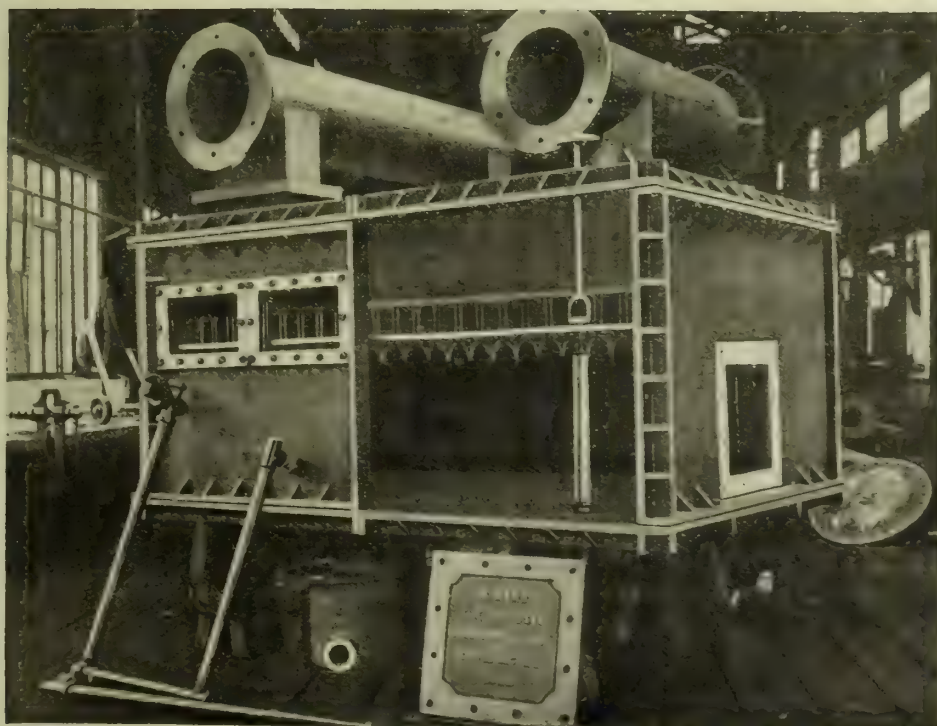
THE WHESSOE FOUNDRY CO., LTD.

Works: **DARLINGTON.**

Gasholders.

Condensers.

Purifiers.



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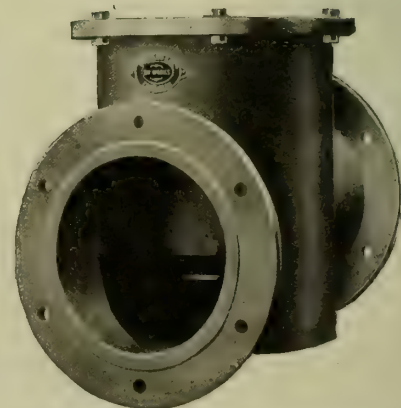
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PILLAR BOX contains Air-Pressure Holder for Loading the Governor from a distance also Recording Gauge and Inlet and Outlet Pressure Gauges.



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From a Photo. of 24 in. Size.

May be Loaded by Weights or Air Pressure from a Distance.

Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

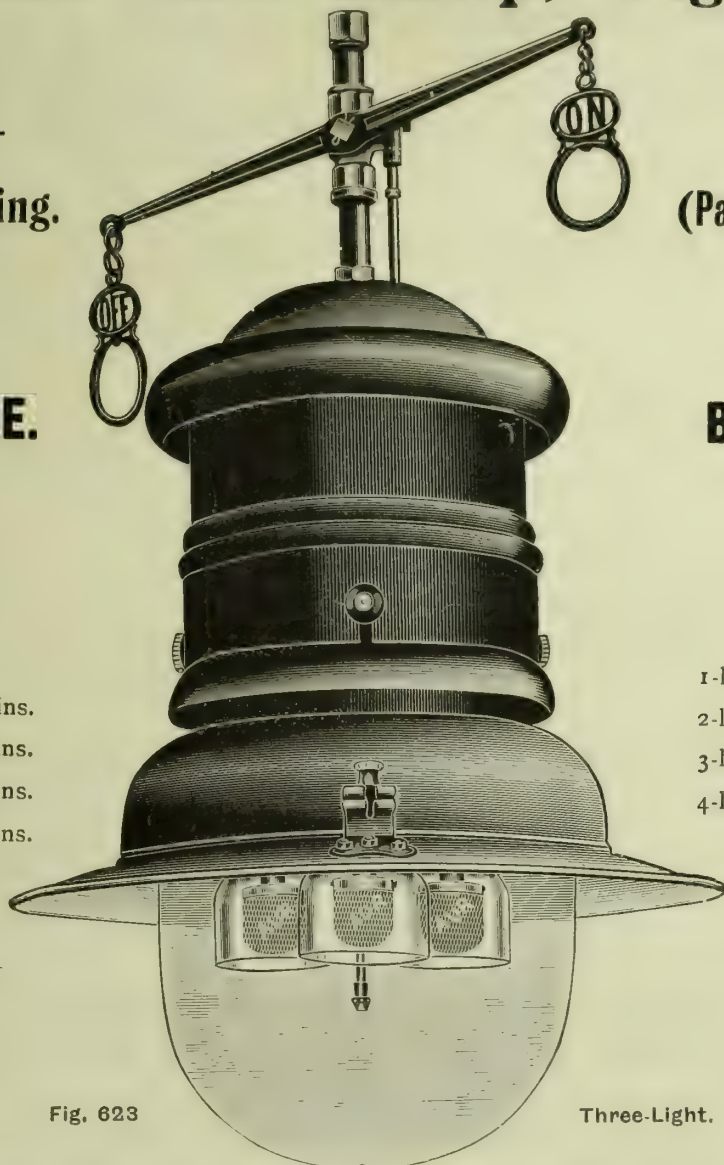


Fig. 623

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52 6	6/- extra.
2-light	8 feet	260	47 6	6/- extra.	4-light	16 feet	550	72 6	9/- extra.

All on or off, or One light on and the rest off, 7 6 per Lamp extra. Cup and Ball, 3 6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3 4 1/2 per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2/9 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6
Case contains	80	18	18	12	Welsbach Mantles, each	6d.	subject as usual.		
									Not made

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4 1/2 d. each.

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Telephone 2410 NORTH.

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25 per cent. greater yield of Ammonia.

More liquid Tar.

Stopped Pipes unknown.

Naphthalene always in solution. 45 per cent. less ground space required.

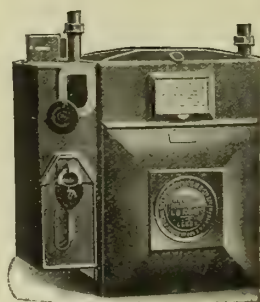
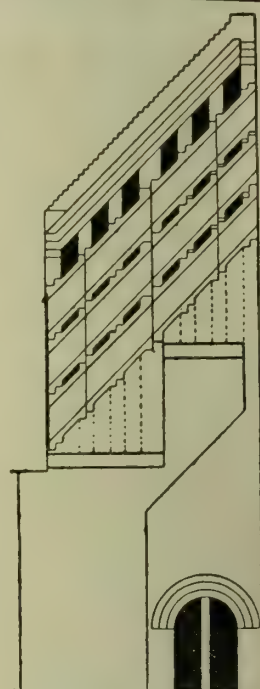
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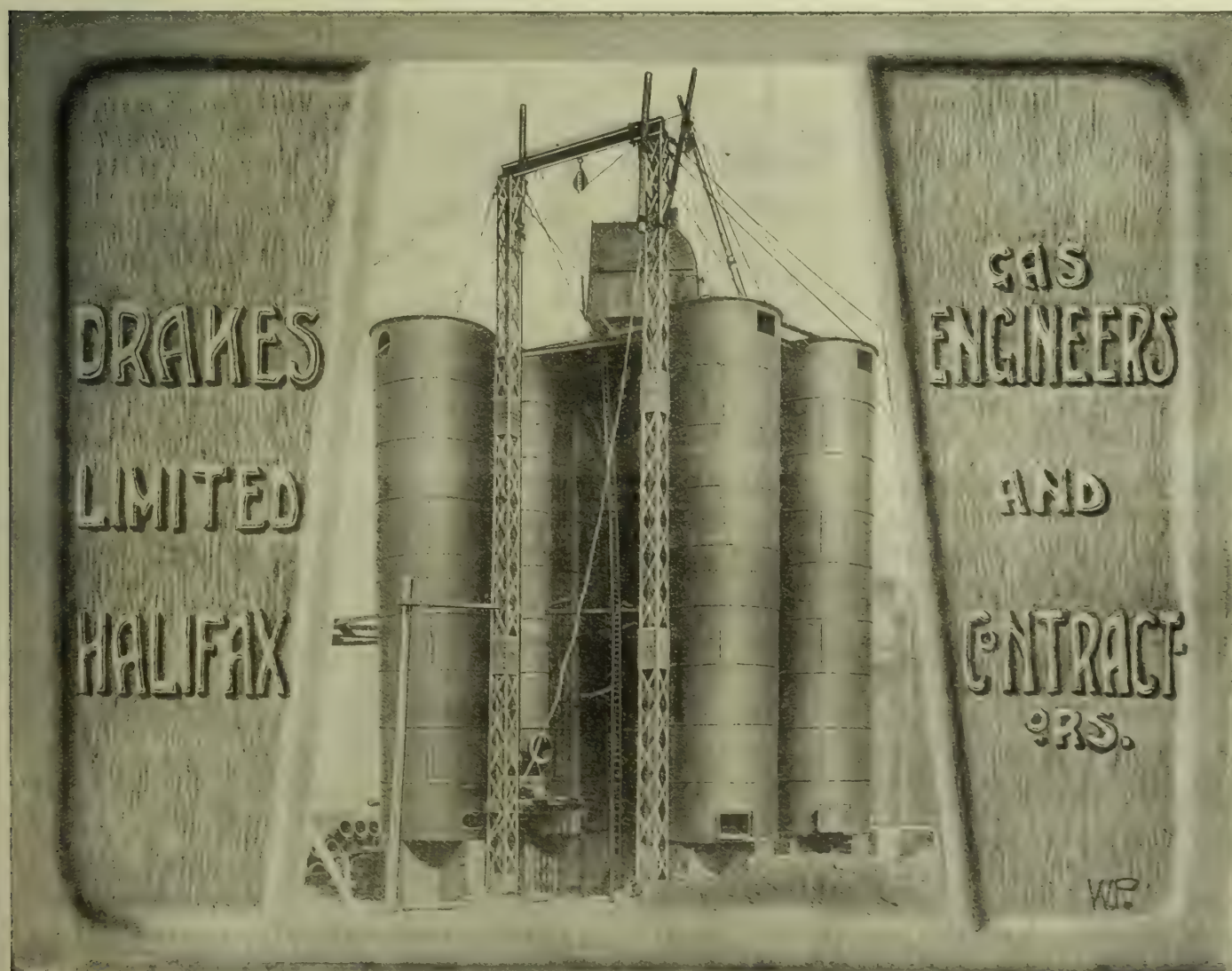
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DURHAM (THORNLEY) COAL.

Gas made per Ton	13,102	cubic feet.
Fuel Consumption	12.3	lbs. per cent.
Illuminating Power	15.56	No. 2 Met. Burner.
Calorific Value	573.6	B.Th.U. (Gross).

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Fuel Consumption	13.4	lbs. per cent.
Illuminating Power	16.19	No. 2 Met. Burner.
Calorific Value	584.9	B.Th.U. (Gross).

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Gas made per Ton	12,145	cubic feet.
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Illuminating Power	15.22	No. 2 Met. Burner.
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See "JOURNAL OF GAS LIGHTING," June 8 & July 20, 1909, for description and results.

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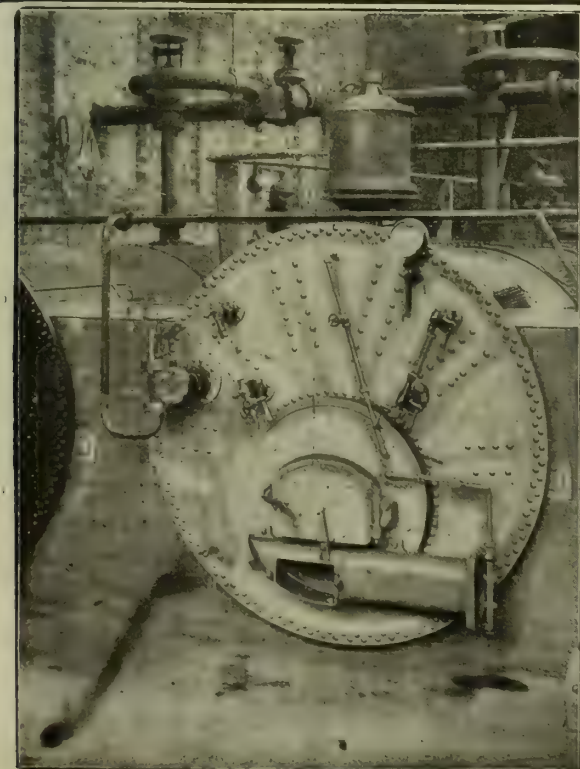
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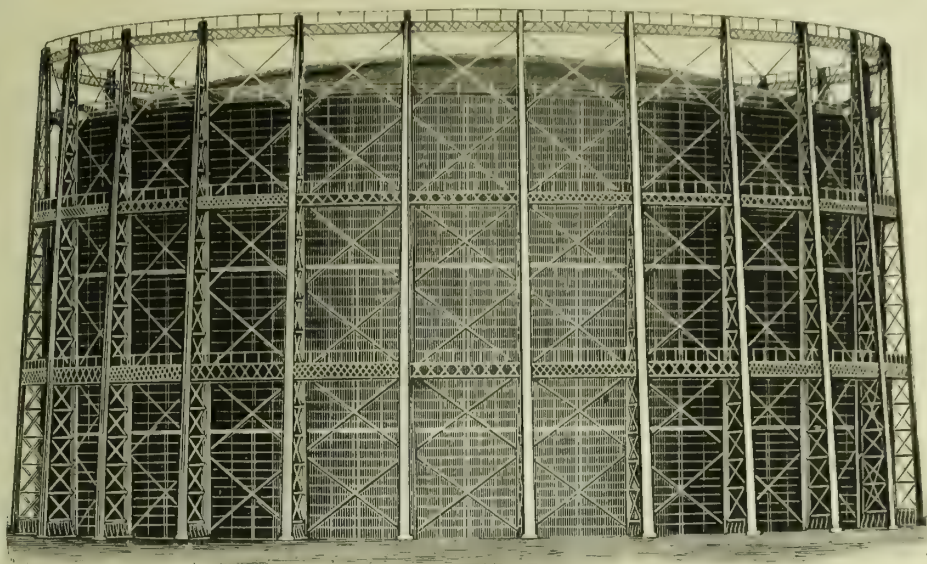
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Carbonizing charges 40 per cent. less than with Horizontals.

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Saleable value of Coke greatly increased.

25 per cent. greater yield of Ammonia.

More liquid Tar.

Stopped Pipes unknown.

Naphthalene always in solution.
45 per cent. less ground space required.

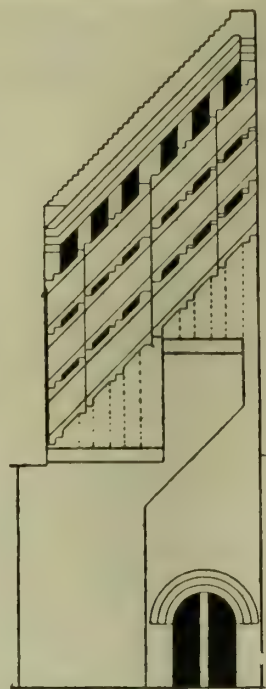
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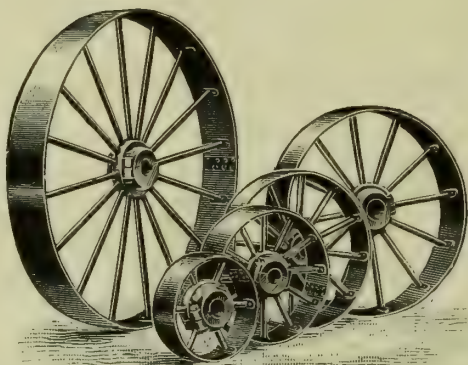
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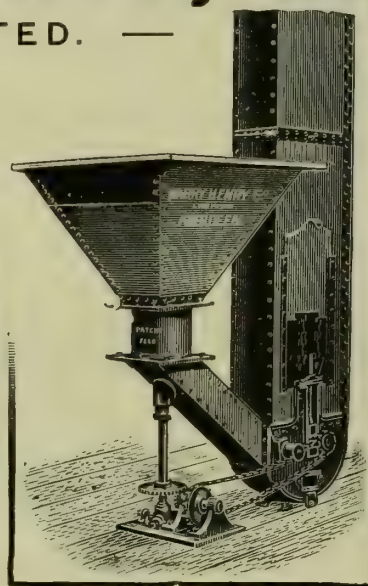
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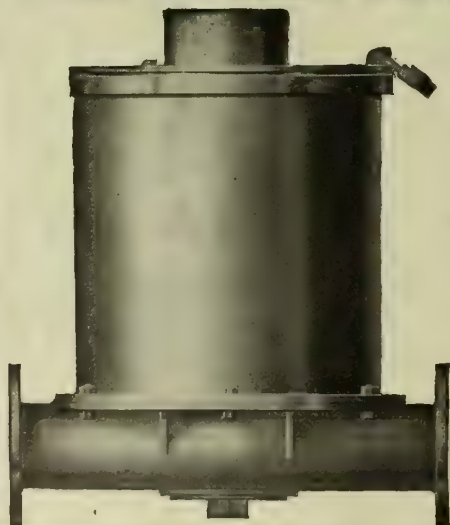
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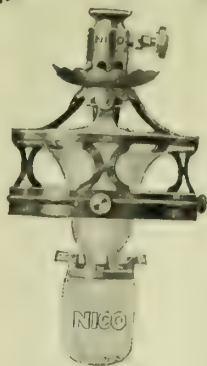
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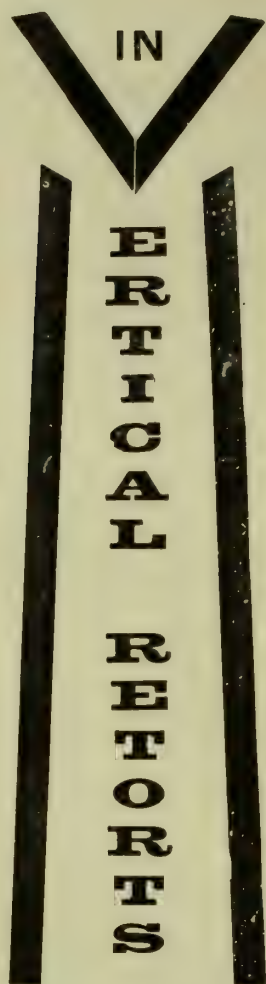
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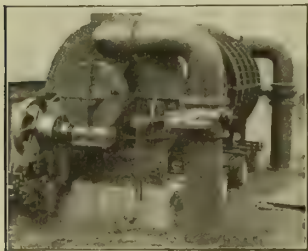
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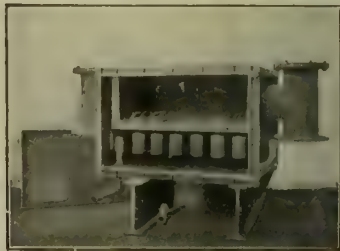
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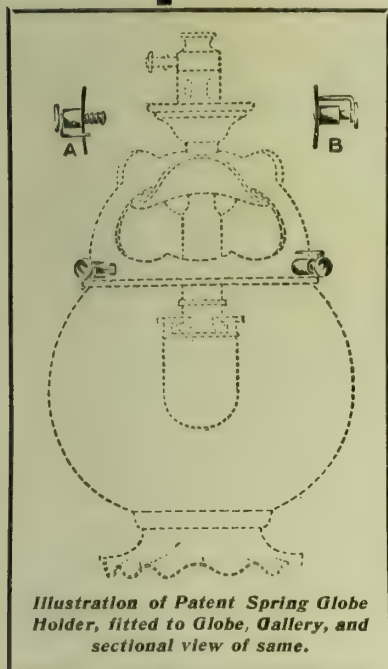
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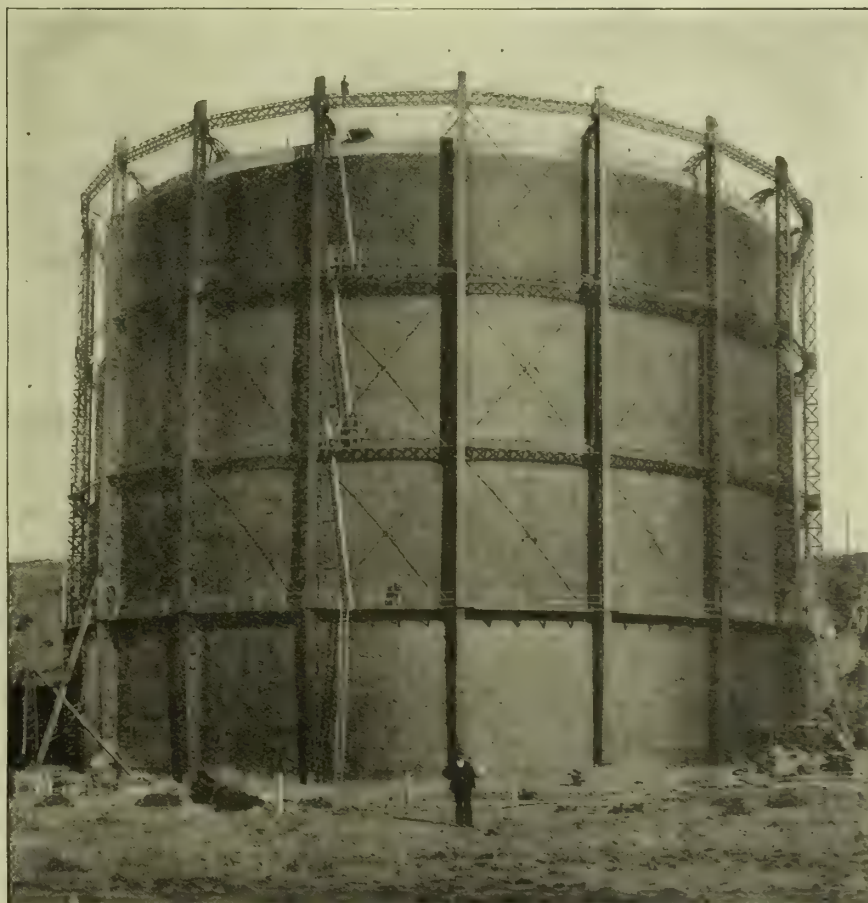
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Belfast (2nd) . . .	4,500,000	Gelsenkirchen (2nd) . . .	350,000	Rhymney Valley . . .	175,000
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Bremen (2nd) . . .	950,000	Hong Kong . . .	450,000	Shanghai . . .	225,000
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Brentford (2nd) . . .	850,000	Innsbruck, Austria . . .	200,000	Southampton . . .	800,000
Bridgwater . . .	200,000	Ipswich . . .	750,000	Southampton (2nd) . . .	500,000
Bridlington . . .	150,000	Kampen, Holland . . .	350,000	Southampton (3rd) . . .	600,000
Bridlington (2nd) . . .	200,000	Kiel, Sleswig . . .	1,000,000	Southgate . . .	400,000
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Brighton . . .	1,750,000	L. & N.W. Rly., Crewe . . .	700,000	Southport (2nd) . . .	900,000
Brighton (2nd) . . .	1,850,000	Lausanne, Switz. . .	250,000	South Shields . . .	650,000
Bromley . . .	1,500,000	Lawrence, Mass. . .	400,000	Stafford . . .	500,000
Bruges, Belgium . . .	200,000	Lea Bridge . . .	350,000	Staines . . .	600,000
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Brussels-Ville (2nd) . . .	750,000	Lemberg (2nd) . . .	500,000	Swansea (2nd) . . .	1,000,000
Brussels-Ville (3rd) . . .	1,500,000	Liège, Belgium . . .	1,000,000	Swansea (3rd) . . .	450,000
Brussels-Ville (4th) . . .	350,000	Liège (2nd) . . .	750,000	Swindon . . .	300,000
Bucarest, Roumania . . .	1,100,000	Lincoln . . .	500,000	Sydney-Harbour . . .	500,000
Budapest, Hungary . . .	50,000	Liverpool . . .	3,500,000	Sydney-Harbour (2nd) . . .	500,000
Budapest (2nd) . . .	1,750,000	Liverpool (2nd) . . .	4,500,000	Sydney-Mortlake . . .	500,000
Carlisle . . .	600,000	Longton . . .	600,000	Sydney-Mortlake (2nd) . . .	500,000
Carlsruhe, Germany . . .	500,000	Louvain, Belgium . . .	800,000	Syracuse, N.Y. . .	850,000
Chigwell . . .	350,000	Lübeck, Germany . . .	400,000	Taunton . . .	225,000
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Commercial, London . . .	850,000	Magdeburg, Germany . . .	1,400,000	The Hague Holland . . .	1,000,000
Commercial (2nd) . . .	850,000	Maidenhead . . .	225,000	The Hague (2nd) . . .	500,000
Commercial (3rd) . . .	1,250,000	Maidenhead (2nd) . . .	225,000	Tilburg, Holland . . .	400,000
Commercial (4th) . . .	2,000,000	Maidstone . . .	500,000	Torquay . . .	350,000
Copenhagen . . .	700,000	Malines, Belgium . . .	500,000	Tottenham . . .	750,000
Copenhagen (2nd) . . .	2,500,000	Malmö, Sweden . . .	350,000	Tottenham (2nd) . . .	750,000
Courtrai, Belgium . . .	250,000	Malta . . .	400,000	Tottenham (3rd) . . .	350,000
Coventry . . .	600,000	Manchester . . .	3,500,000	Tottenham (4th) . . .	1,000,000
Coventry (2nd) . . .	600,000	Manchester (2nd) . . .	3,500,000	Tottenham (5th) . . .	1,000,000
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Cracow (2nd) . . .	200,000	Mayence, Germany . . .	700,000	Tunbridge Wells . . .	1,000,000
Crefeld, Germany . . .	500,000	McKeesport, Pa. . .	500,000	Utrecht, Holland . . .	1,000,000
Croydon . . .	1,250,000	Merthyr Tydfil . . .	300,000	Utrecht (2nd) . . .	1,000,000
Croydon (2nd) . . .	625,000	Middlesbrough . . .	1,250,000	Verviers, Belgium . . .	1,000,000
Croydon (3rd) . . .	625,000	Namur, Belgium . . .	175,000	Vienna . . .	3,500,000
Croydon (4th) . . .	550,000	Nelson . . .	400,000	Vienna (2nd) . . .	2,500,000
Debreczin, Hungary . . .	100,000	Newburgh, N.Y. . .	600,000	Waltham . . .	400,000
Deventer, Holland . . .	150,000	New York . . .	5,200,000	Wandsworth & Putney . . .	1,800,000
Deventer (2nd) . . .	200,000	Nictheroy, Brazil . . .	250,000	Watford . . .	300,000
Dorking . . .	150,000	North Middlesex . . .	150,000	Watford (2nd) . . .	350,000
Dublin . . .	2,000,000	North Middlesex (2nd) . . .	200,000	Wellington, N.Z. . .	350,000
Dublin (2nd) . . .	2,000,000	North Middlesex (3rd) . . .	75,000	West Bromwich . . .	550,000
Dublin (3rd) . . .	650,000	Norwich . . .	1,000,000	West Ham . . .	1,500,000
Dundee . . .	1,500,000	Norwich (2nd) . . .	300,000	West Ham (2nd) . . .	800,000
Dunedin, N.Z. . .	150,000	Norwich (3rd) . . .	500,000	Weston-super-Mare . . .	350,000
Dunedin, N.Z. (2nd) . . .	275,000	Nottingham . . .	1,000,000	Weston (2nd) . . .	350,000
Durham . . .	200,000	Nottingham (2nd) . . .	1,000,000	Wexford, Ireland . . .	100,000
Düsseldorf, Germany . . .	1,000,000	Nuneaton . . .	125,000	Wiesbaden, Germany . . .	850,000
Eastbourne . . .	1,250,000	Oberhausen, Germany . . .	175,000	Winchester . . .	225,000
Edinburgh . . .	2,000,000	Oldenburg, Germany . . .	200,000	Winchester (2nd) . . .	125,000
Epsom . . .	225,000	Ostend, Belgium . . .	100,000	Wolverhampton . . .	1,500,000
Epsom (2nd) . . .	300,000	Ostend (2nd) . . .	200,000	Zwolle, Holland . . .	200,000
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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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VOL. CVIII., No. 2430.—TUESDAY, DECEMBER 7, 1909.

EDITORIAL NOTES—GAS, &c.

A Notable Power Development.

FROM several scientific and practical points of view—particularly from those of the physicist and the mechanist—the paper by Mr. Herbert A. Humphrey, on “An Internal Combustion Pump, and Other Applications of a New Principle,” read before the Institution of Mechanical Engineers, and the discussion upon it (which was completed last Friday night), contain more than passing interest. To the engineer, whatever be his particular work in the profession, new developments in the provision of power in any shape or form have concern. Mechanical operation surrounds us on all sides; and it is developing along the newer lines at a pace that is not a little astounding. And the simple method for the development of power which Mr. Humphrey has now presented to us promises—we can go no farther in positive assertion as yet—to place at command a method whereby there will be a great expansion of power application; for, as the title of the paper implies, the new internal combustion pump is not only capable of raising and forcing liquids, but it is especially applicable to the compression of all elastic fluids. In this statement, taking into consideration, too, that the motive force is gas, are found sufficient reasons, apart from the scientific interest attaching, for calling our readers’ attention to the latest novelty that has come to swell, and possibly to take a prominent place in, the vast and fascinating history of thermodynamics.

The originality and fertility that pervade this invention of Mr. Humphrey (whatever may be its practical future) force themselves upon one at every fresh aspect of consideration; and the acknowledgment of this by many eminent engineers during the discussion on his paper must be alike gratifying and encouraging to the inventor. The direct development and application of power without going through a chain of transformations is of itself a worthy achievement. The supplanting of complication, and the eradicating of old-time difficulties, by a combination of extreme simplicity, enhance the value of the achievement. Mr. Humphrey claims no credit for the radical idea of this invention. As far back as 1868, the notion of exploding a combustible mixture of gas and air to produce pressure on the surface of water with the object of raising the water, was conceived; but the efforts to put it into practice failed through conception not being backed by a sufficient breadth of view. It has been left to Mr. Humphrey, forty years or so later, to discover by critical examination of the problem what appears to be a practical solution, attested by experts, and so far accepted by practical engineers that it is possible there will soon be at work trial plants on a large scale. Then, and not till then, will it be possible to speak in the confident manner that one is tempted to employ in face of the infatuating enthusiasm of the inventor and his friends.

The underlying principle, then, of the new gas-pump is the exploding of a combustible mixture which exerts the force so generated direct on to the surface of water, and so lifts it. The mass of water on which the gas acts is made to oscillate between high and low level; and this movement alone serves to draw in fresh water, to exhaust the burnt products of combustion, to draw in a further combustible charge, and to compress it previous to ignition. Looking broadly at the invention, there has been, in developing the combination, a comprehensive attack on gas-pump, gas-turbine, and gas-engine problems. The plain and simple, if somewhat cumbrous, types of structure by which Mr. Humphrey has secured the end he sought, eliminate much of the mechanism, and therefore difficulty, that obtain in connection with the gas-engine, though the gas-engine, be it said, like most other mechanical contrivances, appears to possess a worse character than is actually the case when the defects of the genus are accumulated and brought under notice in bulk instead of separately. But we cannot escape

from certain facts in connection with Mr. Humphrey’s invention. Where there is no rotating fly-wheel, no slide piston, no connecting-rod, no crank, no bearings or glands of any sort, where the lubricating devices are of the simplest and are little required, and where no strong framework is needed—well, there goes a whole sheaf of points of difficulty, of friction, of waste, of wear and tear, and of labour. There is in the new structure the minimum of mechanism for the power developed. The high temperatures that are necessary for efficiency and economy in the gas-engine are absent here; and therefore also the concomitant difficulties—such as expansion and contraction of cylinder and piston, piston lubrication, and pre-ignition. As a matter of fact, there is little to lubricate, save a little interlocking gear; and as to pre-ignition, there can be no trouble in this regard in view of the fact that the explosion chamber is flushed by water every cycle. It is obvious, on brief acquaintance with the results of his work, that credit has to be taken by the inventor for economies in structure, in working (not speaking at the moment of fuel), and in maintenance.

All of this might allow a big discount from working efficiency in comparison with other forms of engine, and yet give the new invention an easy lead. But for the moment, in regard to results, we have to depend only on those obtained from limited trials made by Dr. Unwin; and careful and accurate as is the learned Doctor in his technical proceedings, we cannot avoid the recognition that the running of any mechanical structure large or small under the conditions of day-by-day actual work is not the same thing as the refinements of trial in the hands of such an expert. Provisionally, then, we accept the testimony of Dr. Unwin, which assures that the fuel consumption in the trials he made, reckoned on the work done in lifting water, was less than in any pumping arrangement, either by gas or steam, hitherto recorded. The new gas-pump used 83·1 cubic feet of Mond gas per pump-horse-power-hour; as contrasted with 120 to 127 cubic feet with a gas-engine and centrifugal pump. The pump answered to the demands upon it with varying lifts without any alteration in the gas and air mixture. There was no misfire or hitch of any description. On the other hand, in using the gas-pump for lifting water, the pertinent question has been asked as to whether there is any contamination of the water by tar or oil or sulphurous acid. Such contamination has not been noticed; and therefore the answer for the present stands in the negative. However, it is an exceptionally good character with which this novel internal combustion pump is introduced; and surrounding it is found much of special technical interest and merit.

District High-Pressure Supplies.

A COMPLIMENT was paid gas undertakings at a meeting of electrical engineers a few days ago, in the acknowledgment by one speaker that there is not anything in the commercial sphere that electrical people can do that the gas people cannot do. The managerial section of the gas industry will try to continue to live up to the good opinion formed of it by some of our electrical friends. The industry, as Mr. Sydney R. Barrett, the Superintendent of the Fittings Department of the Birmingham Gas Undertaking, was telling the Master Fitters’ Association a few days since (*ante* p. 607), is ever at work developing the resources of coal gas, and increasing the field of its utility and value to the public; and one of the ways in which the Birmingham Gas Department are doing this is by putting down plant for distributing gas at increased pressure throughout a large district for the service of all and sundry who require high-power lighting, or gas at pressures above the normal for industrial uses in which high and dependable flame temperatures are essential. The point lifts to the surface again the question as to whether gas undertakings are making the utmost use that they could do of high-pressure supply in aiding, developing, and protecting their commercial interests. The Birmingham Gas Department, of course, are

not actually leading in this matter; but, in connection with it, they are in the van of trading progress. What is being done is an extension of what has been effected in other places. The system of high-pressure supply to the outside lamps of a continuous range of shops, inaugurated elsewhere (on a small scale) the system of general high-pressure supply as distinct from the private installation of high-pressure gas-plant. Groups of shops are being dealt with in somewhat similar manner in other districts, notably at Tottenham, in regard to which information was imparted at the recent meeting of the Southern District Association. But there are undertakings with still larger views as to the potentialities of high-pressure supply, and who look to a substantial development of business from a judicious application of the system. The Fleet Street and neighbourhood high-pressure supply of the Gaslight and Coke Company is a case in point; and the Birmingham Corporation are going to give another example. Fleet Street, through this system, furnishes what the late Chairman of the Streets Committee of the City Corporation described as being the best-lighted thoroughfare in the City; and through the high-pressure main too, the Company have been able to displace electric lighting by high-pressure lamps, and to largely bring the gas into use for industrial purposes in certain of the neighbouring printing and other establishments. The business from the main not only pays, but in regard to lighting it gives an assurance that electrical competitors, with contemporary means, will never oust the Company from places where the high-pressure gas system has got in.

The provision of a high-pressure supply in a likely neighbourhood cannot naturally be made for nothing. There are capital and running expenses to be considered. But increased expenditure in the distribution department has been compulsory; and there are directions in which it may be wise, although not absolutely compulsory, to incur yet additional outlay. The provision of a high-pressure supply in appropriate neighbourhoods is one such, and for several reasons. The flame arc lamp, however much it runs counter to the laws of scientific illumination, is an attractive thing for the publican, for the vendor of cheap jewellery, and for the drapers and tailors who adopt cheap-jack methods in their trading. The modern high-pressure lamp, which has doubled efficiency and so halved consumption for a given duty, is the effective competitor of the flame arc lamp—in cost and in brilliance; and it is an altogether steadier and less harmful form of illumination. But there is a difficulty. Only comparatively large establishments can afford to have a private compressing plant for these high-pressure lamps; and there may be many small shopkeepers in the principal thoroughfares who would like the lamps, but do not want the plant. If there were a general high-pressure supply available, these tradesmen would, no doubt, be pleased to avail themselves of it. A scheme of the kind in a shopping district is the most effective means of competing with the flame arc lamp; and the retention of the outside lighting of a shop means, as a rule, the retention of the inside illumination. The business centres of the larger towns also, in most cases, offer scope for the application of high-pressure gas to industrial purposes.

To a gas undertaking, the advantages of the provision in appropriate neighbourhoods of a high-pressure supply are obvious; and they may be grouped under the heads of commercial, advertising, and business insurance. To the tradesman or manufacturer fortunate enough to be located where he can make use of the high-pressure supply, there are also several advantages. By its means he can obtain illumination per any given unit at a cheaper rate than is possible with low-pressure supply, owing to the threefold increase in efficiency per cubic foot of gas consumed. He has not to bear the initial expense of a private compressing plant; nor do running and maintenance costs fall upon him. The consumer has not to provide any labour or attention of any kind for the compressing plant. There is, in short, a considerable saving to the consumer between the private plant and the common provision of a high-pressure supply. The advantages are thus fairly evenly balanced. The question of the charge to make for the high-pressure gas must be governed largely by local circumstances. The convenience is certainly worth a rather higher price than is paid for gas at ordinary pressure; but that is a matter that need not occasion gas undertakers much concern, so long as business is preserved to them—business of a class which the electricians find the most pregnable of all under the conditions of low-pressure gas supply. In the case of the Gaslight and Coke

Company, they merely charge, in connection with the Fleet Street high-pressure gas supply, a percentage on the ordinary cost of gas to cover the loss of volume due to compression. Apart from the question of general high-pressure supply in suitable localities, it is patent the electricity undertakings are now feeling the effects of private gas-compressing plants. The Hornsey Borough Council have shown their feelings on the matter by deciding that the rates for energy for motors used for driving gas-compressors are to be 13s. 4d. per quarter up to 20 units, and for each additional unit 6d. These are vindictive prices; and electricity for the working of compressing plants comes under the category of power supply! But electric motors are not necessary for gas-compressors; as a matter of fact, they are a danger. On a collapse of the electric supply, down falls the high-pressure lighting to the low-pressure level, though that the tradesman can better tolerate than total extinction. Anyway a general supply of high-pressure gas relieves the users of all personal worry. We believe that from tentative supplies on the small scale, high-pressure supply will exhibit some remarkable developments, and that in the very near future.

An External Cause.

ONE of those deplorable accidents which all must regret, but which care and foresight on the part of gas suppliers cannot avert, has occurred at Islington, in the poisoning by an escape of gas from a fractured street main of three children, the eldest of whom was only ten years of age. Children of such tender years ought not to have been left by their parents unprotected, and particularly after the warning that they had had on the morning of the fatality of the presence of gas in the dwelling. It would also seem that the children were practically prisoners in the rooms. Probably with the best of intentions of safeguarding them—the event proved the mistake—according to the evidence of the mother, “the doors were fastened, so that the children could not get out; but she did not think they were bolted.” Had the children had their freedom, it is not at all unlikely that they would have been alive now. But in this case it is not our business to censure; the Jury did this in the gentlest manner possible by their expression of opinion that it was unfortunate the children were left alone. What was done was done thoughtlessly by a pair of hard-working parents; and no doubt their bereavement is in itself sufficient for them to bear. The aspect of the matter that chiefly concerns our readers is that it supplies another instance of how outside influences contribute mainly to the production of fatalities in which gas has part. In the case of the Bermondsey explosion (about which there is some fresh information in our news columns to-day, p. 689), a fractured water-main and the presence of a disused sewer were the causes that produced the escape of gas and offered storage and conveyance over a considerable section of roadway. In this Islington case, we have a 3-inch pipe broken, some 3 ft. 6 in. from the kerb. The pipe had been in position for 46 years; and from the evidence of the Chief Distributing Engineer of the Gaslight and Coke Company (Mr. H. S. Reeson), it was still in good condition for the conveying of gas.

What, then, caused the pipe to fracture after being in position through such a number of years? It was found that the earth at the spot where the fracture occurred was loose. The looseness must have been of somewhat recent origin, as otherwise it seems almost impossible that the pipe could have been fortunate enough to escape through its long life the accident that has now befallen it. But there is no testimony to show how the earth became loosened at the particular spot, nor as to whether there had been any abnormal traffic over the roadway. Nothing can be said on these points. But something found out the evidently newly-created weak point; the fracture occurred; and the released gas passed along the way of least resistance, and obtained entrance into the basement rooms where the children were. The jury imposed no blame upon the Gas Company, nor was there any foolish talk about the Company (as there has been in times past) undertaking such an almost superhuman task as making an inspection of the whole of their 2184 miles of mains and 2000 miles of service-pipes by opening up the roadways and footpaths, and so creating a condition of things, through loosening the soil, that would lead to more fractures than are heard of now. Nor did the jury appear to be at all astonished to learn that a gas-pipe, properly embedded in good soil, may be as good for its designed purpose after 46 years' service as on the day it was laid. Expressions of opinion, riders to verdicts, and

so forth on the part of non-technical jurymen upon technical subjects of which they have no knowledge, and so do not understand, contribute to no good end; but they are apt to sharpen popular animosity against supply companies, who are anxious to serve the public well, and to do so with all possible concern for the public safety.

The Statue of Sir George Livesey.

It was anticipated, from a statement made last August by the Chairman (Mr. Charles Carpenter), that the memorial of the South Metropolitan Gas Company to the late Sir George Livesey—to be erected on the garden plot adjoining the well-known offices at the Old Kent Road works—would be completed late in the autumn of this year. Anticipation has not been realized; and for a very good reason, there will not be realization until the summer of next year. In the first place, the eminent sculptor, Mr. F. W. Pomeroy, is an exceedingly busy man; and the statue will not be ready until the New Year. He is desirous, too, that the statue should be included in the next Royal Academy exhibition; and to this the Board of the Company have acceded. The formal unveiling will not therefore take place before next summer. The ceremony will doubtless lose some of its freshness by reason of the statue being previously exhibited; but the Board felt—and rightly—that they would be doing the correct thing by consenting to the exhibition, and so affording an opportunity to many, who would otherwise be denied the pleasure, of becoming acquainted with the merits of the statue. This explanation will satisfy all interested readers as to the non-fulfilment of Mr. Carpenter's prediction. While mentioning this matter, it may be noted that, according to an announcement in the "Co-partnership Journal," it has been arranged to place a bust of Sir George, by Mr. Pomeroy, in the vestibule of the Livesey Institute.

Dangers of the Streets.

Yet another danger threatens the long-suffering pedestrian, who, after being chased out of the roadway by motor cars and other fearsome vehicles, only reaches the pavement or refuge to find that it may be still necessary for him to exercise caution—if the thoroughfare should be lighted by electric arc lamps. A young painter last May, while waiting for a friend at the corner of a road in the district of the Leyton Urban Council, stood under one such lamp, and, the globe falling, was severely cut about the head and otherwise knocked about. Absence from work and a doctor's bill resulted; and all these unpleasant experiences formed the subject of an action which the sufferer brought against the Council in the Bow County Court. Ill-luck, however, pursued him even here; for, in the absence of any evidence of negligence in the fixing of the lamp, the plaintiff was non-suited by the Judge who said the Local Authority had a duty cast upon them to have these lamps for lighting purposes. An accident of the kind has admittedly hitherto been an extremely rare occurrence—in fact, the Council's Electrical Engineer stated that it was the first case of the kind he had known in his twenty-five years' experience. The ground for uneasiness exists in a statement which was made by an expert called for the plaintiff—namely, that "a thousand-and-one things might have caused the fall." If the safe hanging of an electric arc globe depends upon the absence of so many factors, there must be an ever-present danger of one or more of them being brought into play. In fact, the Engineer himself seems to have admitted that the accident was one which it would have been impossible to avoid; and this was supported by the expert referred to, who said it would be a very difficult matter to fix globes so that they would not fall on passers-by.

Rating Statistics.

We are reminded once more of the march of time by the receipt from Mr. James Carter, the Borough Treasurer of Preston, of his annual statistics with regard to the rates levied in a selection of towns; and the charges for gas, water, and electricity, and profits and losses on municipal undertakings, in the same places. The present figures relate to the year 1909-10; and some points from them are reproduced in another part of to-day's issue. It is Mr. Carter's custom to add year by year further names to his list; and on the present occasion it is noticed that the already substantial number has been increased by the inclusion of three new-comers—making a total of ninety-four towns dealt with. While not pretending to be anything like a complete

record on the subjects with regard to which information is given, the fact that both large and medium-sized towns are included—combined with the extent of the list—fairly justifies one in looking upon the figures as a useful indication of the state of affairs existing generally over the country. Of course, circumstances alter cases; but it is impossible in a compilation of the character of this one to point to the numberless factors which influence the various figures given in respect of the different places. Thus comparisons of one town with another must be open to the objection which so often attaches to the quoting of bare figures. There may be perfectly valid reasons for the rates being higher in one place than another; and the same remark applies to gas, water, and electricity charges. Still, however, the fact remains that there are these differences; and it is by no means without interest to note them. When a man is contemplating (say) the building of a factory, and is looking for a suitable site, he inquires as to the extent of the rates and charges referred to. He would be hardly likely to concern himself overmuch as to why they happen to be high or why they are low.

Some Figures.

Well, to come to the present returns. Glancing down the list, the rates levied show in a few places a welcome tendency to subside to a somewhat lower level than one has of late become accustomed to. On the other hand, a large number of increases fall to be recorded. As to the amount in the pound levied for rates, there are no less than thirteen places where it is 9s. or over (compared with seven last year)—there being a tie between Norwich and our old friend (in this respect) East Ham for first place, with 9s. 11d. This is an addition of 1d. in the former case and of 8d. in the latter. The number of instances in which the rates amount to 8s. in the pound or more is 36 on the present occasion, as against 24 and 25 for the two immediately preceding years. At the bottom of the scale, there are again the same three towns—Bournemouth, Lancaster, and Oxford—where the rates are 5s. or less in the pound; and in spite of this, in the first-named case there were losses on estates owned and from "other sources" which increased the rates to the extent of 1d. in the pound. The list includes 16 places where the price of gas is 2s. or under per 1000 cubic feet, for domestic purposes, against 15 last year (Sheffield is one of the newly-added towns). Widnes, as usual, occupies first place in regard to cheapness, with a charge of 1s. 2d. per 1000 cubic feet for domestic purposes, and still lower rates to large consumers and to users of power. For a domestic supply of electricity, four places charge 6d. or more per B.T.U.; while in Ashton-under-Lyne, Merthyr Tydfil, and Wolverhampton the average price is 3d., and in West Ham there is a flat-rate of 3d. Twelve of the towns (the same number as last year) named by Mr. Carter "relieve the rates" to the extent of 1s. or more in the pound in consequence of the "rents of property and profits transferred from gas, water, markets, &c.;" but numerous instances are quoted of losses on municipal undertakings which have caused the rates to be increased—in three cases by over 1s. in the pound.

The Latest Gas Undertakings Returns.

The returns relating to the gas undertakings of the United Kingdom for the year ended Dec. 31, 1908, in the case of the Companies, and March 31, 1909, for the Local Authorities, were issued yesterday, but too late to be fully noticed in to-day's "JOURNAL." It was only a few weeks ago (on the 4th ult.) that they were presented to the House of Commons and ordered to be printed; so that their prompt publication is in the highest degree commendable, and is in striking contrast to the dilatoriness of which complaint has been made in recent years. The returns furnish information in regard to 790 undertakings—499 Companies and 291 Local Authorities, compared with 495 and 276 (together 771) before. The following are the totals: Amount authorized, £152,702,081; amount paid up and borrowed, £130,708,693; receipts, £30,519,639; expenditure, £23,474,709; tons of coal carbonized, 15,394,307; cubic feet of gas made, 189,918,737,000; cubic feet sold, 173,957,395,000; length of mains, 34,490 miles; number of consumers, 5,916,120; number of public lamps, 700,696. The totals in the immediately preceding returns, which were noticed in the "JOURNAL" for the 29th of June last (p. 958), were: Amount authorized, £129,702,385; amount paid up and borrowed, £113,865,050; receipts, £30,067,752; expenditure, £22,724,104; tons of coal carbonized, 15,406,753; cubic feet of gas made, 188,486,693,000; cubic feet sold, 172,889,147,000; length of mains, 33,536 miles; number of consumers, 5,665,176; number of public lamps, 700,264. Our usual particulars from the new returns will be given next week.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 691.)

BUSINESS on the Stock Exchange was quiet last week, particularly in the earlier days of it. The tendency at first was not quite pronounced, and prices oscillated at times first one way and then the other. On Wednesday, things took a decided turn for the better, except in the more speculative markets, which are subject to special influences; and for all the rest of the week there was a steady increase in activity, together with an advance in prices. Politics are excluded from these columns, and the *post hoc* is not always the *propter hoc*. But it is a noteworthy fact that, dating from the rejection of the Budget, a strong recovery in the choicest markets, and a buying of the best things, set in to a degree long unknown in Capel Court. The fairly firm opening of Monday had given way to some extent on Tuesday, and Consols had fallen. But all this was changed on Wednesday. Consols rose $\frac{1}{4}$; Railways began to amend; and the Foreign Market was calm and firm. Thursday was most cheerful. Home Government securities were in full cry, and Consols advanced $\frac{7}{16}$. On Friday, the irresistible expansive force pushed Consols up another $\frac{1}{16}$. All the gilt-edged division were in strong demand; the Railway and the Foreign Markets following up. Business continued unusually active on Saturday; and the firmness in the leading departments was well maintained. In the Money Market, the supply was fully abundant, and rates eased down steadily. A reduction in the Bank rate on Thursday was at one time thought possible; but it did not come about. Business in the Gas Market was below the mark in point of activity; and it had no particularly noticeable feature about it. There were a few changes in quotations—about as many in one direction as in the other—but none apparently possessing any significance affecting the stability of the undertakings. In Gaslight and Coke issues, the ordinary was quieter, and evinced not the slightest disposition to budge from its old figures. Transactions marked from 102 $\frac{1}{2}$ to 103 $\frac{3}{8}$. The secured issues showed prices of 87 for the maximum, from 103 $\frac{1}{2}$ to 105 for the preference, and from 82 to 83 for the debenture. South Metropolitan was more active, but still unchanged. Dealings were marked at from 119 $\frac{1}{2}$ to 120 $\frac{1}{2}$; and the debenture was done at from 81 to 82. In Commercial, nothing was done except one transaction in the 3 $\frac{1}{2}$ per cent. at 103—a fall of 1. Among the Suburban and Provincial group, Bournemouth preference changed hands at 15 $\frac{1}{4}$ and 15 $\frac{7}{16}$, Brentford old at 253, Lea Bridge at 121, South Suburban at 120 $\frac{1}{2}$, and West Ham preference at 125—a fall of 1. South Shields rose 3, thus edging above a 5 per cent. price. In the Continental companies, Imperial was very quiet, with only three or four transactions at 105 $\frac{1}{4}$ to 106 $\frac{1}{2}$. Union made 98 $\frac{1}{2}$ and 98 (with a rise of 1 in the preference); and European was done at 24 $\frac{1}{2}$ —a fall of $\frac{1}{4}$. Among the undertakings of the remoter world, Buenos Ayres realized 13 $\frac{3}{4}$, Cape Town 2 $\frac{3}{4}$, Monte Video 12 $\frac{1}{2}$ and 12 $\frac{3}{4}$, Oriental 138 $\frac{1}{2}$ (a rise of 1), Primitiva 6 $\frac{1}{16}$ and 7 $\frac{1}{8}$, ditto preference 5 $\frac{1}{4}$ and 5 $\frac{1}{16}$, ditto debenture from 95 $\frac{1}{2}$ to 96 $\frac{1}{2}$, and San Paulo 14 $\frac{1}{2}$.

ELECTRICITY SUPPLY MEMORANDA.

A Domestic Contract System—Prophecy Again—Fruitful Gas-Burners—Lessons from the Board of Trade Returns—Calorific Values—A Confession from Finchley—The Dog-in-the-Manger Spirit.

THE paper that Messrs. Handcock and Dykes have read before the Institution of Electrical Engineers, on "The Present Aspect of Electric Lighting," is one of the most open admissions from electrical engineers that we have yet seen as to the tremendous pressure from which the electrical industry is suffering. It also affords another illustration of the frantic struggles electricians have to make to get business, and of the tortuous methods whereby they seek to effect their purpose; and their extremity is well portrayed in the grotesque figures that the authors quote for gas lighting. The authors (as a report in last week's issue shows) suggest that householders within certain limits may be induced to change their patronage from gas to electricity by means of a contract system, under which an annual charge of (say) 12s. per 25-candle (say, 30-watt per hour) lamp is made, inclusive of wiring rental for an all-day supply, and 10s. per lamp per annum for a dusk-to-dawn supply. The idea is not new. Charge per burner was at one time in vogue in the gas industry; it is not so now. The gas industry prefers not to do business on mediæval lines in these days. It has a much better method, under which the consumer pays for what he receives; and the gas undertaking gets paid for only what is consumed. There is no speculation on one side or the other; and the undertaking does not look to come out on the right side of the hedge on the average of the business done. It expects every consumer to yield his average of profit per unit of consumption. There is freedom in the business processes of the gas industry, and no limitations. But to all these new systems of charging for electricity, to all the fresh methods that are evolved in the hope that they will be operative in winning over consumers from gas, there are limitations. In the discussion on the Handcock and Dykes paper, it was generally acknowledged that the short-hour consumers could not be supplied under the proposed system, but that they would still

have to come under meter supply. And Mr. George Wilkinson, from his experiences at Harrogate, asserts that the system cannot be applied to cooking and heating. "It would," he says, "be waste of money to do anything of the kind in a neighbourhood where there are small houses, as it is possible to get as many British thermal units out of 6 cubic feet of gas as are to be realized out of a unit of electricity." That is a commonplace fact that the intelligence of few electricians appears able to grasp. There may be such a thing as being too scientific to be able to appreciate the mere practical.

Under this new contract system, it is expected that it is all up with gas. The philosophic and prophetic Handcock and Dykes hold that gas companies will not be able to compete at the price. Mr. J. S. Dow—one of our illuminating engineering friends—asserts, and that truly, that gas companies could do so on the same lines quite well; but they stand in no need of indulging in commercial curiosities of the kind. And Mr. Risch—another speaker in the discussion on the paper—believes that Mr. Dow is correct. The point is worth a little inquiry. The 12s. per annum must be a calculated figure for the 25-candle power (30-watt per hour) lamp. The details of the calculation (so far at least as the publication of the paper enables us to ascertain) remain locked in the breasts or the heads of Messrs. Handcock and Dykes. However, supposing we take 2s. per lamp as representing wiring charges per annum. This will leave 10s. per lamp for current, which, at 5d. per unit, would buy 24 units of electricity; this being sufficient to keep a 25-candle power metallic filament lamp running for 792 hours. A 25-candle inverted gas-lamp only requires 1 to 1 $\frac{1}{4}$ cubic feet of gas per hour, according to quality; so that 1000 cubic feet of gas, or an expenditure for gas of only 2s. to 3s. in most districts, would supply the same illumination in the hours named. Have Messrs. Handcock and Dykes any objections to raise to these figures? If so, let us have them. There is a beautiful disregard among electricians of what can be done by the modern forms of incandescent gas-burners. They have yet to make intimate acquaintance with the truism that it is well to take account of the full strength of one's competitor rather than to under-rate it. Take a house in which there are thirty incandescent gas-burners, in which house the whole of the cooking is done by gas, and gas-fires are used in the drawing and bed rooms, and in which the total and actual gas account, including meter and cooking-stove rents, comes to about £10 a year. The house is well lighted—even wastefully, to please the householder who prefers light to darkness. How is the scheme of Messrs. Handcock and Dykes going to benefit this man, whose gas account of £10 includes all cooking, and a fair amount of heating in the winter evenings and mornings? Credulous as many electricians are in all matters that are opposed to gas, Messrs. Handcock and Dykes are asking much of their fellows in the electrical world in inviting belief in the declaration that, where gas is 2s. 6d. per 1000 cubic feet, 12s. 2d. and (many work out as high as) £1 per burner are (excluding cooking, but including meter-rent) fairly representative figures for domestic incandescent gas lighting. The householder above mentioned would, at 12s. 2d. pay, exclusive of cooking and heating, £18 5s. per annum at 12s. 2d. per burner, and £30 at £1 per burner. He does not pay either figure, including cooking and heating. Consider the matter another way. The £1 would buy 8000 cubic feet of gas at 2s. 6d., which would run a 25-candle inverted incandescent lamp from 6400 to 8000 hours (!) according to the quality of the gas—nearly as many hours as there are in a year. Messrs. Handcock and Dykes should find a platform where the members of the audience are not *compos mentis*. However, electricians really must take heed lest, in adopting the proposed contract system, they do not play into the hands of gas suppliers. Castles built in the air have intangible bases; and the basis of the present scheme seems to be of much the same character.

Look at the question of the expenditure for gas from a much more authentic source than the paper, from which authentic source it is possible to completely show the hollowness of the assertions put forward by Messrs. Handcock and Dykes. The last Board of Trade returns relating to gas undertakings (1907-8) present these facts: There were sold in the year by statutory gas undertakings no less than 172,889,147,000 cubic feet of gas to 5,665,176 consumers, and 700,264 public lamps. Assume that the public lamps consumed, on an average, 3 cubic feet, and that they were alight on an average 4000 hours each (of course, a number consume much more per hour, a number are cluster lamps, and a number in rural areas are not alight all night, nor on moonlight nights; but the calculation will be sufficiently approximate for the purpose of demonstrating our point.) The public lighting consumption on this basis would amount to 8,403,168,000 cubic feet in the year. Divide the remaining 164,485,979,000 cubic feet by the number of consumers, 5,665,176, and the consumption averages between 29,000 and 30,000 cubic feet, which, at the price of 2s. 6d. per 1000 cubic feet selected by the authors, would represent an outlay of £3 15s. per consumer large or small—factory, business establishments, and householders—including the gas sold for power and industrial purposes, as well as for cooking and heating. These official figures absolutely subvert the absurdities set up by our electrical friends as representative and worthy of acceptance by electricians. It is time they threw off the old puerilities and pretence, and looked at facts fairly and squarely in the face.

The remark made by Mr. Wilkinson (referred to in the opening paragraph) regarding 6 cubic feet of gas containing as much thermal value as a unit of electricity, is a point that few electricians have yet realized. This conclusion may be drawn from

the statements that are glibly made as to cooking and heating by electricity at 1d. per unit being every bit as cheap as performing the same operations by gas. Many electricians never get beyond bare asseveration, for the simple reason that they either do not know what they are talking about, or, knowing, find that silence is the best line of escape from an awkward predicament on being challenged. Those electricians who want educating in this matter of the relative thermal values of gas and electricity cannot do better than study the article on the subject by Mr. R. M. Neilson as reproduced in the "JOURNAL" last week (p. 630). There is nothing new in the article, but the method of treatment is practical, and so valuable. It is shown that with coal gas at 2s. 6d. per 1000 cubic feet, 20,000 B.Th.U. can be purchased for 1d.; whereas the heating value of a unit of electricity is 3425 B.Th.U.—the number of thermal units purchasable for 1d. depending on the price per unit of electricity. This is a hard nut for our electrical friends to crack. The work of the gas industry is being directed to realizing still greater heating value from the coal carbonized, though gas manufacture, considering the heating value of the gas, coke, and tar, is already, in regard to thermal efficiency, a highly economical process; whereas from the boiler-house to the electric radiator or electric cooking-stove, there is an unavoidable loss along the whole transformation road, with the result that the heat obtained from an electric-radiator is less than 5½ per cent. of the thermal value originally contained in the coal put under the steam-boiler. The conclusion of Mr. Neilson is the only possible one, that while gas offers good prospects of taking the place of coal for house warming purposes, the employment of electricity for such uses must always be expensive; and electric heating, though useful in special cases, will never be sufficiently economical to justify its extensive use.

The street lighting question rages—at least, perhaps it would be better to say that those electricity supply owning councils continue to rage who are pressed by the Local Government Board on the subject of the relative cost and efficiency for public lighting of modern incandescent gas-burners and electric lamps. The controversy at Finchley has been drawn out to weary length owing to the contumacy—which some vulgar people call pigheadedness—of the Council in refusing to answer the very simple question of the Board. Of course, the Council were well aware they could not reply without giving themselves away; and the Local Government Board have too much knowledge of these matters to be misled by any specious or evasive answer. The Board have taken a very dignified attitude in the matter. They say, and say truly, that it is their duty to satisfy themselves that the precise object for which a loan is to be sanctioned is one in harmony with the interests of the ratepayers. And as the information required is not forthcoming, the Board take the firm stand that they do not feel justified in sanctioning the loan. Some of the members of the Council recognize that their own body has been evasive in the answers to the central authority. Now, however, on the matter being discussed on the final refusal of the Board to grant the loan, the Council's abject fear of modern incandescent gas lighting is disclosed. It does not require a magnifying-glass to read between the closing lines of a resolution passed by the Council, in which it was decided to write again to the Board pointing out that all available information asked for by them was supplied during the local inquiry, and that "any prices offered by the Gas Company could only be regarded as competitive—quoted for undercutting the Council's undertaking, with an ulterior motive which it would not be in the interests of the ratepayers to entertain." That the Council are on the horns of a dilemma is clear; that they cannot give the information asked for by the Board without proving that their public lighting proposal is not in the interests of economical administration is equally palpable; and that they cannot compete with incandescent gas lighting is announced in as unequivocal terms as could be expected.

The dog-in-the-manger spirit is unpleasantly rife in the proceedings of our local councillors. The Chairman of the Finchley Council, in his curious contribution to the proceedings referred to above, confesses as much. "It is as well to announce now," he says, "that we do not intend to take gas. We have our own electricity undertaking; and it would be madness on our part, under the circumstances, to take gas for lighting the streets. It is not altogether a matter of price. It suits the Council to light the streets, as current is thereby used at a time when it is not required for other purposes." When will local authorities draw a distinct line between their trading and the common and legitimate functions of local government, so that the latter and the ratepayers generally may have fair play? It is idle to attempt to synthesize incompatible interests; for one part or the other must suffer. What does the Chairman mean, too, when he suggests that the current for public lighting is used at a time when it is not required for other purposes? Have the Council lost all their private lighting custom? If not, does not the current required for public lighting come upon the peak of the private lighting load? Going farther afield, it is seen that the Epsom District Council have rejected an offer of the Gas Company to light the streets. It is said that the Lighting Committee have gone carefully into the figures, and have found that the promise of the Gas Company—that the offer would result in a considerable saving to the ratepayers—is not justified. We should esteem it a favour if the Lighting Committee would allow us to examine the premises from which their deduction has been drawn. We are not very hopeful as to being allowed to make the investigation; still the privilege would give much pleasure. Then there is the Lewisham

Borough Council, who are not the owners of an electric lighting undertaking. They have recently been inquiring into certain propositions made by the South Metropolitan Electric Light Company regarding street lighting; and they have come to the conclusion that the schemes would entail increased cost without any definite advantage. There we again see the influential difference between the ties of, and freedom from, municipal trading.

ALTERING THE LEVELS OF LARGE GAS-MAINS AT BLACKFRIARS BRIDGE APPROACH.

WE venture to think the statement will go without denial that there is no gas undertaking that has had more difficult tasks to perform in connection with alterations to its distribution system, through all the subterranean work demanded by the progress of public conveniences and changed conditions, than the Gaslight and Coke Company. Underground railways, tramways, and passenger subways, have been necessitated by the growth of the population and business of London, by the demand for means of more rapid transit, and by the altered circumstances of the surface traffic. Burrowings of the dimensions required cannot be effected without disturbing in some considerable degree the long-resident tenants of the ground not far beneath the surface. And some of these tenants are of considerable girth (such as the pipes, conveying gas at high and ordinary pressures, of the Gaslight and Coke Company), and are performing important public service. Consequently, their lowering to the depths required for the construction of these underground means of locomotion, is a somewhat serious business. But, on every occasion, the work has been safely carried out, and without occasioning any interruption of the supply of gas. Notable examples of such work occurred in connection with the Mansion House subways and with the Theobald's Road shallow tramways. Those were a couple of gas-distributing engineering feats that were performed during the time that Mr. G. F. L. Foulger occupied the office of Chief Distributing Engineer to the Gaslight and Coke Company; and now the responsibility for another very heavy piece of alteration work has fallen upon his successor, Mr. H. S. Reeson, and has been executed successfully to his plans, and without a hitch, though it was anything but a straightforward job.

This particular piece of work had its location at Blackfriars Bridge Approach; and it came about in this way: It will be remembered that some time since the County Council secured parliamentary powers to carry tramway lines over Blackfriars Bridge to connect up with the tram-lines along the Victoria Embankment. In order to run the tram-lines over the bridge, it was necessary to widen it; and this brought in its train what for public protection was another necessity, and that was the provision of passenger subways. The widening of the bridge considerably enlarged the space on to which the Embankment, Queen Victoria Street, Blackfriars Bridge, and New Bridge Street converge. This enlargement alone increased the danger of crossing from point to point. The trams added to the danger; and the advent of fast-moving vehicles, such as taxi-cabs and motor cars, also augments the personal risks of such extensive crossings. We understand that, in consideration of the City Corporation not opposing the running of the trams, the County Council consented to bear the cost of the subways, though situated in the City; and, of course, the expense of altering the various services—such as gas, water, electricity, telephone, &c.—beneath the roadway, this being incidental to the work of constructing the subways, forms part of the whole cost.

So far as the alterations of the gas-mains are concerned, it was an altogether interesting piece of work, owing to their number and size, the complications arising from the number of other occupants of the subsoil, and the circumstances under which the changes had to be made. There is a pipe-subway running from Queen Victoria Street to the Embankment, and onwards to Westminster; and this pipe subway had to be lowered at the points where the passenger subways crossed it—that is to say, at each point where the passenger subways intersect the pipe subway, the latter had to be lowered in order to get a uniform level for the former. The depth to which the pipe subway had to be further sunk in places was about 8 ft. 2 in.—the gas-pipes having to be dropped down on either side.

The principal alteration has been to a 36-inch main, forming part of the high-pressure distribution system from Beckton. This high-pressure main had only to be lowered in one place in the pipe-subway, because the main only enters it from New Bridge Street, and not from Queen Victoria Street. But inasmuch as the main runs underneath the passenger subway connecting New Bridge Street to Victoria Embankment, and also the subway crossing New Bridge Street, it was desirable that the 36-inch cast-iron pipes should be substituted by a steel tube extending over the area covered by the subways. This has been done; so that now there is no likelihood of any trouble arising from leaky joints. The depth at which this steel tube now reposes is 12 ft. 4 in. from the surface, and the length is 68 feet; and it has been laid in concrete at all parts where it does not enter the pipe subway itself. Not only was the pipe lowered, but it had to be diverted from the original line of its cast-iron predecessor, for the convenience of the subway structure. There was one inevitable drawback in executing the work. By arrangement with

the City Corporation, it had to be carried out in sections within boardings, in order to prevent any dislocation of the street traffic; and besides the work was subject to the conditions of the subway construction work—the result being that any continuous prosecution of the alterations was an impossibility. But, fortunately, it was possible to cap back the 36-inch high-pressure main in New Bridge Street—this being admissible owing to the two facts that the Company have a 48-inch high-pressure main going westward in addition to the 36-inch main, and that the work was done in the summer months. Otherwise, it would have been necessary to have laid a temporary main while the construction of the subways was proceeding.

The next alteration was opposite the Hand-in-Hand Insurance Office in Queen Victoria Street. At this point, there are steps leading down to one of the subways; and running here are three mains—a 24-inch high-pressure one, and two district mains (24 and 18 inch). All these had to be altered, and run underneath the subway. Steel tubes were also used in these instances. Connection was made with bends, the down and rising pipes being vertical, with a straight connecting-pipe (laid in concrete) under the subway; this bottom pipe being some 17 feet long, so that the down and the rising pipes both stand clear of the sides of the subway. These mains were lowered about 12 feet. An alteration had also to be made to a 6-inch district service-main; but that and other incidental work were merely ordinary matters.

But as has been said an unavoidable inconvenience was that the alterations had to be made piecemeal, and could not be carried out continuously. The same remark applies to the other users of the pipe subway and subsoil. They all had to work in conjunction with each other—the Gaslight and Coke Company, the Metropolitan Water Board, the Hydraulic Power Company, the Electric Light Company, the Post Office, and the National Telephone Company, all of whom have pipes and wires going through the subway. Though not causing the Gas Company any particular inconvenience, it is interesting to note that the old Fleet Sewer runs through this particular locality to the river; and it gave some little trouble in connection with the construction of the passenger subways.

On the successful completion of the gas-pipe alterations, we congratulate Mr. Reeson, the Company's Chief Distributing Engineer, on whom the responsibility rested; the Contractors, Messrs. John Aird and Sons; and Mr. J. F. Yeulett, who supervises, on behalf of the Gaslight Company, all alterations of their large mains. The gas consumers in the neighbourhood had no knowledge that such extensive changes were being effected in the local distribution system—one way of saying they suffered no interruption of supply.

THE GAS WORKERS' STRIKE IN ITALY.

THE title that has appeared at the head of the intelligence week by week regarding the trouble in Italy at the works of the Union des Gaz is no longer appropriate. As was seen from the information published last week, there was an utter collapse of the strike, owing to the firmness of the Company and the weakness of the strikers' position and case; and the men were signing-on again in their hundreds on the revised conditions of the Company. The news from Milan yesterday was that all was proceeding quietly there. At Genoa, there was a little trouble with the yard men when they resumed work; and the Engineer and Manager (Mr. Philip S. Morton) was compelled to deal firmly with the matter, and discharge about twenty of the disorderly ones. Now things are, by the latest intelligence, also going along smoothly there.

PERSONAL.

The Hon. Sir E. CHANDOS LEIGH, K.C.B., K.C., who was formerly Speaker's Counsel, and is one of the Directors of the Imperial Continental Gas Association, has just resigned the position of Recorder of Nottingham.

Consequent on the resignation of Mr. Harold Bloor, who has obtained the position of Gas Manager at Carlisle, Mr. ROBERT H. BROWN has been appointed Assistant Works Engineer under the Birkenhead Corporation Gas Department. Mr. Brown, who has had 15½ years' varied engineering and parliamentary experience, has been for the past 2½ years Chief Draughtsman in charge of extensions at the Birkenhead Gas-Works estimated to cost £120,000; and it was stated in the Council that it had been found "he was such a good man, that the Engineer (Mr. T. O. Paterson) recommended that he be given Mr. Bloor's position." Mr. Brown spent four years as articled pupil to Messrs. Bryan Donkin and Co.; and then passed a year as junior draughtsman to Messrs. S. Cutler and Sons. During the next eight years he was engaged, first with Mr. A. F. Phillips, and afterwards with Messrs. Stevenson and Burstal. Mr. Brown's promotion will be received with particular gratification by the members of the London and Southern District Junior Gas Association, who still remember the pioneer work he did (along with Mr. J. M. Campbell, of Margate) in the formation of that body, of which he was for some time Vice-President. For two years he was occupied carrying through extensive alterations, &c., as leading draughtsman and Clerk of Works to Mr. T. H. Duxbury, at South Shields. Mr. Brown has passed the City and Guilds of London examination in "Gas Manufacture;" and he is an associate member of the Institution of Mechanical Engineers.

OBITUARY.

G. HAMPTON BARBER.

IT is with much regret we have to record the death, early last Thursday morning, of Mr. G. Hampton Barber, the Secretary and Manager of the Birmingham Corporation Gas Department. He had been ailing a little for some time. About three weeks ago, he suffered discomfort from a slight attack of lumbago; and at the beginning of the week before last he complained of occasional abdominal pains. It was typical of the man, however, not to give way to illness unless absolutely obliged; and he was in harness right to the end. On Thursday week, he accompanied the Lord Mayor and the members of the Gas Committee on a visit of inspection to the Adderley Street Gas-Works, and the following day he journeyed to London to keep a business appointment. While there, the pains became more acute; and it was with extreme difficulty that he managed to get back to Birmingham in the evening. A doctor was sent for immediately he arrived home; and he diagnosed the complaint as appendicitis. A consultation was held on the Saturday between Drs. Gamgee, Heaton, and White, and it was decided to operate that day. The operation was performed by Dr. Gamgee; but unfortunately peritonitis had already set in, and his case was regarded as extremely grave. He made, however, a wonderful rally—he was always a man of marvellous recuperative power—and bid fair to falsify the surgeon's verdict. But heart trouble developed; and this was the ultimate cause of the fatal termination of his illness. His death has come as a great blow to those in the service of the Gas Department; and sympathy is keenly felt by everyone for the bereaved family. In addition to Mrs. Barber, who has herself been very unwell for a long time, there are nine children—six sons and three daughters. Two of his sons hold appointments under the Corporation; one (Mr. C. Carrington Barber) being engaged in the Gas Department, and the other in the Water Department. The Works Sub-Committee of the Gas Committee met on Thursday morning; and after passing a resolution of sympathy with Mrs. Barber and the family, and placing on record their sense of the loss which the undertaking has sustained, they adjourned their meeting.

Mr. Barber, who was in his fifty-first year, was born at Carrington, Cheshire, and on leaving school was apprenticed to the trade of millwright and engineer. When nineteen years old, however, he entered the Treasurer's office of the Liverpool United Gaslight Company, with which his father had been associated; and there he remained for nearly twelve years—passing through the various departments having to do with purchases and sales of commodities, &c. At the age of thirty, he joined the Mutual Life Assurance Company of New York; and later—in 1897—he went to Birmingham, with the Midland Employers' Mutual Assurance Company and the Birmingham Mutual Fire Insurance Association.

At the close of 1900, the secretaryship of the Birmingham Gas Department became vacant through the retirement of Mr. Edwin Smith, who had held the office ever since the acquisition of the gas-works by the Corporation. There were 120 applicants for the position; but Mr. Barber was unanimously selected, and he entered upon his duties in February, 1901, at a salary of £1000 per annum. Mr. Charles Hunt and Mr. Henry Hack were at that time the Gas Engineers to the Corporation. Mr. Hunt retired the year after Mr. Hampton Barber's appointment; and Mr. Hack, during 1908. Mr. Barber's organizing and managerial capacity was fully recognized; and on the advice of the Gas Committee, the City Council made no further appointment of Engineers-in-Chief, but established the system whereby, under Mr. Barber's general management, each station was placed in charge of a Works Engineer—an arrangement which has been found to work very satisfactorily.

In 1901, when Mr. Barber commenced his duties as Secretary, the surplus profit available amounted to £30,557. The succeeding year it rose to nearly £57,000; and for the years 1907-8 and 1908-9, the available surpluses were respectively over £61,000 and £71,000. Mr. Barber's salary was increased at intervals until it reached £1400 per annum; but a proposal by the Gas Committee in May last to increase it to £1600 was defeated in the City Council by a small majority. It is felt that by Mr. Barber's death the City of Birmingham has lost one of its most capable officers, and one who, during his tenure of office, had done much to encourage scientific and up-to-date methods. The coal-testing plant at Birmingham was, it may be pointed out, established by the Committee on his recommendation.

The funeral took place on Saturday afternoon at Sutton Coldfield. The weather was terrible. A heavy snow storm, commencing in the early morning, did not cease until late in the afternoon. Notwithstanding this, however, there was a very representative gathering of the civic life of Birmingham at the old Parish Church at Sutton. Among those present were the Lord Mayor of Birmingham (Councillor W. H. Bowater), the Town Clerk of Birmingham (Mr. E. V. Hiley), the Town Clerk of Sutton Coldfield (Mr. Reay Nadin), the Chairman (Alderman Sir Hallowell Rogers, J.P.) and members of the Gas Committee, Councillor Wilson, Councillor Murray, Councillor Toller, Councillor Harrison Barrow, Alderman Bishop, Alderman Lloyd, and many other members of the City Council, Dr. W. B. Davidson (Chief Chemist), Messrs. F. J. Bywater, John Foster, W. Chaney, T. H. Hack (Engineers), W. H. Powell (Cashier), J. Dingley and W. Wastell (Assistant Secretaries), Dr. H. G. Colman, Mr. E. A. Brotherton, M.P.,

and the majority of the staff of the Birmingham Gas Department. Letters of sympathy and apology for absence had been received from Mr. Charles Hunt and Mr. Henry Hack, the late Engineers of the Gas Department. The funeral service, conducted by the Rev. Canon Barnard (Rector of Sutton Coldfield), was a very impressive one. The hymns chosen were stated to be two of the deceased's favourite ones—"Abide with me" and "Lead, kindly Light." Canon Barnard took the opportunity of expressing his own sympathy, and that of every resident in Sutton, with the members of the deceased's family and with the City of Birmingham in the great loss they had sustained. A procession was formed to the cemetery—the coffin being followed by quite 300 mourners—and the interment took place there at about 3.15 p.m. The coffin was borne by eight representatives of the Gas Department. The esteem in which the late Secretary was held, and the sympathy felt for the bereaved ones, were evidenced by the number of lovely floral tributes. Magnificent wreaths and floral designs had been sent by, among others, the Gas Committee, the Clerical Staff of the Gas Department, the Gas-Fitters, the Meter Inspectors, and the staffs at each of the Gas-Works. For many yards round the grave, the snow was covered by handsome tributes of the kind.

The Birmingham Gas Committee had a meeting yesterday afternoon, and passed the following resolution: "That the Gas Committee have heard with profound regret of the lamentable death of their Secretary and Manager, Mr. G. Hampton Barber, and hereby place on record their high appreciation of the valuable and zealous services unsparingly rendered by him as Chief Executive Officer of the Gas Department, and which contributed in so large a measure to the increased success of the undertaking. During the whole time he held office as Secretary of the Department, he served the Committee with the most unswerving loyalty and enthusiasm and exceptional commercial ability; and they feel that his capacity for hard work contributed to a very considerable extent to his sudden breakdown at so early an age. The Committee also desire to express to Mrs. Barber and her family their sincere sympathy with her and them in their great sorrow, and direct that a copy of this resolution be signed by the Chairman and Town Clerk and forwarded to Mrs. Barber."

We regret to record the death last Tuesday, at a nursing home in Glasgow, of Mr. DAVID COATS NIVEN, formerly Engineer and General Manager of the Oriental Gas Company, Calcutta. About thirty years ago, Mr. Niven was Manager of the Dunoon Gas-Works; but in 1882 he obtained the position in Calcutta which was rendered vacant by the death of Mr. James Blackburn, the first Secretary of the British Association of Gas Managers. He arrived in Calcutta on Oct. 6, 1882, and remained there till November, 1903, when he resigned on account of ill-health. In 1896, Mr. J. C. Watson, the Assistant to Mr. Charles Gandon at the works of the South Suburban Gas Company, was appointed Assistant-Manager under Mr. Niven, and he succeeded him in the more responsible position; Mr. Niven being granted his full salary for the remaining three years of his engagement—viz., till June, 1906—in recognition of his services. He returned to England, and lived practically in retirement.

We regret to record the sudden death, on Monday last week, of Mr. EDWARD HENRY CARDWELL, one of the Directors of the South Metropolitan Gas Company. The deceased, who was known in racing circles under the name of "Carlton," was on a visit to Newmarket, and was engaged in conversation with his trainer, when he suddenly fell down dead, as the result of heart failure. According to particulars sent by a correspondent to "The Times," Mr. Cardwell was the eldest son of the Rev. Dr. Edward Cardwell, Principal of St. Alban Hall, Oxford, from 1831 to 1861; and he took his degree at Oxford in 1855. He was a member of the Athenæum, Oxford and Cambridge, Garrick, and Union Clubs, on some of the Committees of which his services were greatly valued for his wise advice and sound judgment. He was modest and unassuming in bearing, kind hearted, courteous, and hospitable. He had been on the Board of the South Metropolitan Gas Company for about seventeen years, and took great interest in the introduction of the profit-sharing scheme which has now developed into co-partnership. The deceased was a first cousin of the late Lord Cardwell.

Mr. James Parkinson, whose service as Town Clerk of Brighouse and Gas Engineer to the Corporation for thirty-one years has lately terminated, was presented last Tuesday by the officials and office staff with three travelling bags and an illuminated address inscribed upon vellum. The presentation was made by Mr. S. S. Heywood, the Borough Surveyor.

The annual exhibition of the Physical Society, which is to be held next Tuesday, will differ from that of previous years in that it will be open in both the afternoon (from 3 to 6 p.m.) and in the evening (from 7 to 10 p.m.). Also short discourses will be delivered at four and eight o'clock by Professor C. Vernon Boys, F.R.S., and at nine o'clock by Professor Silvanus P. Thompson, F.R.S. Among the firms exhibiting will be the Cambridge Scientific Instrument Company, Messrs. J. J. Griffin and Sons, and Siemens Bros. and Co., Ltd. From the programme, of which we have received an advance proof, there appear to be many items of considerable interest.

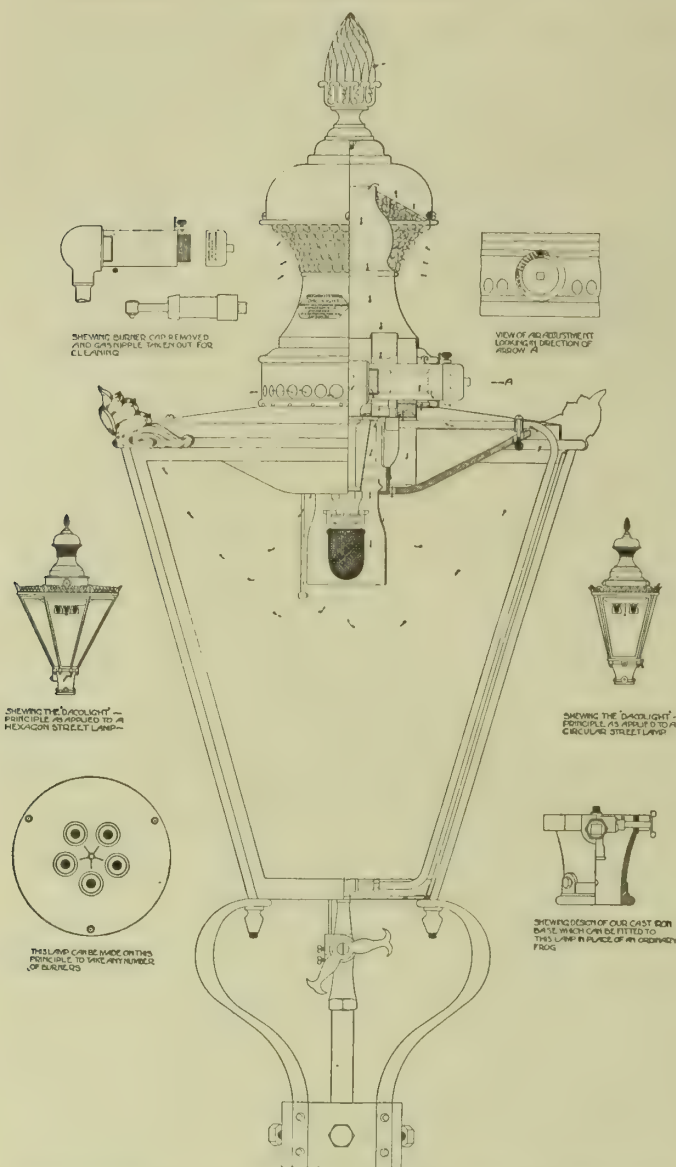
THE "DACOLIGHT" REGENERATIVE LAMPS.

ONE remarkable feature of the development of the inverted incandescent gas-burner has been the exceedingly high efficiency which specially constructed lamps have attained at normal pressures—efficiencies, indeed, that reach and excel those of the older forms of high-pressure lamps with pressures not exceeding (say) 8 to 10 inches. Had invention ceased at those original types of high-pressure lamps, had it been impossible to go beyond the pressures for which the lamps were designed, then assuredly high-pressure lighting would have had to give way before invention in connection with inverted lamps at ordinary pressures. The history of efficiency progress to this stage at normal pressures causes the student of these matters to keep an open mind as to future possibilities, and not to settle down to the belief that the ultimate has been attained. Facts, and not random thoughts or uncorroborated statement, enable a positive declaration as to present achievement. The latest forms of lamp seen and tested that have notable efficiency at normal pressures are the "Dacolight" regenerative types of Messrs. D. Anderson and Co., of Farringdon Road, E.C. They are protected by some four or five patents; and in their design and perfection, with Mr. D. Anderson Mr. J. Worsfold has been associated. The joint inventions were the original lamp and the burner; while the thermostat, the ventilating arrangements, and the cooling device for the gas supply pipe (all of which will be described presently) were inventions patented at a later date by Mr. Anderson, as a result of further experiments. Mr. Anderson, by-the-by, has had a long connection with lamp production aiming at the higher efficiencies—from, in fact, the time of the earlier type of Scott-Snell intensified lamp—and so has had ample opportunity for forming a judgment as to where weaknesses and difficulties exist that should be eradicated, and as to the lines along which to pursue further improvement. The "Dacolight" lamp, in its various forms, embodies the experiences to the present time; and from various quarters, under varying conditions of illuminating power, composition of gas, and pressures, there are authoritative tests to hand declaring efficiencies between 33.5 and 43 candles per cubic foot of gas consumed. With the mixed gas of the Gaslight and Coke Company, of an average illuminating power somewhat under 16 candles as tested by the "Metropolitan" No. 2 burner, readings equal to about 40 candles per cubic foot are repeatedly obtained.

This experience is gratifying; and the experience in trial street lighting is no less so. In Manchester, a trial lamp was fitted up among others in proximity to the Town Hall. The result was an order to light up the whole of Brunswick Road; and now working drawings have been submitted for deliveries of one, two, and three burner lamps. The installation in the Brunswick Road consists of sixty lights; and an interesting point is that in five months, the mantle renewals have only amounted to five. Glasgow, too, has tried the lamp for public lighting. In this case, the firm were asked to supply a burner consuming not more than 1½ cubic feet of gas an hour. A lamp was sent passing 1.4 cubic feet per hour at 15-10ths pressure; and, with London gas, an efficiency of 43 candles per cubic foot was obtained at an angle of 45°. Successful tests have also been made by the Liverpool Gas Company on behalf of the Mersey Dock Board. Trials have been made at Bradford, Nottingham, Salford, Burton-on-Trent, Tunstall, Stalybridge, Llanelli, and many other places; and the results are consistently confirmatory.

This "Dacolight" patent lamp is on the regenerative system; and there are several points in it that disclose a practical appreciation of the requirements of a lamp of the kind, and a study of how to meet those requirements. A gas-lamp—especially an inverted one—will not brook design in any haphazard manner, no matter how good the workmanship and finish. Good and scientific design is precedent to sound workmanship, although just as the latter is no good without the former, so the former is no good without the latter. The new lamp is made in numerous styles for outdoor purposes—for suspension, with glass bowl or square lantern, or, for all the modern types of lanterns for column use, square, circular, hexagonal, and so forth. The lamps are in every part strongly built. No iron is used in their structure; the materials being confined to copper, brass, and aluminium.

The principles of construction of the various operative parts of the different types of lamps are the same; so that one description will suffice for the whole range. The fundamental principle is the securing of (as it were) a long induction in a circumscribed space, so as to cause the air to become heated and expanded, and so gradually create pressure from its entrance until its work has been effected at the burner. Inside the ordinary spinning of the lamp, the patentees have a cylindrical body which practically forms a box, and inside this the burner (or burners) is placed. The box provides an annular space, which is termed the air reservoir or regenerative chamber; and a tube conveying the air to the burner leads from this reservoir. The travel of the air commences just below the burner cap (to be presently described); it passes (becoming gradually raised in temperature in its travel) over the edge of the reflector through openings into the annular regenerative chamber, where it is further heated and expanded; and from there it is conveyed at considerable velocity to the burners for the primary supply, or, for supporting combustion, it passes along the top of the porcelain reflector over the edge and along to the glass surrounding the mantle, or direct if the mantle glass is not preferred. In other words, all the air that is drawn



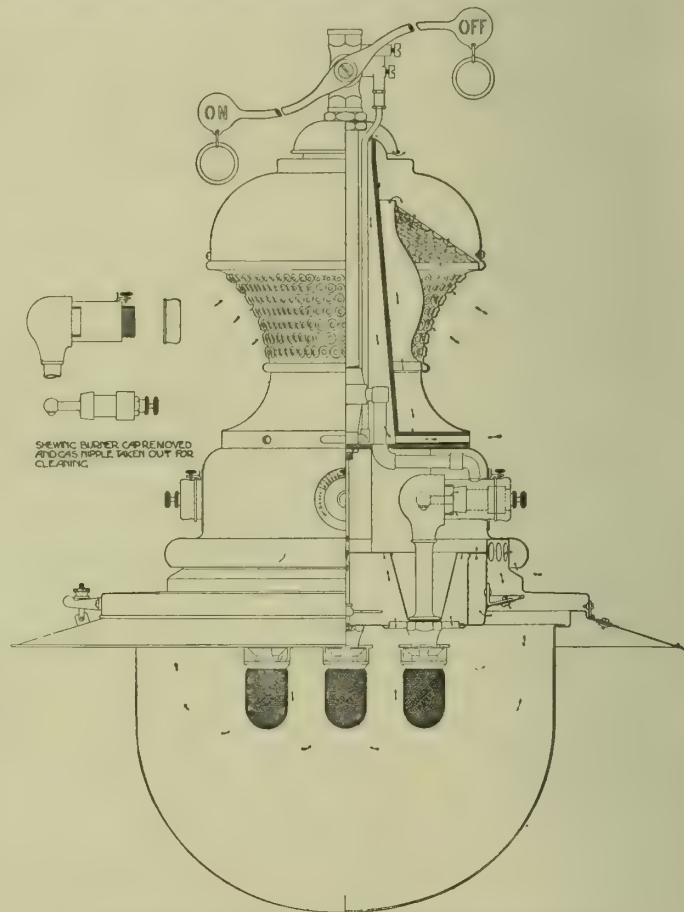
Single-Burner Inverted Street Lamp, showing Details of Construction and Travel of Air Supply.

into the lamp is heated, and is either supplied for the primary work of mixing with the gas or the secondary one of supporting combustion; and therefore it all serves some useful purpose. So effectively did the arrangements for heating and creating pressure act, that it was found necessary to apply some automatic means of regulation, in order to permit of a greater proportion of the heated air being used as the lamp heats up to its work. This is accomplished by placing a thermostat in the pathway of the heated air flowing to the burner.

The burner itself is interesting. It is of angle form; and so constructed that it can be cleaned out perfectly from the outside of the lamp without taking the latter to pieces. The patentees, in fact, have left little for the unintelligent and careless to exercise their detrimental characteristics upon. The body of the burner is made, solidarity being a quality throughout, of solid cast brass. The mixing-tube is surrounded by an aluminium protecting cone; but it is the lateral part of the burner (which allows of the gas and air regulation and cleaning from the outside) in which the greatest interest is found. This lateral part is really made in four distinct pieces. There is the main shaft, surrounded by the air regulating-sleeve, and carrying inside a specially constructed gas-way with the gas-nipple on the innermost end—the whole being finished off with a screw cap outside the lamp. This screw cap can be removed by hand. The small square projection on its outer surface forms a key, whereby the inside shaft constituting the gas-way can be extracted. The gas barrel is at one part slightly contracted; and here the gas finds entrance from the lamp supply pipe, and through apertures to the inside of the barrel, and away to the nipple. This barrel is made gas-tight with the main shaft by ground joints. The drawing, however, shows the parts with great clearness; so that there is no necessity for any minute description. The regulating form of nipple has been discarded in this lamp. The nipples are all properly adjusted to pass a fixed amount of gas, at a given pressure; but provision is made for adjustment should the pressure exceed that for which the nipple has been designed. The air-collar is readily adjusted; and can be secured by a set screw when the requirements of the lamp, on being heated up, have been decided. The parts of the burners are made in various forms (effecting the same purposes) for the different types of lamps. In all cases, everything has been worked out with calculated precision from gas and air inlets to the outlets for the products of combustion.

The lamps are made so that the products of combustion pass away by the chimneys at the side of the burners, with which, however, there is—the burners being boxed-in—no possibility of contact by the products, and therefore no possibility of the heated primary air being vitiated. Each type of lamp has a specially constructed top, so as to positively assure no interference with the action of the lamp in windy weather. There can be no back-draught; but there is a sucking action going on all the while the lamp is in use. The obstruction to back-draught is provided by a combination of expansion box, an inner cover (containing conical shaped holes with the small ends of the apertures directed outwards), and other parts; the perforations in the outer casing being also of conical form.

In the case of the suspension lamps with top central gas supply, it was found that the gas-pipe formerly got so hot, and the gas in consequence so rarefied, that something like 33 per cent. less gas ultimately passed through than when starting cold, with the result that the illuminating power of the lamps appreciably declined. This has been overcome by placing just above the hot-air box another chamber into which cold air passes direct from outside. The central gas-supply pipe is surrounded by a cylindrical casing, and the annular space thus formed is in communication with the cold-air box, so that the portion of the central tube inside the lamp is jacketed by a continuous current of cold air. This has been found efficacious in obviating the difficulty. Flash lights are fixed in the lamps as desired. For the cluster lamps, an ingenious form of gas-cock has been devised for the extinguishing of one or more burners as desired by hand; the idea having been suggested by the simple automatic lighting and extinguishing controller that has been devised by Mr. Anderson.



A Cluster Suspension Lamp, showing Details of Construction.

This controller is of clockwork form, and only requires winding once a fortnight. The mechanism is very simple; and the lighting and extinguishing, as we have seen demonstrated, is instantaneous. Through the special construction of the patent piston cock, the motions are absolutely frictionless; and there is nothing to drag on the mechanism. All the working parts are accessible from the front. The whole controller is protected by a small aluminium casing, which can be fixed in any convenient position at the top of the lamp standard. The times of lighting and extinguishing can, of course, be varied at will; and simple means are provided for lighting in foggy weather. The testimony of experienced lighting authorities conveys a high appreciation of the merits of the controller. Perhaps no better certificate of merit could be given than that the Liverpool Corporation have adopted several hundred of the device.

Major Sir Frederick Carne Rasch having resigned the chairmanship of the South-West Suburban Water Company owing to ill-health, Mr. E. Stopford Jones, the late Deputy-Chairman, has been appointed Chairman, and Mr. Walter Thompson succeeds him in the vacated position. Mr. Courtenay C. S. Fooks (Chairman of the South Essex Water Company) has been elected a Director of the Company.

INAUGURATING A NEW GASHOLDER AT TURIN.

IN the "JOURNAL" for Oct. 26 last (pp. 238, 239), an account and photographs were given of recent extensions at the works of the Consumers' Gas Company at Turin, Italy. On the 15th ult., the new gasholder and pressure room were successfully inaugu-

rated, when the Manager, Sig. Rag. Giacomo Beria, welcomed the assembly and made a few appropriate observations. These, with a suitable selection of photographs, have been embodied in a souvenir-pamphlet which lies before us.



Fig. 1.—Panoramic View of the Turin Gas Consumers Company's Works.

The ceremony was honoured by the presence of the Syndic and others well known in Turin society, to whom the Manager gave a short history of the Company. It was started in 1863; and the effect of it was at once seen in the reduction of the price of gas from 50 centimes per cubic metre (11s. 4d. per 1000 cubic feet) to 30 centimes (6s. 9½d.). In the succeeding 47 years of the Company's existence, and with an ever-increasing number of consumers, the price of gas has continually been reduced until it has reached the present rate of 12 centimes per cubic metre, or 2s. 8¾d. per 1000 cubic feet, which is a lower price than that charged in any other Italian town. In addition to this, the

works have continually been improved, until at the present time they claim—and we think justifiably—to be among the first rank of gas-works in Europe. A panoramic view of the works is given in Photograph No. 1.

The Manager then referred to the work of predecessors: Cav. Giorgio Tonimadini, who became President of the Company in 1884, and previous Managers—Sigg. Lenzi, Rossi, Zina, and Luigi Beria, under the last of whom, it may be called to mind, the work of structural re-organization was all but completed.

For such completion, it was found that a new gasholder tank and holder would be required; and after careful investigation, it

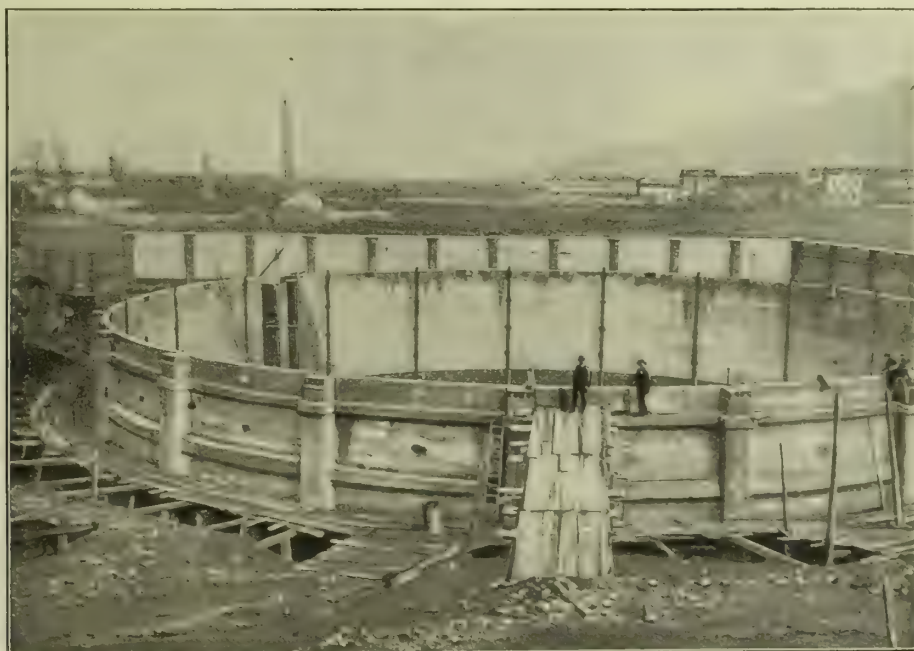


Fig. 2.—Gasholder Tank in Reinforced Cement. About 138 feet diameter by 33 feet deep.

was decided that the tank should be built of reinforced cement. [It may be mentioned, parenthetically, that in Turin there are many fine examples of buildings executed on this system of construction.] The work was entrusted to the Società Ing. G. A. Porcheddu, of Turin; and in a few months it was successfully completed. Particulars of this reinforced cement tank were given in "Le Génie Civil" of June 26 last (p. 179), and are also referred to in the last quarterly bibliographical review of the Société Technique du Gaz. Work on the tank was begun in May, 1908, and was so expeditiously carried out that it was completed in the following September. The actual dimensions of it are: 41·63

metres diameter (say, 136 ft. 7 in.) by 10·20 metres deep (or 33 ft. 6 in.). It has been built a little above the normal level of the water in the subsoil. The tests it had to stand were severe, as it had to resist the thrust of 11,000 metric tons of water, without taking into account any resistance offered by the earth embankment. It was tested full of water for eight days, without this embankment; and no leakage or deformation whatever showed itself. The earth-backing was afterwards proceeded with, and the tank, which is the largest of its kind yet built, was successfully completed. An illustration of it is given in Photograph No. 2. It perfectly satisfactorily stood its test with some 11,000 metric tons

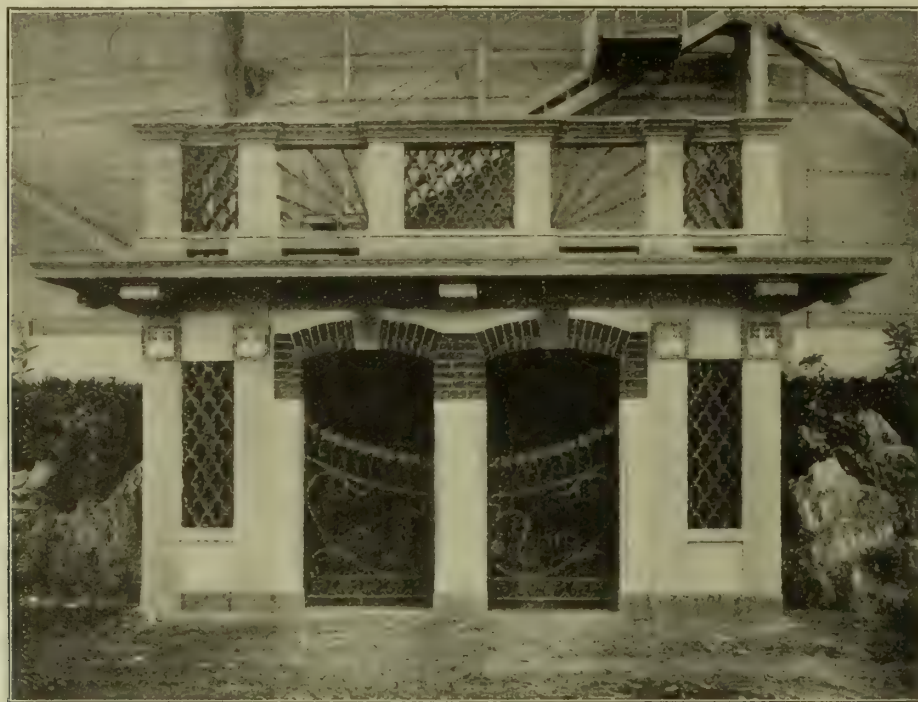


Fig. 3.—Elevation of the Dry Well containing the Inlet and Outlet Pipes of the New Gasholder.

of water, and was thus handed over to Messrs. Samuel Cutler and Sons, who, from among several competitors, were selected as the builders of the holder. "There soon arrived," said Sig. Beria, "from England all the innumerable pieces of which the lifts and guide-framing are composed, and all was so precisely prepared that not even a file had to be used to ensure the perfect coming together of the parts. In a very short time, and with a simplicity of means really wonderful, the imposing guide-framing and strong lifts were erected, repeated tests upon which have proved the perfect working of the new gasholder. To Messrs. Samuel Cutler and Sons are certainly due our praise and our thanks." The holder is a three-lift one, and is designed on Messrs. Cutler's well-known lines. It contains 35,000 cubic metres (or about 458,000 cubic feet) of gas. A photograph of it has already been published (see *ante*, p. 239); so here we only give, as of some interest, an illustration, in Photograph No. 3, of the

pleasing design of the "dry well," containing the inlet and outlet pipes of the new holder.

The day following the inauguration (Nov. 16), the Gas Company's workmen participated in the celebration, when the Manager addressed the men in well-chosen words, and thanked them for their hearty efforts and willing assistance. He said he was convinced that it was not by strife between classes, but by affection between them wherein lay the whole secret of human progress; and in this sincere spirit he thanked them one and all, from the highest to the lowest, for their work in advancing the interests of the Company and in preserving the good esteem of the community.

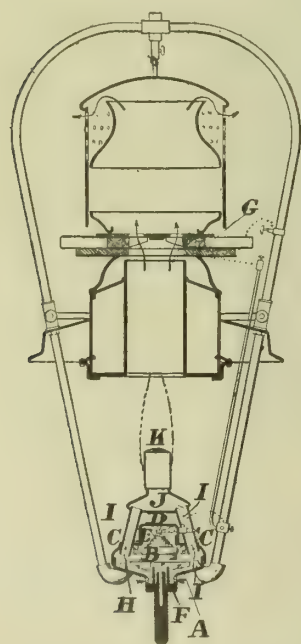
It but remains for us to add our congratulations to Sig. Beria, the Manager, and the directorate of the *Società Consumatori*, and the contractors concerned in the successful completion and inauguration of their work.

THE "SOLEIL D'OR" GAS-BURNER.

IN an article dealing with the subject of the utilization of the lost heat of gas-burners, M. Grebel refers to the burner which has been brought out by the French Auer Company, and to which has been given the name of the "Soleil d'Or." It is an embodiment of the principle of supplying

the burner with a mixture of gas and air at an increased temperature, in order to obtain a higher illuminating result. The burner, to which reference has already been made in the "JOURNAL," is shown in the accompanying illustration, which is reproduced, with the descriptive particulars, from the "Journal de l'Eclairage au Gaz et à l'Electricité."

The aspiration of the air and its admixture with the gas are effected by means of a fan with vertical and radial blades A arranged in the lower part of the armature of a small electric motor B with vertical axis, placed under the burner in a metal box, and located between two induction magnets C. The lid of the box contains two brushes D, composed of silver thread, articulated, and falling by their own weight on to the collector E of the motor. The axis of the latter is prolonged by a freely-turning shaft F, enclosed in a sheath filled with oil, and ending in a pivot made of hardened steel. It is really a thermo-electric pile, actuated by



the products of combustion, which furnishes the current necessary for the working of the motor. This pile G is composed of metal plates soldered in couples at each end, and arranged radially, so that the lower solderings form the prolongation of the inner side

of the chimney. The outer ones are cooled by the surrounding air. The pile does not furnish the power of more than about one watt; but this is quite sufficient to set in motion the fan, which draws in the air from below, in the direction shown by the arrows, and expels it after having caused it to mix with the gas. The latter escapes by two injectors H placed in two tubes I, which conduct the mixture to the chamber surmounted by the burner K.

M. Grebel says the burner described gives the light of upwards of 960 candles for a consumption of 35.3 cubic feet of gas per hour, or about 28 candles per cubic foot. He has seen some of these burners which, when well regulated and attended to, gave a light that was very warm to the eyes and remarkably steady. He points out that the burner enables a light of high power to be furnished without necessitating the installation of compressing plant, as in the case of high-pressure burners.

AN ITALIAN PAPER ON COKE-CONVEYORS.

THE last issued number [October] of our Italian contemporary, "Il Gaz," contains a paper by Sig. Ing. M. Böhm, which was intended for, but was not given at, this year's Italian Gas Congress at Venice. On the general observations on coke-conveying in the paper we need not dwell, as they have long been known—its difficulties, systems, quenching troubles, wear and tear, breakdowns, dust production, and so forth. Reference is made to the large coke handling and storing plant by the firm of Pohlig at the Cologne Gas-Works; also to the installations at the Tegel works, Berlin, by Messrs. Bleichert and Co.; at the Provan works, Glasgow, by Messrs. Babcock and Wilcox, Limited; and at the Bovisa works, Milan, by Sigg. Ceretti and Tanfani. The running water coke-conveyor at La Villette Gas-Works, Paris, is mentioned. It is stated that the earliest hot-coke conveyor was that patented in England in 1867 by Messrs. Breckon and Dixon, consisting of a chain with raised sides and forming a kind of continually moving channel, in which the coke, without being dragged, was carried along out of the retort-house and quenched.

After describing the system of coke conveying formerly in use at the San Celso works, Milan (where Sig. Böhm was at one time Engineer), he shows the method which replaced it—ordinary

narrow-gauge tip-waggons, running upon rails, first under a quenching tower, then on to a steam-worked lift (illustrated in fig. 1), raised, and tipped on to the coke heap in the yard. The tip of the first lot of coke is some 3 metres in depth, or about 10 feet; and upon it are placed the rails for carrying the waggons further and further, as may be desired, until the required space is filled. It is said that practical working has proved that the transit of the waggons and the men pushing them do not have any deteriorating effect on the coke. The empty waggon returns on connecting rails to the same lift, ready to descend after the succeeding full waggon has come up; or a second lift could be adopted to work in conjunction with the first—the returning empties to assist in lifting the on-coming full waggons.

After the first layer of coke has been made, a second and a third are formed, reaching to a height of 9 metres (say, 30 feet). The expense of storing coke on such a system as this—including interest, sinking fund, and motive power—is said to be one-fifth of that of storing by labour with coke baskets, in the old Italian way. How it compares with modern transporter systems, we are not informed.

The last conveyor described by Sig. Böhm is that of Messrs. Babcock and Wilcox, and shown in cross section in fig. 2 and in longitudinal section in fig. 3. It is of the tray-carrying type, and is submerged in water. The metal trough is fastened, as usual, along the front of the settings, and is placed just under the drawing stage—being covered in by hinged doors. The trough rises at its end, and is furnished with water-overflows for maintaining a constant water-level. The trays are joined together by a steel chain, which is carried on travelling rollers running on rails fixed on the sides of the trough. A scraper is provided for the clearing-out of any sediment in the trough bottom. Special provision is made for lubricating the chain on its return journey; and the wearing parts and power required are said to be few and slight, and the breaking-up of the coke is claimed to be avoided.



Fig. 1.—Milan Method of Storing Coke by Lift and Platforms for Narrow-Gauge Tip Waggons.

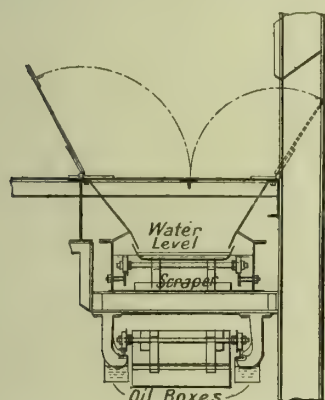


Fig. 2.—Cross Section of Tray Conveyor running in Water.

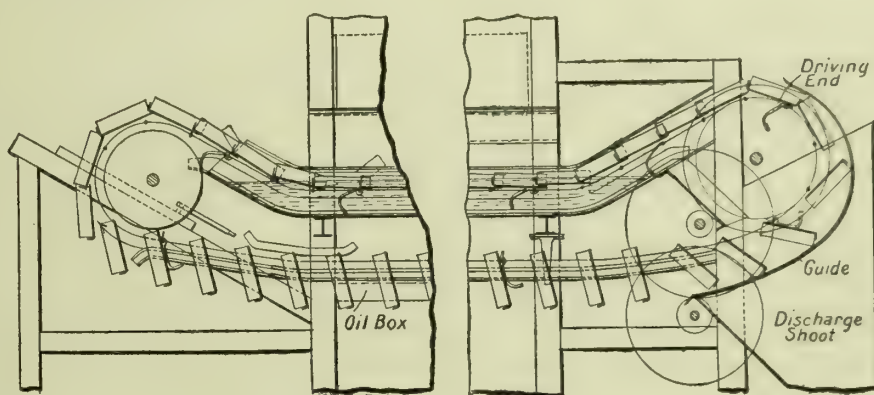


Fig. 3.—Longitudinal Section of Tray Conveyor.

HUMPHREY'S INTERNAL COMBUSTION PUMP

And other Applications of a New Principle.

The discussion was resumed on Friday last, at the Institution of Mechanical Engineers, on the paper by Mr. HERBERT A. HUMPHREY, on the above subject. Extracts from the paper, with an abbreviated report of the opening of the discussion, appeared in the "JOURNAL" for the 23rd ult. The following report gives points from the speeches delivered in the further discussion on Friday.

Professor CHATTERTON discussed the question of the application of the gas pump from the point of view of the small user; his interest lying in the fact that during the past five or six years in the South of India, the department with which he is connected had been endeavouring to induce the use of oil engines and pumps for irrigation. Up to the present, they had succeeded in putting down nearly 200 pumping-stations. The long delivery-pipe which regulated the speed at which the Humphrey gas pump worked had been referred to as a disadvantage; but for irrigation, it did not matter whether the pipe was long or short. In the paper the author stated that "the length of the pipe between the combustion chamber and the high-level tank must be sufficient to contain such a mass of water that its kinetic energy at maximum velocity shall ensure the burnt gases being expanded to atmosphere. This is the limiting condition." It seemed to him (the speaker) there must be some slight error about this, because whatever the mass of water might be, it would absorb the kinetic energy of the burnt gases; and if the mass of water was comparatively small, the velocity would be high, and if it was large the rate at which it would move—its acceleration—would be much smaller. What seemed to him to determine the length of the pipe was rather that it must be long enough so that the mass of the water was set in motion by the energy of the water—the continuing motion had to be sufficiently long to enable the water coming in from the low level to fill up the explosion chamber and pipe behind the

moving column of water. This seemed to be the determining factor in settling the length of the delivery-pipe. If the pipe was not long enough, the water would move at too high a velocity, and it would come to rest too quickly, and there would not be time for the valves to admit a sufficient quantity of water to allow it to move to the high level. One advantage of the pump seemed to be that they would get rid entirely of suction-pipes. As to the question of efficiency, from Dr. Unwin's report he found that when the pump was working under its maximum load, a little over 12,000 B.Th.U. were consumed per pump-horse-power-hour, and, when working at two-thirds its load, the amount of heat required to obtain a pump-horse-power-hour was 13,596 B.Th.U. In one of the largest pumping-stations they had in India, in which there were eight Diesel engines of 160-horse power, lifting water over a range of about 14 feet, he found in some trials that, under the most favourable conditions, 13,000 heat units were required to generate a pump-horse-power-hour, and, when the pumps were working at about two-thirds the most efficient load, the thermal units rose to 17,000, which was a great contrast with the Humphrey pump. Using a suction-gas plant, with charcoal, the thermal units per horse power were about 14,100. That, however, was working under exceptionally good conditions; and, as a general rule, such a high result could not be obtained. They had about 150 oil-engines and pumps—chiefly centrifugal; and using the residuals of petroleum, he found the best results obtained from small pumps was with an absorption of not less than 50,000 B.Th.U. per horse power; and in other cases, 40,000. With the Humphrey pump, only about one-third the number of thermal units were required per pump-horse-power-hour. Taking the figures from about half-a-dozen pumping-stations, he found in addition to the cost of fuel, a great deal was spent on lubricating oil; the average for the six stations for this purpose being 30 per cent. of the cost of the fuel. With the Humphrey pump, the cost of the fuel would be practically negligible. They had therefore the prospect of getting the work done for an expenditure of about one-third the fuel, and saving the greater part of the cost of lubrication. He commented, too, on the simplicity of the pump; and he also called attention to the fact that, as it could be used for compressing air,

it would be a convenient arrangement to use in some cases the compressed air for lifting water from wells. The important point in India would be the fuel supply. They had few gas-works there; and for the small sized installations, suction-gas plants would have to be on a smaller scale than they were now.

Mr. C. LIDDELL SIMPSON (London) remarked that a gas pump of 16-horse power that gave the results shown in the trials of Dr. Unwin would take a lot of beating. Through the courtesy of Mr. Humphrey, he had had an opportunity of seeing the pump at work. The head of the pump that Dr. Unwin tried was only 14 in. by 24 in. by 4 ft. stroke. The one he saw was of rather larger diameter, 24 in. by 24 in. by 4 ft.; and it was most remarkable to see this running with such little mechanism. He should like to know whether, seeing that the exhaust gases went away so cold that one could put his hand in them without causing damage, Mr. Humphrey had thought of exhausting the gases into vacuum, and ascertaining whether this would enable the pump to make a greater number of cycles. So far as he understood, it had not yet been proved whether the pump would suck like an ordinary engine; but judging from the general arrangements of the pump as they now saw them, it would always have to be sunk below the water-level so that there was a head on the suction valves.

Dr. H. S. HELE-SHAW (London), remarking as to the effect of the products of combustion on the water, said it had struck him there was a possibility of greatly reducing the bulk if Mr. Humphrey would use the explosion downwards. He directed further remarks to showing that, as in the case of the pulsometer and the injector, the uneconomy of fuel consumption did not prevent the use of a useful piece of apparatus. In his opinion, no one had succeeded in obtaining what Mr. Humphrey had done through the beautiful simplicity of the means of compression. He had secured the beautiful simplicity of the pulsometer, with the admirable efficiency and economy of the internal combustion engine.

Mr. J. EMERSON DOWSON (London) remarked that the first point he should like to refer to would be the explosion of the gases in contact with water. Some twelve years ago, he had to report on a system of heating water by burning gas and air at pressure under water. The burners were simply put into a tank of water; and they burned the gas and air there. The result was very poor; there being incomplete combustion. Later on, they tried a Voigt engine. This had a water-piston; and, so far as he remembered, there was no trouble about the explosion of the gases. Mr. Humphrey seemed to have gone one better. It might be perhaps worth considering as to why it was that, in the case of the heating of water to which he referred, there was practically failure, and why in the case of the explosion of gases under compression, there had been success. He did not know why it was. But his own opinion was this: In the case of the water experiment, the burners and the gas were in contact with the water; but in this case, and in that of the little Voigt engine, there was, he took it, a cushion of products or of air, or partly of both, between the water and the new charge of gas and air, and this gave some protection. Very possibly it might account for the difference. If Mr. Humphrey would have an analysis of the exhaust gases made, it would help them to see whether or not there was complete combustion. As to the fuel consumption, Mr. Humphrey estimated, assuming a central station, a fuel consumption of 2 lbs. of anthracite per Board of Trade unit. The leading gas-engine makers would guarantee that the consumption would not exceed 1 lb. per brake horse power hour; and if 50 per cent. were added for dynamo, &c., they had 1½ lbs. Contracts were made for the consumption, with bituminous coal, not to exceed 1½ lbs. In the case of the gas-engine, they knew there were considerable heat losses; and it seemed they must infer with the Humphrey system those losses would be still more. He should also be glad to know about the absorption of the soluble gases in the water. He referred more particularly to the sulphurous acid gas; and his point was as to whether the quantity was so small that it could be neglected. If the quantity were appreciable, he took it that, in many cases for domestic and industrial purposes, some treatment would be necessary.

Mr. R. H. MÜLLER noticed that Mr. Humphrey's pump had valves as in the ordinary piston pump; and he did not know whether, for any purposes where the water was not very clean, pump-valves were very desirable. The circumstance, in his opinion, which was most in the way of the general application of this pump was that it required not only a suction head, but the suction head must be very constant indeed. Such a condition was seldom met with. He did not think the tar that might condense in the water would come into direct contact with the water supplied to the consumers.

Captain SANKEY and Mr. HENRY LEA criticized some of the comparative figures in the paper as to fuel consumption. They were not quoted in our abstract, so we can leave them with the remark made by Mr. Lea, as to whether the lesser cost of the Humphrey pump, having regard to the points of depreciation, interest, and repairs, would justify the greater cost in fuel for running the pump.

Mr. I. V. ROBINSON (Glasgow), who is connected with the manufacture of large gas-engines, dealt with the point as to whether the Humphrey gas-pump was going to cost more than an ordinary gas-engine. The firm with which he is connected have supplied several engines indicating about 1600-horse power; and these engines weigh, with the fly-wheels, about 150 tons. He had attempted to work out the relative weight of a pump on Mr. Humphrey's system; and he went at length over the calculations

he had made—the conclusion at which he arrived being that the total weight would not be much less than 250 to 270 tons, and on top of this would have to be added some 170 tons of water oscillating in the pipes. But being chiefly pipe work, it should come out cheaper per ton than the ordinary gas-engine. He thought Mr. Humphrey should make an effort to increase the mean pressure throughout the stroke (which probably could be done by higher compression), and also increase the number of cycles per minute. Both these would reduce the cost of the pump, and probably enable it to be made use of to a much greater extent. As to the effect of sulphur in the gas, in his opinion this would be disastrous; but Mr. Humphrey assured him this was not the case. He (Mr. Robinson) had seen wrought-iron silencers absolutely riddled through. In that case the sulphurous acid perforated the pipes in a short time, and so they had to do away with all water in the silencers. Mr. Humphrey had made an unkind remark about ordinary gas-engines with regard to lubrication and stores. He (the speaker) had in mind a small gas-engine, coupled to a 375 kilowatt "D.C." generator, which was supplying power to an engineering works; and this plant generated in one year about 700,000 units, the load-factor being about 21 per cent. The cost of repairs for twelve months was only £12, and the cost of oil and stores about £28.

Professor J. A. EWING asked whether Mr. Humphrey found any embarrassment from the heating of the chamber, or did he anticipate finding any? If so, how would he deal with it in the case of chambers of large size?

Mr. BERTRAM BLOUNT remarked with regard to the amount of sulphur in the gas, this would depend naturally on the composition. But the amount would not be very large; and he himself did not feel apprehension that corrosion would occur. A cognate question was as to the contamination of the water which might be used for drinking. It was a little difficult to speak upon this point definitely. But, again, he did not feel any apprehension, for the reason that the explosion of even rather crude gas in contact with water for the short time it must be from the pulsations of the column of water, could scarcely, to his mind, absorb any appreciable quantity of the products. His view was—speaking without experiment—Mr. Humphrey would not fall into difficulty there. If this was so, the utility of the apparatus would be extended to all sorts of pumping purposes.

Mr. HUMPHREY only partially replied to the discussion owing to the lateness of the hour; and he will be contributing a written reply to the "Transactions." He expressed his gratification for the kind and generous way in which the paper had been received. Many of the criticisms had not only been favourable, but helpful and suggestive. Mr. Humphrey went on to show that Mr. Davey was hardly justified in some of his criticisms by quotation from the South Staffordshire Mines Drainage Commissioners' reports. He showed, too (as Mr. Bryan did on the last occasion), that in the comparison with steam-engines the figure of 18 lbs. of steam per pump-horse-power-hour was justified. Another point was that what he (Mr. Humphrey) claimed was that he had made a pump, and not the various parts of which the pump was composed. Regarding its bulkiness, he was quite prepared to admit that, if Mr. Davey had compared it with a gas-engine, the apparatus must be considered bulky, because, when one expanded the combustion gases down to atmosphere, it was necessary to provide a chamber much greater than that of the "Otto" cycle engine cylinder of the same power. By illustration on the screen, he also showed that the gas pump occupied less space than the Davey and Worthington pumps, while delivering much more water. Including the discharge-pipe, the comparison as to space was favourable; but why should Mr. Davey want him to include with the gas-pump the discharge-pipe? He objected to do so, as whatever the form of pump used, there must be pipes to carry away the water raised. As to the contamination of the water, an independent analyst had made an analysis; and, as the result of his investigation, he said he was of opinion that the water was not contaminated by tar or sulphurous acid. As already observed, the remainder of the reply is to be communicated to the Institution "Transactions" by Mr. Humphrey.

A Municipal Gas-Works Testing-Plant.

From the last quarterly bulletin, or "Revue Bibliographique," issued by the Société Technique du Gaz—referring to an article in the "Revue Industrielle" of May 15 last, p. 195—we learn of a testing laboratory that has been established in the municipal gas-works at Vienna-Simmering, which is a place about two miles from Vienna proper. The plant does not include any experimental ovens; but the gas is taken from different parts of the works to the laboratory apparatus. The latter is housed in a building 20 metres long by 12 metres wide (65 ft. 7 in. by 39 ft. 4 in.), which is divided into four rooms. One of these is for condensing plant; another for purifiers; a third for machinery; the fourth for testing apparatus. The gas from the actual works travels through a 6-inch pipe; and, by an arrangement of valves, it may be either coal gas before or after purification, or water gas, or a mixture of both. Measuring and testing appliances are provided to treat 500 cubic metres (17,658 cubic feet) of gas per 24 hours. By these means, it is possible to make tests on a sufficient quantity of gas in order to arrive at results of practical value, and which will serve as a guide in the actual manufacture of both gas and bye-products.

A YEAR'S TECHNICAL AND MECHANICAL PROGRESS IN THE GAS INDUSTRY.

By IRVIN BUTTERWORTH.

[Extracts from a Paper written for the Fourth Annual Meeting of the American Gas Institute.]

Large bodies move slowly, and it could hardly be expected that radical and revolutionary advancements would be made in the technique of an old and established industry like ours during the short period of one year. Nor will the mention of any such steps of progress be found in this report. However, when we come to examine carefully the developments in each branch of the engineering and mechanical divisions of our business during even the short period of the last twelve months, we find that, in the aggregate, a satisfactory, creditable, and encouraging increment of progress has been made.

Unfortunately, it is difficult for the contemporary historian to discriminate between the new things that are destined to be permanent improvements and those that are only heralded as such, but that prove after experience to be valueless. Many claims of progress are controversial for the first year or two. In the following notes, therefore (which are by no means exhaustive), care has been exercised, so far as possible, to record as advancements only those things that seem actually to be such; although, to show the trend of effort towards progress, and as matters of interest, some things that look promising have been mentioned simply for what they are worth, as having been "brought out" or invented. Whether they will prove permanently useful to our industry must be left to the future. It will also be noticed that, whatever may be said as to the superiority of American commercial or business-getting methods in the gas business, our technical progress seems to originate, for the most part, in Europe—chiefly in England and Germany. The attempt has been made to enumerate the following points of progress in the order of their importance.

CARBONIZATION OF COAL.

There has been world-wide interest and activity during the past year in all matters pertaining to the study of the problems of coal carbonization. As a result, we have to-day the choice of many different methods, including ordinary horizontals and inclines, inclines at an angle of 45°, verticals (both continuous and intermittent), chamber ovens of various sizes and positions, combined coal and water gas retorts, &c. In Germany, the feeling prevails that the days of the ordinary horizontal and inclined systems are numbered, and that the star of the verticals and chamber ovens is rising. As the result of the success of the latter with long-hour charges, engineers operating ordinary horizontals and inclines have been stimulated to make the most of these systems, and have found that by increasing the size and duration of the charges they are able to get better results in yield and candle power of gas and quality of coke. This practice is therefore being generally adopted; and the placing of inclines at the greater angle of 45° is the outgrowth of this experience.

BYE-PRODUCT COKE-OVEN PLANTS.

The bye-product coke-oven industry is coming into closer alliance with the gas industry with each succeeding year. More cities, both in America and in Europe, are adopting coke-oven gas, to a greater or less extent, as their "town gas" supply. In the city of Indianapolis, a bye-product plant has just been erected for the primary purpose of supplying gas to the city; and in Chester (Pa.), a plant has been diverted from its original purpose of making coke as its chief product to the principal business of making illuminating gas. The bye-product works at Hamilton have been doubled in capacity; the one at Detroit has been enlarged; a new plant is now building in Gary; and a large iron and steel company have just contracted for one in Canada, to have a carbonizing capacity of 1000 gross tons per day.

It has been suggested that a possibility of the future is the manufacture of practically all gas throughout the thickly populated portions of the country at a comparatively few central points in large bye-product plants (which are only a modified vertical retort or chamber oven), and the high-pressure transmission of the gas through pipes to the intervening cities and towns. However that may be, it is certain that the bye-product coke-oven system is making headway; and it is hardly too much to say that it has made greater technical progress recently than has perhaps any other branch of the gas business. The developments at Chester, above referred to, are especially interesting and significant. Here the modified plant saves all the gas for sale (after enrichment with benzol); uses no more coal and produces no more coke than ordinary retort-benches yielding an equal quantity of gas; utilizes the small and inferior coke for producer gas making, and all or any desired portion of the tar, to good advantage, for heating the oven flues; while the coke produced is, of course, suitable for metallurgical purposes, and therefore commands a higher price and a wider market. A block of this type has been installed in Detroit.

There are three or four bye-product coke-oven systems in use, and all of them have made technical improvements during the past year. Notable progress has been made in benzol enrichment, in the direction of a better understanding of how to treat the gas to ensure the proper absorption and retention of the

benzol vapour in cold weather. This is effected by thoroughly drying the gas and removing certain interfering hydrocarbons. The gas is so scrubbed, also, that the last particles of tar mist and naphthalene vapour are removed; and, for proper manipulation of the gases in exact proportions, the Venturi meter has been developed and applied with very satisfactory results.

CHAMBER OVENS.

Probably the most remarkable feature of the gas industry during the past year or so is the rapid development and adoption of chamber ovens—a system of carbonization intermediate between ordinary retorts and bye-products coke-ovens, designed and used primarily for the manufacture of gas, and therefore employing coke instead of gas for fuel. Although Klönne made an unsuccessful attempt at a chamber setting at Schalke as long ago as 1892, and Dr. Bunte pointed out their promising possibilities in 1894, the first successful experiments in their construction were made late in 1901, by Ries and Schilling, at Munich. After a few years of experimenting in a small way, quite a large installation was built in 1906; and it has been running almost constantly ever since. As the result of its success, chamber ovens have been erected by several concerns on different designs.

Most of these installations have been erected within the past year or two—some probably being yet uncompleted; and, considering their novelty, and their radical departure from ordinary construction, their introduction has been astonishingly rapid. This is the more strange for the reason that apparently these chamber ovens have not thus far shown markedly better results as a whole than those obtained by the usual retort methods. The "JOURNAL OF GAS LIGHTING" sees no great advantage in them, except where a better coke is needed; and yet Dr. Lessing, a competent authority, said before the Institution of Gas Engineers last June: "I have no hesitation in saying that I consider the coming of the chamber setting by far the most important event in the carbonizing branch of the gas industry during the past twelve months."

Briefly, the chamber ovens are not essentially different in shape and size from bye-product ovens, but they are built horizontally, vertically, or inclined (mostly the latter), and are heated with coke instead of with gas. The largest chambers contain from 6 to 7 tons of coal. The candle power of the gas is not above 12; and this may explain the relative slowness of their introduction into England and other places where higher illuminating power is required than in Germany. At least one chamber oven concern is now represented in America.

HIGH-PRESSURE LIGHTING.

Recent developments in high-pressure gas lighting constitute probably one of the most interesting and important steps in the progress of our industry, especially as they may point the way in which gas is destined to cope with electricity for its share of the illuminating business. During the past year several gas companies in America, including those at Boston, Chicago, Milwaukee, and Detroit, have experimented with high-pressure gas lighting, with encouraging results, especially when employing burners made for, and properly adapted to, high pressure. In Europe, notable progress has been made in this direction, particularly in Berlin, where, on the 1st of July of this year, 25 miles of streets were being lighted with 1531 high-pressure gas-lamps, supplied by four separate compressors, with gas at from 53 to 78 inches of water pressure, and giving light, in some cases, of over 4000-candle power each.

The Pharos system of high-pressure gas lighting is said to show an economy of 40 to 50 per cent. compared with ordinary low-pressure lighting; from 60 to 70 per cent. compared with electric metallic filament lamps; and from 80 to 90 per cent. compared with carbon filament lamps. The Pharos burners employ no chimneys. The Graetzin type of high-pressure gas-burner seems to be the one mostly used in Germany thus far; while the Keith, Sugg, Pharos, Lucas, and others are being tried in England. The compressors used for bringing the gas to the desired pressure are very efficient and compact. One delivering 500 feet per hour at 55 inches pressure weighs only 60 lbs. In the Pharos system, either the gas or the air is compressed, according to circumstances. The Lucas lamp has recently been fitted with a thermopile, heated by the burner, which supplies current to a small electric motor mounted in the base of the lamp, and carrying a fan which produces the desired pressure. A somewhat similar burner has also recently been placed on the market in France.* Only one mantle is used; the illuminating power being 1300 candles when burning 28 cubic feet of gas per hour—making an efficiency of over 46 candles per foot. This is really not a high-pressure, but a self-intensifying lamp.

AUTOMATIC STREET-LAMP LIGHTING AND EXTINGUISHING.

So much has been done within the past year or so in the development and perfecting of methods and devices for automatically lighting and extinguishing street gas-lamps, that this might properly be considered one of the most important steps of recent progress in our business. At least twelve different systems are now in use in Europe and Great Britain, where, of course, gas street lighting is much more in vogue than it is in America. Up to the 1st of July last, 20,000 burners had been fitted with one of these systems; in January last, 30,000 were using another; while

* The author was doubtless referring to the "Soleil d'Or" burner, which is described and illustrated on p. 670.—ED. J.G.L.

as long ago as November, 1908, 28,000 were equipped with still another. European cities everywhere are rapidly adopting these and other systems, and saving, according to reports, about 50 per cent. in labour, 30 per cent. in mantles, 20 per cent. in chimneys, and 10 per cent. in gas, as compared with methods previously used. Some of these systems employ an independent clockwork device at each lamp; others light and extinguish the lamps by means of a wave of high gas pressure through the mains, imparted at the works or other central point; while still others employ a combination of these two methods. A degree of ingenuity that commands our highest admiration has been exercised in overcoming the many and great difficulties incident to making the "wave" system successful, flexible, and reliable; and it is not too much to say that the system has now passed the experimental stage and has been made practical and dependable. It is interesting to note that in one of these systems at least the pilot-light at the burner consumes only 0.1 cubic foot of gas per hour.

FIRE-CLAY GOODS.

During the past twelve months much progress has been made toward the production of better fire-clay goods. Manufacturers generally have adopted more thorough and scientific methods for improving the quality of their output; one American manufacturer claiming an increase of 100 per cent. in the life of his material. Some three years ago, a new material for retorts and settings was brought out by a well-known maker of fire-clay goods in America; and although it gave extraordinarily good results from the start, it is only within the past year that large installations built with this material have brought it into the lime-light as a notably superior product. Owing to the fact that it does not settle under high heats, and has a greater conductivity than materials previously and generally used, the results obtained from it in the way of gas yield per pound of coal are quite sensational—running as high as 6 feet, with no diminution of candle power; thus marking a noteworthy forward step in our progress fairly belonging to the past twelve months.

A Committee representing the Institution of Gas Engineers has been co-operating with the English Ceramic Society in a movement having for its object the standardizing of fire-clay materials. Original and important experiments were conducted in this country during the past summer with a view of determining the heat conductivity of different fire-clays under different temperatures; and the results, which are of considerable value to our industry, were reported at the last meeting of the Michigan Gas Association.

WATER-GAS APPARATUS.

About a year ago, a German process of water-gas manufacture was described, the essence of which is the constant maintenance of a particular temperature in the generator; the result being an increase in efficiency. This is accomplished automatically; the gas pressure at the inlet of the holder actuating a manometer which operates a recording pen and also rings a signal bell. This method of control has been applied during the year to a number of plants in Europe, with excellent results in the way of increased hourly yield and decreased coke consumption. Several companies in America have within the past year or so installed devices for securing the volumetric regulation of the admission of air and steam in their water-gas generators. They accomplish this by so throttling the generator connection-pipe, on the Venturi meter principle, as to cause the pressure fluctuations in the base of the generator, due to the variations in the resistance of the fuel bed, to signal the operator, and, in the case of one company, to automatically regulate the admission of air, the steam being also mechanically measured. This automatic regulation is so much more exact than hand regulation, that the result in actual practice is a decided improvement in efficiencies; and the device constitutes an invention of great value and importance in water-gas manufacture.

GAS STREET LIGHTING.

There has been very little change during the past year in either the volume of gas street lighting in America or in the means for such lighting. The tendency, of course, is towards high-pressure street lighting; but this is being tried so far in America in only a limited way and in special locations. In Great Britain and Europe, however, conditions are quite different; and there has been considerable progress there in both high and low pressure gas street lighting. England, for instance, has added during the year about 22,000 low-pressure street-lamps, and now has a total of about 800,000. This increase is doubtless due in part to the success of the automatic lighting and extinguishing systems now coming into extensive use; and it does seem that, with these remarkable devices and the wonderful results of high-pressure gas, the street lighting of American cities, as well as those of Europe, may soon again be done, in large part at least, by gas.

VERTICAL RETORTS.

Although vertical retorts have been the subject of more interest and discussion during the past year than ever before, and several additional installations of them have been and are being made, the technical and mechanical improvements in these systems have been few and comparatively unimportant. The Woodall-Duckham system (employing continuous carbonization) has, however, been considerably improved by the substitution of an individual coke-discharging drum for each retort, which obviates the handling of hot coke, and brings the work of each retort directly before the eye of the operator. The Dessau system (in-

termittent carbonization) has been improved only with respect to the bracing of the retorts. The three small trial installations of intermittent system verticals made in America within the past year or two—those at Manchester (N.H.), Columbia (Mo.), and Vancouver (B.C.)—have apparently all been failures, at least as originally constructed, though efforts are still being expended to make them successful. A small installation of the Woodall-Duckham system is being finished at La Grange (Ill.) for experimental purposes; and a contract was recently let for the erection of a large installation of 120 vertical retorts on the Dessau system at Providence (R.I.), the plans providing for eventually doubling this number.* The Dessau (or Bueb) system has grown rapidly in favour in Continental Europe, particularly in Germany. There are said to be upwards of 4000 Dessau vertical retorts now in use, and installations have been made in Dessau, Berlin, Aix-la-Chapelle, Brussels, Frankfort, Oberspree, Cologne, Potsdam, Bremen, Warsaw, Trieste, Genoa, Rio de Janeiro, and several other cities. Continuous carbonization seems to appeal to our English cousins as the ideal to be attained; and Glover and West have recently tried, with excellent results, a comparatively large installation of their own design on this same principle, at St. Helens. [See *ante*, p. 316.] There is a growing feeling that the vertical-retort system has passed its experimental stage, and has not only established its success, but bids fair to become quite widely adopted for works making more than 500,000 cubic feet of gas per day, especially when candle-power requirements are not high. While the illuminating power of vertical-retort gas is somewhat low, and the furnaces require careful treatment and watching, the system has the following claimed advantages: An increased yield of gas and ammonia; improved quality of coke and tar; great saving in first cost of land and buildings; less nitrogen, fixed sulphur, and naphthalene; improved working conditions; and less wear and tear of retorts. The practice of introducing a little steam into vertical retorts for the purpose of making some water gas, or what is called "wet carbonization," while having some advocates, has not been found by most operators to be advantageous.

MANTLES.

The use of incandescent mantles has grown to such proportions that, according to one authority, there were manufactured last year the following numbers (in millions): Germany, 100; America, 55; Great Britain, 35; France, 15; Austria, 3; Italy, 2; Belgium, 2; and Russia, 1—total, 213. One new factory in England has a capacity for 10 million mantles annually. With such large production, it is inevitable that every year, including the past one, has brought forth improvements in the machinery and methods for mantle making, and in the mantles themselves. Ramie mantles are now used very largely in England, though the Plaissetty cotton mantle is employed to a considerable extent for street lighting. High-pressure gas lighting with such lamps as the Graetzin, Keith, &c., has led to the increased manufacture of mantles specially impregnated for withstanding the high pressures. A new braided mantle, made of asbestos and ramie, has been brought out recently, for which increased strength and durability are claimed. The most interesting invention is a metallic filament mantle, said to be very strong and durable, and to yield 85 candles per cubic foot of gas (probably under high pressure). It is, however, still in the experimental stage.

PRODUCER GAS POWER PLANTS.

The development of producer gas power plants is interesting and important to us because of their competition with city gas. However, this competition should not be serious for sizes of engines below 30 or 40 horse power; and as there are comparatively few prospective installations larger than this, producer power plant is not nearly so formidable a competitor as the electric motor. It is interesting, however, to note the rapid development of the producer plant, especially for use with cheap and low-grade fuels, such as lignite, "bone" coal, mine roofing-slabs, culm, &c. Several such plants are in successful use with peat as fuel; and one or two are using cotton-seed oil, sawdust, &c. The best available information on the recent development and present status of the producer gas power plant is to be found in the report of Dr. R. H. Fernald, lately issued by the United States Geological Survey. According to this report, there are now about 500 such plants in operation in America, aggregating about 125,000 H.P., 57 per cent. of which is produced from bituminous coal and lignite. While about 88 per cent. of the number of installations use anthracite, those using bituminous coal average twelve times larger. The report states that while the first cost of these plants is high as compared with steam plants (except for the very large sizes), their cost of operation is less, resulting in a decided net saving. The suction producer has practically superseded the pressure producer working into a holder.

BENCH FURNACES.

The Parsy bench furnace, invented in 1906, is said to be rapidly coming into successful use in Europe.† It is suitable for either large or small works where there is no cellar—everything being above ground; and it is said to be practically as economical as the most complicated and expensive furnaces. M. Parsy has

* This installation was described and illustrated in the "JOURNAL" for Aug. 3 last (p. 313).—ED. J.G.L.

† See "JOURNAL," Vol. CVII., p. 182.

more recently brought out a novel form of gas-producer for his furnaces. A concern in England is also building and introducing a furnace in which the producer gases are taken up flues in the side walls of the producer, instead of through nostrils in the arch; the secondary air being also taken up in the same way, resulting, it is claimed, in a 20 per cent. increase in the duty of the retorts. In America, bench furnaces in which a portion of the flue gases are brought back under the grate-bars are being improved and more generally adopted.

CHARGING AND DISCHARGING MACHINERY.

No noteworthy improvements have been reported in these machines during the past year; but minor improvements are being constantly made, and charging and drawing machinery is coming into more extended use each year. This is especially true in the case of small works; machines being now frequently used where for the greater part of the year as little as one ton of coal per hour is handled. The De Brouwer charger has been recently adapted to very small works; and an entirely new manual power machine for charging and discharging has been brought out within the past year in France. A new hydraulic coke-pusher has also been put on the market in England within the year. The proprietors of one concern have improved their manual charger by making it much easier to handle, and their power charger so that the shoot can be quickly lifted at any moment, irrespective of the position of the carriage. The Fiddes-Aldridge charging and discharging machine has been adapted to serve retorts five tiers high, and is so efficient that through retorts 21 feet long, and carrying 900-lb. charges, can be discharged and refilled in 30 seconds.

GASHOLDER CONSTRUCTION.

A three-lift holder was recently erected by beginning at the top and working downwards; the crown and upper sheets being lifted by jacks and otherwise as the construction of the lower sheets proceeded. This was the second holder built in this fashion. The spiral guided holder seems to be holding its own, as there are now some 300 in use. A million cubic feet holder of this sort was erected at Montreal a year ago; and one of the spiral-guided holders erected in England during the past year has a capacity of $3\frac{1}{2}$ million cubic feet.* In Germany recently, several gasholders have been constructed with Intze tanks, in which the tank stands over a masonry tank of smaller dimensions. Oil-tanks are now occasionally constructed inside holder tanks, especially those of relief holders. The largest gasholder in Continental Europe has just been finished at Hamburg—capacity, 7,060,000 cubic feet.

HIGH-PRESSURE DISTRIBUTION.

The past year has added its increment to the growth of high-pressure transmission and distribution; and there is now hardly a gas company of any considerable size that does not employ it to a greater or less extent. America was the pioneer, and still leads all others, in the use of this system, and in its refinements; but European cities are rapidly falling into line. During the past year there has been a tendency towards conservatism in the application of high-pressure to low-pressure distribution; and the consequent reduction of the percentage of the gas subjected to very high pressures. This, however, does not refer to the transmission of gas between town and cities. In Great Britain, one company at least is automatically regulating its gas-pumping plant by means of a pressure pipe direct from the centre of distribution. The transmission of gas at high pressure through long cross-country mains from town to town is increasing year by year, both here and abroad. In Germany, 344 villages are now thus supplied with gas.†

DISTANCE LIGHTING (LOCAL).

At least three systems for the distance lighting of gas in homes, factories, churches, &c., by means of the electric spark, have been brought out in Europe during the past year. A foreign concern making a pneumatic push-button device for lighting and extinguishing gas-burners has recently begun making the plungers of steatite, which greatly reduces their unfortunate tendency to stick and cause trouble. There have also been some other improvements of a minor character in this system of distance lighting; but further improvement is greatly needed. The so-called "Norwich switch" has come into considerable use in England; and inventors are still chasing the *ignis fatuus* of that desideratum of our business, a thoroughly satisfactory self-lighting mantle, with some claimed progress as time goes by.

UTILIZATION OF TAR.

The low price of tar has revived progress in means for burning it economically. A French patent was taken out early this year for heating and atomizing tar to increase its efficiency as a fuel. Three papers on the use of tar as a retort-bench fuel were presented at the meeting of the French Gas Society last Summer,‡ and one at the meeting of the Italian Gas Society. The use of tar for laying dust on roads, and for so constructing roads as to make them dustless, is increasing rapidly, both in America and

in Europe. Experience is gradually showing road builders and public authorities how the tar should be applied; and progress would be still more rapid if they would accept the knowledge gained by the experience of others, instead of trying to work out the problems for themselves. The tendency is towards the use of heavier material as a binder for the upper courses of the stone and surface material, which gives more permanent results than surface application only. One large tar concern in America reports an increase of 125 per cent. this year over last in the quantity of tar used for roadway purposes, and they estimate for the year 1909 there will be treated with tar about 1000 miles of roadway 15 feet wide. The Roads Improvement Association of England report that last year nearly 1500 miles of English roads, averaging 20 feet wide, were treated with tar.

SULPHUR PURIFICATION.

Experiments were made in Germany within the past year or so with the view of finding some means for cheaply removing bisulphide of carbon from illuminating gas by washing it in certain oils and chemicals; but while some success was secured in the laboratory, the process was deemed too expensive for adoption on a working scale. Wood charcoal has also recently been experimented with for the removal of this impurity, with partial success. In Oregon, the old abandoned method of reheating purified gas, thus converting the bisulphide of carbon into sulphuretted hydrogen, and then removing the latter in the usual way, has recently been revived; but as the added expense incident to the nearly total extraction of the sulphur thus effected is there about 1 c. per 1000 cubic feet, it is not likely the method will be very widely adopted, especially in view of the prevailing tendency to relax the sulphur restrictions heretofore imposed upon gas companies. In this connection, it is also pointed out that gas produced in vertical retorts contains about 40 per cent. less fixed sulphur than does gas from horizontal retorts. During the past year there has been a revival of interest in the problem of purification by ammonia, and several experimenters are working along this line, with encouraging prospects of final success.

THE FELD WASHER.

About a year ago, Walthar Feld, of Germany, brought out his new system and apparatus for removing (separately) from coal gas its tar constituents, cyanogen, ammonia, and even sulphur compounds, by fractional distillation of the gas; his scheme taking advantage of the different dew-points of the various vapours. The Feld washer is regarded as a promising and important invention, and is already being successfully used. It may develop into the solution of the problem of the complete purification of gas in closed vessels.*

PHOTOMETRY AND CALORIMETRY.

One of the important technical advancements of the past year or two is the effort that has been made toward the adoption by all civilized countries of a standard unit of light, to be maintained jointly by the national standardizing laboratories of the United States, France, and Great Britain—such unit to be called the "International Candle" (or some other suitable name), and to be employed in all photometric determinations, gas and electric included. Though all gas and electric organizations throughout the world are desirous of the establishment of such a unit for universal adoption, the difficulty of agreeing upon a satisfactory unit is, of course, great.

Apart from the efforts that have been made for the adoption of an international unit of candle power, no notable progress in photometry has been made during the year. Studies in this subject were reported last October by Mr. Carl Hering to the British Engineering Society; and the National Physical Laboratory of England presented further evidence of the reliability of the 10-candle pentane lamp as a primary standard of illuminating power. At the meeting of the German Association of Gas and Water Engineers last summer, Dr. Bunte recommended that photometric tests should be dispensed with everywhere, as they had been in Berlin. Flicker photometry has been declared by the Physical Technical Institute of Charlottenburg to possess no advantages over the ordinary methods. Dr. Kruss, of Hamburg, described last spring a new form of integrating photometer.

The increasing tendency during the past twelve months towards the substitution of the calorific for the photometric test for gas, both in America and in Europe, can properly be considered a step in advance in the technical progress of our industry. The number of companies who are required to furnish gas of a specific heating power is increasing; and the next step should be, and doubtless will be, the removal of existing requirements as to illuminating power. This is also foreshadowed by the prevailing tendency towards a lower candle power requirement, especially in Europe, and in the actual removal of all such requirements by one State Commission in America in specifying the quality of gas to be supplied in that State.

The use of calorimeters in the gas business is rapidly increasing as the result of the growing importance of the heating value and the lessening importance of the lighting value of gas. One well-known Eastern house reports the sale of more than 60 calorimeters of one rather inexpensive type within the past eight months. As the result of the increased attention that is being given to this

* The washer has lately been described in the "JOURNAL" (see Vol. CVII., p. 816).

* See "JOURNAL," Vol. CV., p. 231.

† In this connection, reference may be made to the article on "The Spread of Long-Distance Gas Supply on the Continent," which appeared in the last number of the "JOURNAL" (p. 605).

‡ See "JOURNAL," Vol. CVI., pp. 975-7.

subject, there is much activity in the invention and improvement of calorimeters, and numerous makes are now on the market. At the Electrical Exhibition at Manchester about a year ago, a new portable calorimeter was exhibited, especially adapted to testing suction producer gas continuously. The firm showing it has likewise so improved another of their calorimeters as to provide for neutralizing by weak alkali the effects of the products of combustion on the interior of the instrument, and also for automatically shutting off the gas if the water supply should suddenly cease. The accuracy of their calorimeter is said to be limited only by the skill of the operator in reading the thermometers; and tests can be made in two minutes. A new recording thermo-electric calorimeter was also described a few months ago in a paper by Professor Féry read before the International Congress of Applied Chemistry; and another calorimeter was very recently brought out in France, and described in the gas publications last August. There is scarcely a maker of calorimeters who has not improved his instruments within the year. New types should, however, be carefully tested before being used, if accuracy is desired.

METERS.

The oil-dipping of meter diaphragms has been more generally adopted, with good results; and improved methods of introducing the oil have been evolved. Meter provers and "complaint" meters have been improved. Promising experiments have been made, during the past few months, looking to the devising of a means for accurately and quickly testing consumers' meters *in situ*. At least one large gas company have recently put into operation in their meter-shop a complete and detailed piece-price wage schedule. The dictum has recently gone forth from Manchester that consumers' meters should be tested for correctness of indices as well as of measuring chambers. An American inventor has just brought out a simple device for attachment to ordinary consumers' meters, for indicating and measuring the passage through them of extremely minute quantities of gas. This will be useful for detecting very small leaks in house-piping, &c. A greatly improved lock for prepayment meter cash-boxes has been brought out, and also a "thief-proof" cash-box. A coin-changing attachment for prepayment meters has also been invented. The use of the rotary station meter seems to be increasing. A station meter, said to be practicable, has just been brought out that works on the very interesting principle of adding electrically a known quantity of heat to the gas, and determining the quantity of gas flowing by its rise in temperature. This meter may come in good play in measuring high-pressure gas.

GAS-ENGINES.

The increasing use of producer-gas engines has led manufacturers to give more attention, with promising results, to the effect of high compression in the ordinary type of gas-engine. The use of larger engines for producer and blast-furnace gases is increasing—more particularly in America. Last August, 628 gas-engines of 1000 H.P. or more were said to be in use—some of them being as large as 6000 H.P.; and one or two are being built of 8000 H.P. capacity. The opinion has been expressed that such large engines are mechanically rather than thermo-dynamically deficient; but internal-combustion engines are in better favour to-day than they ever were before. The city of Philadelphia already has a gas-engine high-pressure water-pumping plant for fire protection, and has recently decided to duplicate it in another part of the city, employing ten 300 H.P. gas-engines, all to use city gas. A Washington paper recently reported that the United States Steel Corporation and also a large New England concern owning a big line of cotton-mills had decided to substitute gas-engines for steam-engines in all their plants. The gas-turbine has not yet materialized, though several inventors and scientists are at work upon it.

GAS GRATES AND HEATERS.

With the constant tendency towards a lower price of gas and a higher price of solid fuel, the gas-grate and room-heater become more and more important, especially in view of the increasing number of apartment houses in cities. The percentage of auxiliary house-heating that is done by gas is increasing each year. During the past year much study has been given to the improvement and perfecting of gas-grates, or "fires," as they are called in England, particularly in the direction of increasing their radiating efficiency. At the last meeting of the Institution of Gas Engineers, a previously appointed Gas Heating Research Committee, working in connection with the University of Leeds, presented a noteworthy and instructive report on the subject of heating with gas. It is becoming recognized that gas-grates are even more hygienic than are coal-fires.

TECHNICAL EDUCATION IN GAS ENGINEERING.

Year by year better public facilities for learning gas engineering are made available. Several colleges in America now have courses bearing especially on this subject, including the Universities of Michigan, Wisconsin, and Illinois. In England, the Livesey Professorship of Gas Engineering at the University of Leeds has recently been endowed, in the sum of £10,000, by the gas industry of Great Britain, as a memorial to the late Sir George Livesey. This University already maintained a Department of Fuel and Gas Engineering; and a number of public lectures have been delivered there on this subject, as well as in Edinburgh, Glasgow, London, &c. Courses in gas engineering

are maintained at technical schools in Carlsruhe, Cologne, and several other European cities.

Among the other matters dealt with by the author are "Coalite," "Coalexid," and "Gasoline Lighting;" and a number of miscellaneous subjects are mentioned under the heading of "Odds and Ends."

The paper is followed by a useful appendix, containing a list, compiled by Mr. Frederic Egner, of books on technical subjects pertaining directly or indirectly to the gas industry, published in any language during the past twelve months; the author's object being to indicate the present tendency of thought along the technical lines of our business. The appendix also contains a classified list of all papers on technical subjects connected with the gas industry presented at any Gas Association meeting since the date of the last meeting of the American Gas Institute, together with classified lists of all patents issued during the year in the United States pertaining to the gas business, and of those granted in England which have been described in the "JOURNAL"—the purpose being to show the present trend of invention in the gas industry.

NAPHTHALENE PICRATE, AND THE QUANTITATIVE DETERMINATION OF NAPHTHALENE.

In the "JOURNAL" for the 9th ult. (p. 409), it was mentioned that at the monthly meeting of the London Section of the Society of Chemical Industry a few days previously a paper on the above subject, by Messrs. W. P. Jorissen and J. Rutten, was on the *agenda*, and that, in the absence of the authors, an indication of its principal feature was given, by request of the President, by Dr. Harold G. Colman. The full text of the communication is published in the current number of the Society's "Journal," from which we reproduce it.

In the course of a large number of determinations of naphthalene by the Colman-Smith method,* the results obtained were always too low.† In these experiments, coal gas freed from naphthalene or air was passed together with naphthalene through U-tubes containing picric acid solution, which were weighed before and after the experiment. Niermeyer got similar results independently. When it was attempted to determine the picrate formed by filtering, washing with water, and drying in a desiccator, the results were lower still—82 per cent. of the naphthalene *in maximo*. It was, however, observed that accurate results were obtained when the washing-bottles contained not only a saturated solution of picric acid, but undissolved picric acid as well.

The method used was as follows: 250 c.c. of a saturated solution of picric acid is evaporated to about 150 c.c., and transferred while hot to two gas-washing bottles. The coal gas, which has been freed beforehand from tar, cyanogen, hydrogen sulphide, and ammonia, is passed through the bottles at a rate of 30 to 40 litres an hour. When a fair quantity of picrate has been formed in the first bottle, the gas-meter is read, and the picric acid solution and the picrate are transferred to a 250 c.c. flask. The bottles are washed with water, which is added to the solution, and the latter is made up to 250 c.c. with water and heated in the closed flask for half-an-hour at 40° C., and shaken from time to time, in order to dissolve the picric acid. The cooled solution is filtered, and 25 c.c. of the filtrate are titrated by a solution of potassium hydroxide of known strength, using litmus as indicator; 25 c.c. of the original solution are also titrated. From the difference, the quantity of absorbed naphthalene may be easily calculated. The results obtained were as follows:—

Naphthalene Found by Weighing the U-Tube.	Naphthalene Found by Titration.
Mgr.	Mgr.
147	145
158	154
139	141
215	217
380	383

The fact that it is necessary to have enough undissolved picric acid in the gas-washing flasks is explained by the phase rule: Picric acid, naphthalene picrate, naphthalene, and the saturated solution, cannot be in equilibrium with each other at the same time; hence, if there is equilibrium between the saturated solution, picric acid, and naphthalene picrate, any naphthalene which is added is transformed into naphthalene picrate as long as picric acid crystals are present.

If the method was to give good results, it was necessary that the picrate should be practically insoluble in a saturated solution of picric acid. This was found to be the case. 100 c.c. of water were shaken for some weeks with 5 c.c. of picric acid and 2.5 (in the other experiment 5) grammes of naphthalene picrate at a temperature of 25° C. A large thermostat was used, which was kept at constant temperature by means of a toluene regulator. The precipitate was then allowed to collect at the bottom of the bottles, and part of each solution was drawn off and weighed. After heating with excess of a solution of sodium hydroxide of known strength (about decinormal), the remaining sodium hydroxide was

* "JOURNAL," Vol. LXXV., p. 798.

† "Het Gas," 1908, p. 447.

titrated by sulphuric acid (about decinormal), using phenolphthalein as indicator. The strength of the sodium hydroxide solution was tested by means of pure picric acid.

For the determination of the naphthalene, some 10 per cent. of sodium hydroxide solution was added to weighed quantities of the solutions. The separated naphthalene was filtered off into a small tube containing asbestos (which had been heated beforehand, in order to remove traces of organic matter). After washing with water, the small tube was placed in a combustion tube partly filled with copper oxide, and the naphthalene was decomposed in a stream of pure oxygen. The carbon dioxide formed was absorbed as usual and weighed. In this way it was found that 100 grammes of the solution contained 1.44 grammes of picric acid and 0.0027 gramme of naphthalene. Some experiments were made with pure naphthalene picrate in order to verify these results. The weighed quantity of the substance was treated with sodium hydroxide, the naphthalene was filtered off, and was decomposed as in the experiments described above.

Naphthalene Picrate, Mgr.	Carbon Dioxide Produced, Mgr.	Naphthalene Calculated from the Carbon Dioxide, Mgr.	Naphthalene Calculated from the Picrate, Mgr.
41.1	48.8	14.2	14.7
56.1	65.1	19.0	20.1

Naphthalene is practically insoluble in water; in 100 grammes of the saturated solution of picric acid and naphthalene picrate, about 3 milligrammes are found. As the solutions used in Rutten's method are not saturated at the moment when they are filtered, the inaccuracy caused by the solubility of the naphthalene is very small.

Solubility experiments were also made at the same temperature (25° C.) with picric acid alone and with naphthalene picrate and naphthalene. It was found that 100 grammes of the saturated solution of picric acid dissolved 1.33 grammes of this substance. In 100 grammes of the solution, which is in equilibrium with naphthalene picrate and naphthalene, 0.183 gramme of picric acid and a trace of naphthalene are present.

In consequence of this, the "solubility" of the naphthalene picrate observed by Colman and Smith—who found that 100 c.c. of water at a temperature of 14° dissolve 0.1857 gramme of "naphthalene picrate"—is to be interpreted in a somewhat different manner. The decomposition of naphthalene picrate by water, which is a great drawback in using the method of Colman and Smith, had already been observed some fifty years ago by Fritzsche. He stated that the crystals were superficially decomposed when treated with cold water. On boiling the solution with water, it was found that naphthalene distilled with the water vapour. That the picrate can be recrystallized from a weak solution of picric acid, is shown by the diagram obtained when the results of the solubility determinations are plotted in a triangle after the manner of Schreinemakers, when treating three component systems.

Paternò and Nasini, who determined the freezing-point of solutions of naphthalene picrate in acetic acid, found that in dilute solutions it is almost completely dissociated into naphthalene and picric acid. Anschütz observed the same in benzene solutions. In order to ascertain whether this is also the case in alcoholic solutions, we determined the boiling-point of such solutions, using Landsberger's apparatus. Solutions which contained 5.68 and 11.67 grammes of naphthalene picrate in 100 grammes of absolute alcohol, showed elevations of the boiling-point of 0.345° C. and 0.650° C. From these data the molecular weights 189 and 206 are calculated. As half of the molecular weight of the picrate is 179, it follows that in alcoholic solution, too, the decomposition is considerable, and increases with the dilution.

These experiments were made in connection with the method of Stavorinus for the determination of naphthalene in coal gas. The gas is passed through glacial acetic acid, and the dissolved naphthalene is precipitated again by diluting or by neutralizing the acid. After filtration through a filter, drying at 100° C., and washing with water, the naphthalene is put into a small crystallizing vessel, containing 5 grammes of picric acid and 50 c.c. of strong alcohol. The solution is evaporated on a water bath, and the remaining substance is dried till the weight does not change any more. After heating on the water-bath for six or ten hours, and even after having added another 50 c.c. of alcohol, the weight of the residue was stated by Stavorinus to remain constant. Now Niermeyer and also Rutten observed considerable decrements of this weight. The latter observed the same at a temperature of 60°. Our observations on the decomposition of the picrate in alcoholic solutions offer an explanation for the observed evaporation of naphthalene during that of the alcohol. Also on heating the pure dry picrate at a temperature of 100° for some days, we found that the naphthalene is totally evaporated (also traces of the picric acid; the vessel is coloured yellow).

[A report of the remarks to which the paper gave rise has already been given, *ante*, p. 409.]

Recent Wills.—The late Mr. John Henry Cox, the Manager and Secretary of the Sunderland Gas Company, whose death was recorded in the "JOURNAL" for the 28th of September, left estate of the gross value of £24,082, with net personality amounting to £22,937. Sir Theodore Martin, the Chairman of the Brymbo Water Company and a well-known Parliamentary Agent, who died on the 18th of August at the advanced age of 92, left estate of the gross value of £157,706, with net personality £145,065.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Visit to the Tottenham Gas-Works.

In accordance with the arrangements made in the programme for the session, a large party of members of the Association, with the President (Mr. W. J. Liberty) at their head, on Saturday afternoon paid a visit to the works of the Tottenham and Edmonton Gas Company. Before doing so those who were able to get down by early trains took advantage of the offer which had been made to them on the occasion of the reading of Mr. W. Wright's paper a week previous, to inspect the sand-blast gas-cooker cleaning apparatus which he then described.

The sand-blast plant (for full details of which readers may be referred to Mr. Wright's paper reproduced in last Tuesday's issue, p. 616, as well as the number for May 4 last) is not at the gas-works, but at the stores and stove-repairing shops in the rear of the Company's offices in the High Road, Tottenham, where there is ample room for its accommodation. On arrival, the members were received by the Engineer of the Company (Mr. A. E. Broadberry); and under his guidance, and that of Mr. Wright, who is Storekeeper, they saw the whole process in operation. The first sand-blast plant put down has proved so satisfactory that a second one has just been installed in which it is intended to clean small parts; Mr. Broadberry's experience being that the cost of the system is about three-quarters that of hand work, while it does the work very much better. That the sand-blast is a rapid and efficient scourer could be easily seen by watching through the glass windows in the cleaning room. As the nozzle was moved slowly up and down the article that was under treatment, the effect was much as if the operator had been directing a spray from a painting machine. Next was witnessed the removal of a batch of cookers from the oven in which they had been baked for the removal of the grease and dirt—this being the operation that precedes the sand-blasting. Finally, the members inspected the retort in which the Bower-Barff process is carried on—that is to say, in which, by the action of superheated steam in the heated retort, the small parts which have undergone sand-blasting are covered with black oxide, which prevents them for the future from falling a prey to red oxide or rust—of course, providing the black oxide coating is not chipped off. Parts which had been through this process had a very attractive appearance; and the extreme simplicity of the system was rightly regarded as being a great point in its favour.

Already far more than repaid for the journey to Tottenham, the party then left the offices, and proceeded to the gas-works in Willoughby Lane, where other members were awaiting them. No time was lost in starting off on the inspection of the works, for the daylight that remained had to be made the most of. In groups, the members were piloted by Mr. Broadberry, Mr. J. Fisher (his Chief Assistant, who has recently taken up his duties), Mr. E. H. Harman (who has been doing duty for Mr. Fisher during the time that he was engaged in Antwerp), Mr. G. Warburton (Chemist), Messrs. Fiddes and Randall (from the Drawing Office), and Mr. H. Banyard (General Foreman). There was so much to be seen, and so little time to see it in—this latter, of course, being a drawback inseparable from winter afternoon visits to works—that the inspection had perforce to be of a rather more hurried nature than would under other circumstances have been the case. Nevertheless opportunity was afforded the members of taking in the main features of the works, and the visit, from start to finish, proved both pleasant and profitable.

A beginning was made with the retort-houses, of which there are two. No. 1 house was reconstructed in 1898, and fitted with Arrol-Foulis hydraulic stoking machinery; while No. 2 house was built in 1905, and formed the subject of a lengthy illustrated article in the "JOURNAL" for Feb. 13, 1906 (p. 413). In this house, the charging is done by De Brouwer machinery, and the discharging by the Jenkins De Brouwer ram. Charges of from 8 to 8½ cwt., of about 7½ hours' duration, are worked in the 20 feet retorts; and the make of gas is about 12,000 cubic feet per ton, using a mixture of Northern and Derbyshire coal. The elevating plant is in duplicate, to provide for emergencies; and in the ordinary course of things, the sets are used alternate days.

Leaving the retort-houses, and passing by the hydraulic coal-wagon tipping arrangements, there was reached a useful looking appliance, made on the gas-works for the purpose of separating the clinker from the pan breeze. It is made of a piece of 48-inch main, arranged with a fall of 1 in 5; the principle of the separator being a revolving cylinder placed at a slight angle. The mixed materials are fed in at the bottom, and a stream of water poured in at the top. A helical vein inside (driven by a small gas-engine), about 2 inches deep, worms the clinker which is too heavy to ride over the vein up to the top; while the breeze, being of lighter specific gravity, is washed with the stream of water out at the lower end. The separator thus not only performs the function of sorting out the fuel from the clinker, but at the same time it washes from both all dirty particles, and leaves a clinker of high grade at one end and a fuel (after it has been allowed to dry) of most excellent quality at the other. The breeze is used on the works; while the clinker is sold. Mr. Broadberry anticipates that his coke figures will show a marked improvement in consequence of the fuel thus being recovered from the ash. The arrangement was only finished somewhere about last midsummer.

A pause was made to admire the Arrol type of hydraulic power machinery, which is utilized for operating all the slides of the coal-hoppers, raising some of the purifier-lids, and working the waggon-tipping rams and the Arrol-Foulis stoking machinery. Out of a battery of ten Babcock and Wilcox boilers, eight are fitted with Crosthwaite's fire-bars and forced draught arrangement. These furnaces will, it is found, burn anything at all like fuel that may be put into them. The Humphreys and Glasgow carburetted water-gas apparatus is at the present time undergoing that frequent change in connection with plant at the Tottenham Gas-Works—namely, extension. There are already two 500,000 cubic feet sets and two 1,000,000 feet sets; while a 1,500,000 feet set is being put down in place of two 250,000 feet sets. A feature of the carburetted water-gas house which attracted attention is the arrangement made for bringing the coke up to the charging stage. Instead of the usual lift, the coke is raised by means of a bucket conveyor, and taken to a large overhead hopper, from which it falls down a shoot into the buggies as required. Some 350,000 gallons of oil are stored on the works, in three tanks.

Perhaps one of the most attractive buildings (on a works where everything is clearly made to look as pleasant as possible), is the valve-house, in which some ferns in hanging baskets appear—strange as it may seem—quite in keeping with their surroundings. In this house, where the holder inlet and outlet valves are assembled, there is a bye-pass safety governor; and there is also a little De Laval turbine, which is found useful for clearing out gas from a light holder and pumping it into a heavier one. Growing ferns were noticed in at least one other of the buildings; and the comfortable appearance of the interiors generally was freely commented upon. Amid such surroundings, it is not in the least to be wondered at that the men should feel impelled to keep all the machinery, &c., up to a high standard of cleanliness. Another thing about the works in which special interest was taken by the visitors is the system of emptying syphons under vacuum which was devised by Mr. John Terrace, at the time when he was Mr. Broadberry's Chief Assistant. Every syphon on the works is connected up to the vacuum plant. It is unnecessary to repeat here the description of the arrangement which appeared in the "JOURNAL" (together with a diagram) after the visit of the Eastern Counties Gas Managers' Association to Tottenham—see the number dated Oct. 2, 1906 (p. 28). The London Junior Association, it will be recalled, saw the process in operation on the occasion of their visit about eight months ago to Croydon—Mr. James W. Helps stating then that he had taken the idea from Mr. Broadberry's works. The Rostin system of lighting and extinguishing lamps by increasing the pressure at which the gas is sent out from the works is in use for the public lamps practically all over the district. There are four boosters; and of these two are used at a time, in tandem.

The sale of coke in paper bags has come to be quite a big business at Tottenham, as elsewhere. The price is 4d. for 28 lbs., or 4½d. delivered. Shopkeepers are supplied at 3s. 6d. a dozen bags, and make quite a good thing out of retailing them. But it seems that Tottenham is not a place which in any case experiences much difficulty in getting rid of its coke.

At the conclusion of the inspection, the members of the Association, as well as a party from the East Ham Technical College who had been visiting the works at the same time, were hospitably entertained at tea in the handsome Co-Partnership Recreation Room, after which

The PRESIDENT said it was a great delight to the Association to find themselves again at Tottenham. They had visited the works some years previously; and it was interesting to note the changes that had in the meantime been made. At the date of their earlier visit, water gas was being a great deal talked about; and their particular object in going to Tottenham was to see one of the early plants installed there. This plant was at the present moment, they were pleased to see, being reconstructed on a larger scale. One reason why they were glad to be at the works that day was because associated with the Company was that distinguished gentleman, Mr. Corbet Woodall, who gave the members such an interesting address at the opening meeting of the present session. The Tottenham and Edmonton Gas-Works had a name, he found as he went about, for "wrinkles." There were to be seen there things which were new and expedient, and which were not to be seen generally in gas-works.

Mr. E. SCEARS proposed a hearty vote of thanks to Mr. Broadberry and his assistants for showing them round the works, and to the Directors for giving permission for the inspection. He remarked that to those who were engaged in constructional work, it was extremely instructive to revisit a works after several years' interval. He supposed that about the most marked feature at Tottenham was the architectural arrangement of the buildings and the interior decoration, which was far in advance of what was seen in most gas-works. It was evident the opinion prevailed at Tottenham that if a workman's surroundings were made better, it made a better man of the workman himself.

Mr. W. H. VANNER, who seconded the vote, said that what had struck him most was the efficient way in which everything was carried on. Not only was the plant most satisfactory, but also the way in which the workmen kept the machinery and buildings tidy and clean. Their thanks were certainly due to the Company for the hospitality that had been shown them.

Mr. T. F. CANNING supported the vote, and pointed out that it was a compliment to the Association that such Engineers as Mr. Broadberry should give up their time to them.

The PRESIDENT added that he had been much impressed with the pride the men took in their work, which was evidenced by the spick-and-span condition in which everything was. Whether it was the co-partnership feeling running in their blood, he did not know; but the men all seemed to take the greatest interest in the upkeep of everything they had to do with.

The resolution having been carried with hearty applause,

Mr. BROADBERRY said he was much obliged to the members, not only for himself and his assistants, for their vote of thanks, but also on behalf of the Chairman Mr. Corbet Woodall and the Directors and Secretary of the Company. He was sure that the Directors would be very pleased to have it reported to them that the Association had appreciated their visit to Tottenham. If Mr. Woodall had been in a fit state of health, it was his intention to be present that afternoon so as to welcome the members; but unfortunately he was suffering from a bad cold, and it would have been inadvisable for him to undertake the journey. The Secretary (Mr. E. Topley) had also asked him to express his regret at being unable to be with them. So far as he (Mr. Broadberry) and his staff were concerned, they had been amply repaid for having devoted their Saturday afternoon to this visit, when they found the members so well pleased with what they had seen. The inspection itself had been made under rather disadvantageous circumstances so far as the time of year was concerned—both because they found the works so busy, and being so busy it was not possible to keep everything so clean and spick-and-span as they wished; and also because the daylight was so short that they had been compelled to rush somewhat rapidly round the works. If there had been time for them to examine into the details more closely, he certainly thought they would have found a great deal to interest them. Not that he claimed that anything about the works was really novel; but when he went about to other works, he kept his eyes open and took up any idea he thought was good, and tried to improve upon it when introducing it into his own works. They were, of course, exceptionally placed so far as this particular matter was concerned, because he believed Tottenham enjoyed an almost unique record. Nearly ever since the Company was formed in 1845, they had been regularly doubling their output every eight years. Under such conditions of progress as this, one had an opportunity of introducing every novelty into the working, and keeping everything absolutely up-to-date. With the constant extensions going on, there was a chance of testing every idea that seemed good. Whether such ideas occurred to them on their own works or whether they were given to them by a generous brother engineer, they felt equally justified in adopting them; and in precisely the same way, they were glad to give any of their own ideas away to others who might find them useful. He was proud to think that, if in their works they had cribbed a good many ideas from other people, they had been able occasionally to give them something in return. If any of the members had seen anything in the works that particularly interested them, and during the rush they had not had time to inquire fully into it, and so would like to make a further inspection of the works and inquire about this particular thing at any time, they would find themselves heartily welcomed. If it was the sand-blast plant, or anything to do with the High Road depot, they would find Mr. Wright, who was one of their own members, in charge of the shops up there; and he would do all that he could for them. If, on the other hand, it was anything in connection with the works themselves, they would find Mr. Fisher there in charge; and if he was not able to give them his personal attention, he would tell off one of his able assistants to accompany them round the works. Anything they could offer the members in this way, they were most heartily welcome to. If it should be a question of the high-pressure lighting, for which the Company were trying to make themselves—he was going to say to some extent famous, but, at any rate, with which they had been very successful, Mr. Richardson, one of the inspectors, who took a special interest in this branch, would be most pleased to accompany them either to the Alexandra Palace, where there was an extremely fine exhibition of this system of lighting, or else to Harringay, or any one of the four different groups in Wood Green, where high-pressure lighting had been adopted. These groups in Harringay and Wood Green were worked on the idea that the outside lighting of shops could be better carried out if it was done in a uniform way by a joint scheme of a number of shopkeepers combining together. The Company found no difficulty in getting from fifty to a hundred shopkeepers in a group, who hired from them a high-pressure lamp giving 600-candle power, for a rental of 20s. a quarter for five nights a week, or 22s. for six nights. This system, which was introduced only just before Christmas last, had spread so enormously and become so popular, that he was glad to learn that surrounding districts had thought it worth while copying; and shopkeepers, not only in their own area, but in the district of supply of other gas companies, were anxious that some similar installation should be carried out for their benefit. In every branch the Company aimed at being up-to-date; and he thought he might fairly claim that they were in the forefront in regard to high-pressure lighting. Evening would, of course, be the best time for any of the members who wished to inspect the installations to which he had referred. He might add that if any of those present had time and would care to further inspect any portion of the works that was still available, they would be welcome to walk round again after tea. Or if they would like to remain in the room as guests of the Social Club, it would be a pleasure to entertain them. They had been having their tea in a room that was the direct outcome of co-partnership.

The Directors of the Company had always done all they could to encourage the workmen to improve themselves in their work by giving them the most suitable surroundings to work in; but in addition to this, they had also done everything to induce the men and the officials to join together in one brotherhood, working in one interest. They had formed athletic clubs for all branches of sport; they had started a rifle-range open to all employees to join; they had provided the room in which the party were now assembled, which they hoped would be a centre of co-partnership; and, of course, above it all was the fact that they had admitted all the employees as co-partners in the Company. In this room, they would see all grades of the service joining together in all their enjoyments; and since the room had been opened, some very pleasant evenings had been spent there. In opening the room, the Chairman suggested that a good motto for it would be: "To make a man a better workman; and to make a workman a better man." This was the spirit in which the Directors wished always to deal with their men; and while they went on in this way, he was sure the undertaking would continue to progress. With such constant progression, if ever the members should pay another visit to Tottenham, he was afraid they would always find the works more or less untidy in some part, because they had always to be adding to and extending the plant. It meant a great deal of work to keep up with an increase like theirs. The members could imagine for themselves what it meant, when they considered that in eight years' time the Company would be called upon to supply twice the quantity of gas that they were doing now. This meant that during the next eight years they had to provide new works or extensions of the existing ones equal to the size of the plant in use at the present time. This was no light task; but it certainly did something to lighten the task when they heard visitors to the works say that they were pleased with what they saw.

After rising from the tables, a number of members remained for a time in the recreation-room, which contains two full-sized billiard tables; while others went with Mr. Broadberry to the rifle range, where some of the party indulged in a little shooting practice.

PRODUCERS & INTERNAL-COMBUSTION ENGINES

This was the subject of a paper read by Mr. F. L. M'LAREN, of Dumbarton, at the meeting of the Western District Division of the Scottish Junior Gas Association, held on Saturday in Glasgow—Mr. D. CURRIE, of Stirling, the President, in the chair. In the course of his paper, the author made the following remarks.

In the Presidential Address of 1908, it was pointed out in a very definite manner that the thermal efficiency of the modern steam-engine was such that its days were numbered, as no improvement of any consequence was to be hoped for. After the brains of a century have been spent in perfecting this prime mover until we have it in the ideal form of the steam-turbine, it would have been pleasing to think we had reached the ideal. Yet, can we be surprised we have not? How came the steam-engine to be? A very clever engineer—all honour to his name—saw the effects of steam expanding, and concluded that the latter would be an excellent force to harness into the service of men. But the power engineer of the present day thinks on quite different lines. The problem is to get an abundant supply of two substances which, when united, will evolve heat. The first two substances to come forward to help us were atmospheric oxygen and ordinary coal gas. The latter came with its impediment, high price, and the air with its worse than useless complement, nitrogen. It soon became evident, however, that, in order to get the most heat out of these substances, their pressure had to be raised before allowing them to part with their heat. To do this efficiently still remains a problem. In the meantime, Otto's idea holds the field. But if we are to get power in the form in which we want it—viz., rotary—it is evident we must depart from the Otto principle. Having witnessed the miraculous development of the steam-turbine, we are satisfied that even a wider and more glorious career awaits the successful application of the internal-combustion principle to rotary prime movers. In the address referred to, it was shown how high compression before combustion was a *sine qua non* of efficiency. To reach efficiency, then, we are face to face with an insoluble enigma. We must compress the gases; and it is the compression which makes the machinery so heavy and bulky. What does our problem really resolve itself into in order to get efficient results? We must apply our expanding gases directly and continuously to the impelling parts of our prime mover. To manage this, we have to burn both the fuel and the supporter of combustion under pressure, and we have to compress the supporter of combustion before the former can be carried out. This means that as every pound of fuel is burned, 235 cubic feet of air have to be compressed to 100 lbs. or over, which is really no easy problem. The fact of the matter is, our engines of the present day are just makeshifts—made to use a number of different fuels which are ready to our hand. However, in spite of these imperfections, we are proud of them; and, having reached a stage nearer the ideal, it is well worth while considering the relative advantages and prospects of the modern producer gas-engine. When it was first suggested to work internal-combustion engines on producer gas, the calorific value

of which was below about 150 B.Th.U., it was thought that such a keen gas (as compared with town's gas, the calorific value of which is about 600 B.Th.U.) would hardly work satisfactorily. But, when tried, the results soon showed that this idea was ill-founded, especially when higher compression pressures were used. To increase the calorific value of the gas, however, and also to keep the producer at good working temperature, hydrogen is supplied in the form of steam mixed with the air, and this combines with the carbon in the producer. [The author proceeded to describe the action of the producer.]

Mr. W. A. Tookey points out that there is a limit to the amount of good gas that any producer will yield, seeing that good gas can only be produced when the generator is of such capacity as will allow sufficient depth of fuel to become incandescent to serve for both combustion and reduction zones, when the engine is working under its load. If this condition occurs when the engine is not working at its full output, any increase in demand for gas by the engine will cause more air to be admitted. The combustion zone will take care of itself, and extend from the fire-bars to such a height as would ensure all the air becoming converted to CO₂. But while the maximum limit can thus be determined, there is also a maximum limit as regards quality of gas from any generator. Decomposition of steam and production of good gas can only be obtained at comparatively high furnace temperatures. This can only be produced by the rapid combustion of the fuel, which can only be obtained by causing the air to pass through the fire in a strong current.

The second limit to the size of a suction-gas plant depends upon the rate of flow of the air through the fire; and this affects the cross sectional area of the fire-brick lining, as the requisite volume of air will pass through a large opening at much lower velocity than through a more restricted area. It is therefore quite as important to proportion the diameter of the fire to suit the necessary draught as to provide sufficient depth of fire to enable combustion and reduction to do their part. Further consideration will show that the available area of the combustion zone for the passage of air is influenced by the average size of the fuel. Experience has determined that a depth of fire from 24 to 30 inches is quite sufficient to give good gas under all conditions of work; and, therefore, almost without exception, this depth is common to all suction gas-producers.

Having arrived at the depth and diameter of a producer to work a given power of engine, I will pass on to consider the relative merits of the different gases used for driving internal combustion engines. When asked which of these gases is to be preferred for motive power, irrespective of cost, I should say, "That obtained by the partial combustion of carbon in a producer." And I have good reasons for my answer. The trouble of pre-ignition in small paraffin engines is aggravated when the powers are increased. Petrol is perfectly homogeneous; but being rich in hydrogen, it is impossible to get it to combine with the requisite amount of air for its complete combustion, with the result that the products of combustion leave the cylinder after the explosion at quite a bright red heat. No gas requires so little as 100 per cent. of air for its complete combustion as producer gas, which combines with the air without any great explosive violence, emitting a comparatively cool exhaust, and rendering the running of the engine more like that of a good triple-expansion steam-engine. Herein consists one of the great economies of producer gas. The supporter of combustion in all internal-combustion engines is air, which consists of one part of oxygen to four parts of nitrogen. In all gaseous explosions there is considerable waste in the heating of this nitrogen, which constitutes the greater part of the exhaust gases; so that the less air used to give complete combustion to the fuel the less heat is lost at the exhaust. Again, when the explosion takes place in a cylinder, the speed of the piston is unfortunately at a minimum, the crank being at dead-centre, with the result that the products of combustion are unable to absorb all the heat liberated by the explosion fast enough; and the heat requiring to find an immediate outlet, does it in supplying the cooling water round the head of the cylinder. A violent explosion is therefore a bad thing thermodynamically, as well as from the mechanical point of view. So that in the producer-gas engine we have a saving in the two most important directions—viz., the loss to cooling water and the loss to exhaust. Another advantage is the greater flexibility in the running of the engine.

Whatever the reducing agent may be, we must bear in mind that what is wanted at the outlet of the producer is carbonic oxide and hydrogen, and also remember that having made all the necessary arrangements for the production of this gas, we must see that no oxygen gets access to these gases to form other compounds. Originally the walls of producers converged towards the fire-grate, in order to bear the weight of the coal in the producer, and thereby reduce the weight on the fire-bars. This was found to encourage the air to pass up the walls, and so form excess of carbon dioxide at the top. Perpendicular walls are now adopted, whereby all the air must necessarily pass through some fuel before reaching the top. To prevent air leaking up the walls, the layers of bricks should be dodged, so that no two joints on adjacent layers register with one another. Moulders' sand should be carefully packed—in fact, rammed—down between the bricks and the outer casing, so that if any of the fire-brick joints prove faulty, they fill with sand and prevent air getting up and burning the carbon monoxide and carbon dioxide before it leaves the generator. A sight-hole at the top of the generator enables leaks of this description to be detected, as round the

sides of the lining tongues of flame will be seen above the incandescent fuel, showing that combustion is taking place at the expense of the quality of the gas.

In order that a producer may be got quickly under way, it is essential that it should be properly installed. It must be borne in mind that anthracite is a troublesome fuel to ignite, since there is only a small volume of hydrocarbon to be set free at the lower temperatures. On this account, it is difficult to set up a draught; and the fan should not be entirely relied upon for this purpose. Besides forcing in air to a producer, the necessary precautions should be taken to prevent an accumulation of that evil element, nitrogen, at the top. For this purpose, a fairly long vent-pipe, with easy bends, should be fitted. When a boiler is put down to give power, every consideration is made in the building of a huge chimney-stack; but many a producer has to go with a foot or two of the cheapest piping, sufficient to take the fumes through the roof of the shed. If it is not convenient to take the vent-pipe straight up, easy bends should be used, and no right-angle knees and horizontal lengths be used. Moreover, the area should not be restricted, since the more gas that can escape the quicker will the fire draw. A large quantity of smoke and grit has to pass up these pipes, so that any sharp bends or corners favour the accumulation of this dirt, and make the vent difficult to clean. These pipes should not be less than 3 inches in diameter, and as long as possible; for the better the draught that is natural the better the fire, and the sooner will the producer be ready to deliver clean, burnable gas. A little forethought displayed in the installing of a producer may save countless hours of hard work and worry in the starting of the gas-engine, and win for the latter the credit for reliability and convenience which it deserves.

To kindle the fire, place some oily waste on the fire-bars, then some shavings and sticks, and then a bucketful of coal. Repeat this, having a double layer of each, allowing about 5 inches depth of coal, and then apply a light. Close the door above the fire-bars, and see that water is in the water-vessel to the right level, and that there is none in the ash-pit. Satisfactory natural draught will soon have the fire ready to receive sufficient coal to half fill the producer. After the engine has been looked to and oiled, the ash-pit door may be closed and the fan can at once be put into operation for a few minutes and then the producer filled, when gas will be ready for passing through the scrubbers. On the gas at the outlet being transparent, a test can be made of the gas; and on the appearance of a good, blue flame, the gas may be turned on to the engine. The fan should be kept going until the engine is under way, then the air-door to the vaporizer should be opened and the fan put gradually out of action. As the gas is enriched by the supply of hydrogen from the water, the engine will take up its load, and the water supply must be turned on to maintain the level in the water-vessel.

The air should be heated as much as possible (to, say, 80° Fahr.) on entering the producer, so that it may take up as much moisture as it can in passing through the vaporizer. This is a law of nature we are all well acquainted with. The more steam used the cooler the producer will be; and thus the danger of clinker forming will be obviated. The regenerator principle is further carried out by superheating the air and water vapour before it passes through the fuel; but this should not be carried to excess, as the fire-bars are liable to suffer. It is the rushing past of the cold gases on which the fire-bars depend to keep them from burning by contact with the hot fuel. Therefore, by superheating gases which pass the fire-bars, the latter may easily be destroyed. Where water is kept in the ash-pit, however, any chance of this occurring is removed.

Having set the engine agoing, let us consider what are some of the troubles we are liable to experience, so that when we do meet them we shall know how to act. Nothing is more annoying and unsatisfactory than for a whole factory to be brought to a standstill on account of the failure of the gas, or for any other like reason. Take the reason (whatever it be) to the managing-director, and the inevitable answer is: "I can get a cartload of excuses; but I want the work carried on without interruption." The great advantage of the steam-engine has always been the fact that, in the event of a breakdown, it is a comparatively easy matter to diagnose the trouble. With internal-combustion engines, we must admit this is not so easy. Still, a little chemistry and common sense will carry an engineer inevitably to victory. One of the features of the greatness of James Watt was that he not only made a successful steam-engine, but he invented the indicator to take a record of what went on in the region which was hidden from the ken of man. So it behoves us to provide the necessary instruments to enable us to read what operations take place in the different parts of the producer, in order that the cause of any failure may be readily traced.

In the working of a gas-producer not much technical knowledge is required, since, as I have said, it is merely a hole to put coal in; and providing a man can do the latter, that is all he need know so long as everything goes well, and except when the mere putting of coal in will not make the engine go. Analysis of the gas will at all times give indication of the nature of any trouble that may exist, and what is most likely to be the cause of the trouble is the presence of carbonic acid. Fortunately, this gas is easily soluble in a solution of caustic soda or potash, and, consequently, an instrument can readily be used to detect the presence of a gas which ought not to exist in large quantity in a producer. Tests should be taken from time to time and the percentage of carbonic acid noted, when all is in good working order, and then

when anything does go wrong the test will indicate in which direction a fault is likely to be. For instance, supposing that air leaks through the plant and gets into the generator at the top of the fuel and meets the gas while it is still very hot, then part of the carbonic oxide will be turned to carbonic acid. The gas will be poor, and the test will show up the cause. If the leaks are at a cold part of the plant there will be no combustion, but the percentage of CO₂ will be affected and will be low, which could also be shown on the test.

On the other hand, if too much steam is allowed to enter, the temperature of the fire will be too low to convert the carbonic acid to carbonic oxide; and if too much air is admitted in proportion to the fuel, the carbonic acid will rush through without being reduced, and there will be too much of it in the gas. But in this case, the temperature will rise; and there may be flame above the fuel. There must be sufficient carbon surface presented to the air as it passes upwards in the producer. If more air gets past than should do, a smaller size of fuel will work in the producer satisfactorily. This will indicate that leakage is occurring, and repairs should be made accordingly.

The great enemy to be got rid of in producer-gas installations for power purposes is the tarry matter. How to present moist surfaces to the flowing gases from producer to engine is the problem to be solved by the scrubbers. The principle of regeneration should be carried out, to obviate to as great an extent as possible the necessity of the scrubbers acting as coolers; for we must remember that all heat given to cooling water is lost. The water as it enters the scrubber containing the coke or other irregular solid, should be sprayed so that it trickles over all the surfaces of the solid evenly. And as the water flows downwards, it should meet the gas on its upward passage. Thereby the majority of the impurities separate out at the foot, and are drained off, while the remainder deposits on the upper portion of the wetted surfaces. Arrangements should be made so that the lower portions of coke can be easily cleaned or renewed periodically by arranging two sets of grids in the scrubber at different levels. The size of the coke should be varied from large at the bottom to small at the top. Care should be taken to avoid short-circuiting in the scrubber. If one side of the scrubber is found to be hotter than the other, it means that most of the gas finds its way up through an easy passage, and avoids the cleaning operations. This should be put a stop to at once by refilling the scrubber; for cleanliness is a very necessary virtue in producer-gas engine work.

The proportions of a scrubber should be: Height, at least twice the diameter. There should be ample room between the top of the coke and the scrubber top, as this acts as a reservoir of gas which the engine can draw in when varying the load. Although coke is largely used for cleaning purposes, it is not on account of its porous structure, but, being light, it is easily handled, and is as good as anything that can be got, although pebbles, wooden boards, &c., are often used, and answer the purpose well.

Mr. M'Laren was proceeding to show a number of slides in illustration of his remarks; but as there was trouble with the lantern (an electrically lighted one), the President suggested that the members might meantime discuss the paper.

Mr. A. H. WHITELAW (Glasgow) said he thought Mr. M'Laren had shown the members very clearly that the producer-gas engine had a future before it. He might point out that a great many of the things the author had said might seem at first to be backing up that engine as against the one using ordinary gas. Personally, he was perfectly well aware that Mr. M'Laren was speaking of the engine more particularly from the marine engineer's point of view. He happened to know that Mr. M'Laren had been devoting some time to producers as applied to marine work; and he (Mr. Whitelaw) looked upon him as a pioneer in this line of study. He had had many difficulties to overcome; and he (the speaker) was sure that the Association wished him all success in the enterprise upon which he had embarked. He was certain they had appreciated all Mr. M'Laren's remarks. He hoped no one would put a wrong interpretation on the subject-matter of the paper. It was not a question of town's gas *versus* producer gas. He thought there was a great deal to be learnt from a study of this subject. He was not prepared to go the length Mr. M'Laren did, as to the reliability of the producer-gas engine; but he would go so far as to say that perhaps some day it might be first. For small power purposes, town's gas had a future before it; but they would not require to have a five days' fog if they were to recommend the use of it. They wanted a good supply of gas. He was sure all who worked in retort-houses would appreciate the subject. If Mr. M'Laren had done nothing else, he had taken them out of a rut, and had shown them the practical application of producer gas in internal-combustion engines.

Mr. P. M'DOUGALL (Helensburgh) said it would be difficult—indeed, almost impossible—to attempt to discuss the paper in an impromptu manner. However, the question of how with town's gas they were to meet the competition with suction gas, had been, and would be, a difficult problem for gas managers to solve. He mentioned suction gas because he believed this gas was the only serious rival with which ordinary gas had to compete. Suction gas had come to stay; and it lay with those who were responsible for the welfare of the gas industry to do what they could to meet and overcome the competition. The problem was not insurmountable; and, so far as he could see, there was only one way in which this could be done, and that was to sell town's gas at

a special rate for power purposes. The question then would be, At what price could it be sold without affecting the interests of ordinary consumers for lighting and heating? In fixing the rate, it should not be forgotten that the gas-engine was principally a day load, and in consequence did not materially affect manufacturing costs. Of course, the undertakings whose conductors had been wise in husbanding their capital expenditure, and who had considerably less standing charges, would always be in a healthy condition to meet any competitor who might enter their district. However, so long as they continued to hand over large sums of money in aid of the rates, or in subsidizing electricity departments, so long would they remain unable to fight the competition he had mentioned. In fixing the rate for gas for power purposes, the fairest way, so far as he could see, would be to charge sufficient to cover the cost of manufacture and distribution, *plus* capital charges (keeping in view the fact that it was a day load), calculated on the amount necessary to provide the additional consumption, and not upon the whole capital of the undertaking. With town's gas, no attendance was necessary beyond the starting of the engine. The supply was free from uncertainty, and could be turned on at any moment; and the capital costs were considerably less. With suction gas he believed the cost was 15 or 20 per cent. greater than with town's gas, for the same power.

By this time, the lantern had been got into working order, and Mr. McLaren proceeded to throw on to the screen a series of views, which occupied the remainder of the evening. In one of these it was shown that the duty of the ordinary steam-engine was 11 per cent.; of the turbine steam-engine, 14 per cent.; and of the producer-gas engine, 27 per cent. In another, that with the ordinary steam-engine, out of 1120 heat units, only 100 were available for power; so that for every shilling they paid they obtained only a pennyworth of heat. In gas power the loss of heat was very much less, as they only required 494 units to get 100 units available. One of the views shown was a photograph of Mr. McLaren's *Pioneer*, and the explanation was given that with it a voyage was made from Dumbarton to Port-Glasgow and back at a cost for fuel of 5d., which would have been 4s. or 5s. with steam. Views were also shown of gas-engines which are being designed for war vessels, particularly for torpedo boats, in connection with which the object aimed at is to be able to shoot the torpedoes by means of gas, instead of by compressed air as at present.

MANCHESTER JUNIOR GAS ASSOCIATION.

Visit to the Openshaw Gas-Engine Works.

Members of the Manchester and District Junior Gas Association paid a visit on Saturday afternoon to the Openshaw gas and oil engine and suction-gas plant works. The party, numbering fifty, included the President of the Association, Mr. James Taylor, of Mossley, Mr. F. Thorp, the Vice-President, Mr. J. Alsop, the Hon. Secretary, and Mr. R. Garlick, the Hon. Treasurer.

Nearly three hours were spent in an inspection of the works, which cover some 15 acres and just now find employment for about 2000 hands. A centrifugal tar-extractor and the very latest models of gas-engines came in for a good deal of attention. Mr. S. Birkett, the Assistant-Manager to the firm, Mr. F. Bertenshaw, another of the Managers, together with Messrs. J. Gordon and S. Maude of the general staff, acted as guides to the party over the different departments—explaining the processes and answering questions put to them in the course of the tour.

At the conclusion of the inspection, Mr. Carter, at the call of the President of the Association, moved a vote of thanks to the firm for having allowed members the opportunity of inspecting the works, and to the gentlemen who had acted as guides to the party. Mr. Carter, in the course of his remarks, said they were especially indebted to Messrs. Birkett, Bertenshaw, Gordon, and Maude for giving up their usual Saturday afternoon to show members of the Junior Gas Association round the works and explain to them the things with which they were so familiar. It was a self-sacrifice on the part of these gentlemen that he and his colleagues deeply appreciated. He (Mr. Carter) had been much struck during the inspection by the enormous engines turned out by the firm, and the capacity of the works for the making of engines down to the smallest—both for gas and oil.

Mr. A. Hodgson seconded the resolution, and in doing so paid a compliment to the guides for their painstaking efforts and the considerate way they had dealt with the questions asked.

Mr. Taylor, in putting the matter to the vote, said he had been impressed by the extensive nature of the works and the excellent manner of their arrangement and equipment.

The resolution having been carried by acclamation, Messrs. Birkett, Bertenshaw, Gordon, and Maude responded in turn—each, in effect, saying that he had been only too pleased to show the visitors round and explain why the firm still claimed to be the first in their line.

It was mentioned by Mr. Thorp that the Association were soon having a debate with the Manchester students' section of the Electrical Engineers, and he thought Mr. Bertenshaw and his colleagues might be able to furnish some information which would be useful, as to the cost, &c., of gas-motors compared with electric-motors.

Mr. Bertenshaw said he and his colleagues would be only too pleased to furnish all the information they could on the point.

From his own experience, he was sure that they—as being particularly interested in gas and gas production—were frequently subjected to what he might call unfair competition from those in charge of electrical undertakings. He mentioned a case in point that had recently come under his notice in regard to a certain corporation electricity undertaking, and was surprised at the apathy of gas managers to the formidable competition being offered by the low rates charged for electricity, particularly for motive power purposes. As he had said previously, this competition was not always conducted on fair lines.

Mr. Taylor: What you suggest is that certain corporations are supplying current below cost.

Mr. Bertenshaw replied in the affirmative, and said he knew of places in Manchester where current was being supplied at $\frac{1}{4}$ d. per unit. He desired to point out, while on this subject, that in some cases the use of town's gas was prohibitive on account of the cost, which was the main thing after all; and he added that this was the reason his firm had gone in for the supply of suction-gas plants.

Before the company separated, it was arranged that Mr. Bertenshaw and his colleagues would furnish what information they could to assist the members of the Association in their debate with the electrical engineers.

THE FIRST CLAY RETORTS IN ENGLAND.

It may be remembered—see "JOURNAL" for Nov. 9, p. 405—that a paper, on "Carbonization Fifty Years Ago," was lately read before the Scottish Junior Gas Association, by Mr. T. Orr, of Motherwell. The author mentioned that clay retorts were introduced into the South Metropolitan Gas-Works about 1851; but he quoted an extract from the "JOURNAL" for Jan. 10, 1851, which stated that two settings of five clay retorts "have been uninterruptedly in action for upwards of seventeen months," which would indicate that they were in use about July, 1849.

In the December number of the South Metropolitan Gas Company's "Co-Partnership Journal," the following statement appears: "As a matter of fact, these ten clay retorts (\square pattern, 20 in. by 12½ in. by 7 ft.) were ordered on Dec. 27, 1848, of a Mr. C. Perkins, and were made in Belgium—a detail of some interest in view of recent correspondence in the Technical Press on the subject of foreign retorts. Four years previously, Mr. Croll had tried clay retorts; and his experiment is thus described by Richards—

The first employment of clay retorts in England on an extensive scale was at the Brick Lane station of the Chartered Company, in 1844, under the direction of Mr. Croll. These retorts were obtained from one of the most accredited manufacturers in England; but, in consequence of their defective nature, the great experiment resulted in complete failure, to which circumstance may be due the great prejudice which existed for some years against their use.

"Mr. Orr also referred to brick retorts, which were invented by Grafton and Spinney and improved by Clift. As many of our readers know, brick retorts were exclusively in use in the Old Kent Road works thirty years ago, and have only disappeared within the last twenty years; the pattern used being really a modification of Mr. Clift's design, but in a different setting. We believe, but are not quite sure, that Mr. Clift first introduced his retorts at the Adderley Street Gas-Works at Birmingham, where he was Engineer. When he retired from the Birmingham works in the early sixties, he built gas-works for the supply of Redditch and district; and in 1873 he formed the Redditch Gas Company. Clift's brick retorts and settings were exclusively used at Redditch until regenerative heating was adopted less than twenty years ago. We learn from Mr. Orr's paper that, in 1852, Mr. Clift claimed that fire-brick retorts were as economical in consumption of fuel as iron ones, which was doubtless very true. The great point in favour of brick retorts was their durability. Mr. Clift claimed a life of twenty years with only £1 per bed per annum for repairs. We cannot say that this length of life was always obtained in practice, nor that the yield of gas was quite equal to that of the less durable clay retort. But brick retorts held their own for a long time with engineers who understood how to use them; and the Editor [Mr. W. T. Layton] has an almost affectionate recollection of them, and of the late Mr. J. E. Clift, the first gas engineer he ever knew."

At the meeting of the Metropolitan Water Board last Friday, an application made by the Cambridge Water Company for the assistance of Dr. A. C. Houston, the Director of Water Examination, in connection with certain experiments proposed to be undertaken by them in sterilizing their water supply, which is principally derived from the chalk, came up in the report of the Water Examination Committee. The Committee considered it advisable to consent to the request, on the ground that the matter was not only one affecting the public health, but that the inquiry to be undertaken might afford much valuable information to the Board. As, according to Standing Orders, no officer is allowed to receive fees for outside services without first obtaining the sanction of the Board, the Committee recommended that the necessary permission be given Dr. Houston in the present case; and this was agreed to.

A LINK WITH THE PAST OF LONDON GAS.

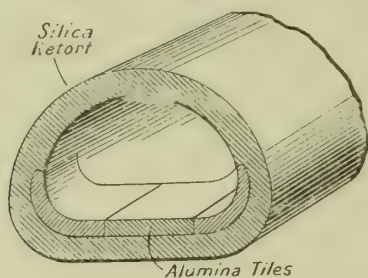
There passed away at Brighton on Nov. 30, at the advanced age of 93, Mr. Hunter Jones, formerly Engineer-in-Chief of the London Equitable Gas Company. Through the interest of the late Mr. Robert Jones, M.Inst.C.E., of the Commercial Gas Company, the deceased came to London about 1855 from Wolverhampton, where he had the management of the then new Stafford Road works under, at first, his brother Mr. R. Jones. He afterwards had charge of the gas undertaking in Bahia, since leaving which he lived privately, except for taking interest in the Epsom and Ewell Gas Company, of which his brother was Lessee.

Some measure of the long tenure of life of Mr. Hunter Jones appears from the fact that the late Mr. Thornton Andrews, M.Inst.C.E., of Swansea, who recently died full of years and honours, had been his pupil, and was always keenly inquiring after his old chief. A further index of the scope of his life is that, while he was at Ebury Street, Mr. Richard Jones, his cousin, was Resident Engineer of the London Gas Company, under the late Mr. Robert Jones as Consulting Engineer, who lived at the old Vaux-Hall part of the then London Gas-Works, and which was curious from its antiquity—a portion of it being reputed as the rendezvous of the conspirators, with Sir Richard de Vaux at the head, for the destruction of the Houses of Parliament. At the date of Richard Jones' management, the old Vauxhall works covered the site of the park and garden belonging to the Hall, relics of which cropped up in various parts of the works. Wet lime purifiers overhung the wharf edge, with discharging-pipes for filling the barges with "Blue Billy." Alongside were Vauxhall gardens in full swing, only recently invaded in part by the new railway bringing up passengers from the old South-Western terminus at Nine Elms.

Physically and mentally, considering his great age, deceased was a remarkable specimen of humanity. We are glad to learn, on inquiry of Mr. Henry E. Jones—one of his nephews—that the deceased retained all his faculties right up to the time of his death. He was out driving unattended only four days before his death. He could always read without spectacles, and had most luxuriant hair, which, strangely enough, suddenly whitened before he was thirty years old. He was scientific to the last, and directed that his remains should be cremated. This was carried out on Saturday last, the 4th inst., in the presence of his nephews and grand nephews.

SUGGESTED EXPERIMENT IN RETORT MAKING.

Mr. Albert Cliff (Messrs. Williamson, Cliff, Limited), of Stamford, sends a suggestion for a new retort, which he considers will appeal to engineers who know something of the qualities, &c., of refractory materials.



As the sketch shows, his proposal is to form the outer case of the retort of tough silica material, with alumina tiles—say, about 2 inches in thickness—on the bottom and sides, as an inside lining. Such an arrangement, he thinks, would have the following advantages: 1. It would make a very light retort. 2. It would be a good heat conductor. 3. It would not be at all expensive to make. 4. The increased thickness on the bottom and sides would be less than when set in silica shields, as is now common. 5. There would be no flange on the flat and corners at the mouth end, where T bolts could be arranged. The top would run in section like an ordinary retort flanged at the mouth end, and box-bolts could be used if desired. 6. Consonant with the trend of the times, such a retort would take a very considerable amount of punishment.

London and Southern District Junior Gas Association.—The third general meeting of this session will be held next Friday, at the Cripplegate Institute, when a lecture will be given by Mr. Jacques Abady, of Messrs. Alexander Wright and Co., on "Light—and Some Reflections." Owing to certain unforeseen circumstances, it has been found necessary to make some alterations in the programme. On Jan. 28, Mr. Rosevear's paper "Notes from Hythe," will be followed by "Questions." On Feb. 25 a paper will be read by Mr. Somerville, entitled "The Incandescent Mantle; Having Special Reference to the Use of Non-Collodionized Mantles." On April 22, in place of "Questions," Mr. Clark will give his paper "Some Notes on Gas Lighting."

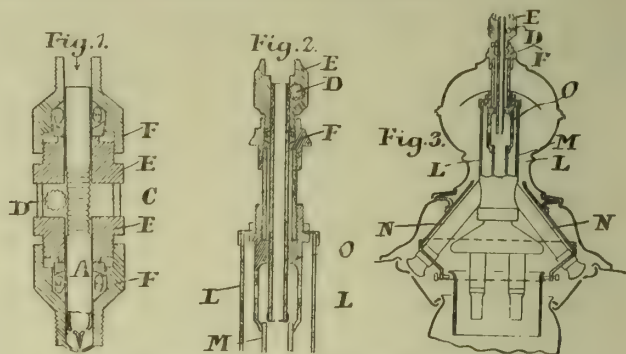
REGISTER OF PATENTS.

Nipples for Incandescent Gas-Burners.

HELPS, G., of Nuneaton.

No. 18,887; Sept. 9, 1908. No. 8650; April 10, 1909.

The complete specification of these "combined inventions" points out that the tube which directly conveys gas from the supply pipe to the burner is provided with a valve and with a screw-thread on the outside and a pinion gearing with the screw-thread, for the purpose of opening or closing the valve. It allows the needle or other device regulating the orifice of a gas-nipple to be actuated from outside the lamp casing, although the nipple itself may be a considerable distance from the power employed to actuate the needle.



Helps' Adjustable Nipple for Incandescent Burners.

Fig. 1 is a section of two stuffing-boxes in conjunction with an adjustable nipple. A is the adjusting needle; B, the nipple; C, a toothed tube or rack; D, the pinion; and E, the gland forming, with F, a stuffing-box. The gas passes down the tube A, which terminates in a needle point which regulates the orifice of the nipple B; the adjustment being obtained by revolving the pinion D.

Fig. 2 shows a long toothed tube containing a nipple working in conjunction with the pinion D. The nipple is attached to the tube and barrel connecting the part F to the air-chamber O. As the tube is actuated by the pinion, the air space between the burner-tube M and the nipple-tube is opened or closed. It is shown closed. L is the air casing.

Fig. 3 shows the burner applied to a complete lamp; but this construction is not claimed under the present application, as it forms the subject of another patent. L is the air casing, M the burner-tube, and N air-tubes supplying the air to the nipple through an air-chamber O.

Manufacturing Gas from Liquid Hydrocarbons.

LAKE, H. H.; a communication from the HYDROCARBON CONVERTER COMPANY, of New York.

No. 23,831; Nov. 10, 1908.

This invention has reference to the producing of unfixed gas from hydrocarbons which are liquid at ordinary temperatures and from heavy oils generally; the object being to produce a gas (particularly suitable for use as fuel in engines and burners) in such a manner that no carbonaceous residue is deposited on the retort within which the formation of the gas is effected.

It has been proposed in the manufacture of coal-tar oils, the patentees point out, to introduce in the form of spray or vapour residual products obtained from the distillation and rectification of petroleum and other mineral oils into retorts containing charcoal, metal, stone, or other material and maintained at such temperature as to avoid the production of a large quantity of permanent illuminating gas. Their improved process consists in passing oil, or the vapour thereof, alone through the pores of a solid plate or through powdered or pulverulent silicious material (such as porcelain, earthenware, burnt clay, brick dust, quartz-sand, or the like) contained in a retort or chamber maintained at a temperature between 300° and 800° Fahr., "whereby an unfixed gas is produced without the deposition of carbonaceous residue."

For carrying out the process, any suitable form of apparatus may be employed; but those described in patent No. 24,109 of 1908 have been found to adequately meet the requirements. The patentees give, for the purpose of clearly understanding the invention, a concise description of four constructions there referred to, and which have been found effective as to the results obtained.

Production of Ammonia.

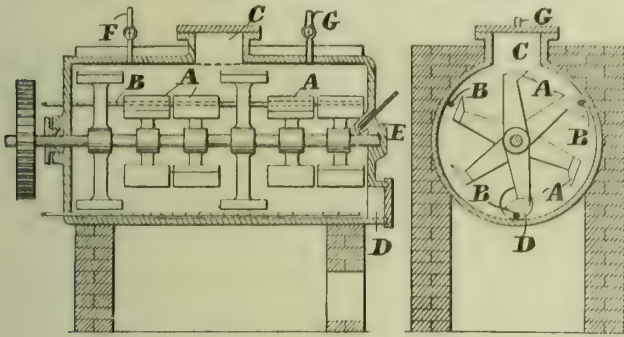
FRERICHS, F. W., of St. Louis, Missouri, U.S.A.

No. 23,889; Nov. 7, 1908.

This invention is directed more particularly to the process in which "saltcake" is added to the ammoniacal liquor; the mixture being then evaporated to dryness and the resulting dry mixture used as a source of ammonia. The object in view is "to obtain ammonia in a purer state and with less expense than is possible by processes now in general use and further to obtain commercial sulphate of ammonia freed from volatile carbon and nitrogenous organic compounds."

To this end the process consists in distilling off the ammonia and volatile ammonia compounds from ammoniacal liquors, combining same with ammonium sulphate or without other acid sulphates to make neutral salts and decomposing the neutral salts by heat into free ammonia gas and pyrosulphates. By this process, as the patentee points out, the volatile carbon compounds and nitrogenous organic

compounds which remain in the ammonia and the commercial sulphate of ammonium obtained by the usual processes are removed. The cheapness with which the process may be carried out is emphasized "since only such amount of lime is required as is necessary to decompose the non-volatile ammonia compounds contained in the ammoniacal liquor, and, theoretically, no sulphuric acid is lost in carrying out the process—only such sulphuric acid being actually lost as escapes in handling and by oxidation; the same sulphuric acid being used over and over."



Frerichs's Ammonia Still.

The apparatus shown comprises a cylindrical retort within which a shaft is journaled through an ordinary packing box or gland and operated by any approved gear. The shaft carries a plurality of agitators A; and pipes B are provided through which air may be forced. For charging the retort an opening C is provided (having any form of closure); and a discharge opening D, with closure, is also provided. Preferably a pocket E is formed in one end of the retort in which a thermometer may rest, and a pipe F, controlled by a valve, is employed for discharging the products of decomposition which are produced at temperatures below 200° C. A pipe G, controlled by a valve, is also employed, from which the ammonia gas may be discharged at temperatures between 200° and 400° C. The retort is set in the furnace heated in any approved manner.

The process is started by heating commercial sulphate of ammonium in a suitable still (preferably provided with an agitating device) to a temperature sufficiently high to volatilize the carbon compounds contained in the salt and to convert the nitrogenous organic compounds into sulphate of ammonium by reacting with the sulphuric acid of the ammonium salt; but care must be taken that, in this period of the process, the temperature is kept below the degree at which considerable quantities of ammonia gas are liberated from the salt. In doing this, the salt may safely be heated to 200° C.; and in order to facilitate the process of purification, an air-blast may be introduced in the still in some suitable manner. When all the nitrogenous organic compounds and all the carbon compounds—which term includes methyl alcohol, ethyl alcohol, isopropyl alcohol, acetone, benzol, toluol, naphthalene, and similar compounds—have been volatilized or destroyed and the products of decomposition have been eliminated, the temperature is increased to such a degree that a material proportion of the salt decomposes according to the following formula:—



This takes place at or about 350° C.; but the process can be hastened without destroying any ammonia by raising the temperature to 400° C., in which case part of the acid sulphate of ammonium is decomposed into pyrosulphate of ammonium and water according to the formula:—



If the temperature is much higher than 400° C., considerable quantities of nitrogen are evolved, which proves a decomposition and consequent loss of ammonia.

The resulting pure ammonia gas can be then worked into such products as may be desired. The acid sulphate of ammonium and pyrosulphate of ammonium resulting from the operation are dissolved in water; and the resulting solution of acid sulphate of ammonium is utilized for absorbing the volatile ammonium compounds and impure ammonia gas coming from crude ammoniacal liquors during their initial distillation—thus completing the circle of operation.

Jointing Pipes, Mains, and Branches.

CHICK, P., of Highworth, Wilts.

No. 4196; Feb. 20, 1909.

This invention relates to pipe joints for gas and water mains and branches, in which the spigot has projecting nibs or lugs passing through notches in an inwardly projecting flange on the socket and engaging behind the flange on the partial rotation of the pipe. The joint is made tight by metal run therein. The invention relates particularly to the means employed for making such joints tight. For this purpose, one or more holes are provided through the collar end of the socket midway between the space occupied by the enlarged flange of the spigot and a groove on the outer surface of the spigot flange, and at a corresponding position on the interior surface of the socket. The grooves may be of semi-circular or other suitable section, such as dove-tailed.

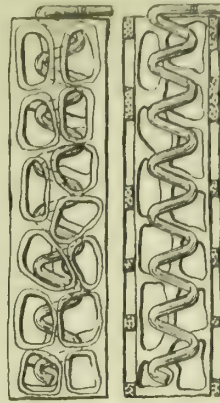
Water Pressure Reducing Apparatus.

BOWER, G., of Ballybrack, and LEARY, W., of Shanganagh, Ireland.

No. 24,142; Nov. 10, 1908.

This invention relates to apparatus for use in connection with the water supply of houses, factories, water-mains, and the like, whereby the pressure of water from the main is automatically reduced when the

taps are not in use. The main pipe is fitted with a full-way cock or valve, the outer extremity of the stem of which is provided with a worm-wheel or lever designed to be more or less opened and closed by the sliding movement of a worm or crank forming the extremity of a sliding rod, which enters a piston casing and is furnished at its extremity with a cup valve. A tubular connection is made between the main pipe and the extremity of the piston casing; and a spring normally retains the sliding-rod and worm or crank operating the worm-wheel or lever of the stop-cock in its rearward or open position. In practice, when the taps are open, the full-way cock or valve is likewise open by the action of the spring; while when the taps are closed, the pressure from the main, transmitted through the connection, takes effect upon the cupped extremities of the sliding rod and more or less closes the full-way cock or valve until a balance of pressure is obtained.



Bradnock's Gas-Fire Fuel.

Fuel for Gas Fires and Stoves.

BRADNOCK, J., of Rosebery Avenue, Clerkenwell, E.C.

No. 24,268; Nov. 12, 1908.

The object of this invention is "to prevent the waste of heat which often occurs owing to the gas-flames passing too directly through the fuel, and thus not having with it the necessary amount of contact with the fuel to make a bright and cheerful fire."

It is proposed to insert into the fuel a steel wire (twisted or otherwise bent, but preferably coiled), against which the flame impinges and by which its direct passage through the fuel is retarded. The flame is thus broken up and caused to heat the sides of the hollow fuel blocks.

The invention is shown applied to a well-known pattern of asbestos-clay fuel.

Anti-Vibration Incandescent Gas-Burner.

OULTON, J., of Bowling, and NEWHOUSE, W. A., of Bradford.

No. 9740; April 24, 1909.

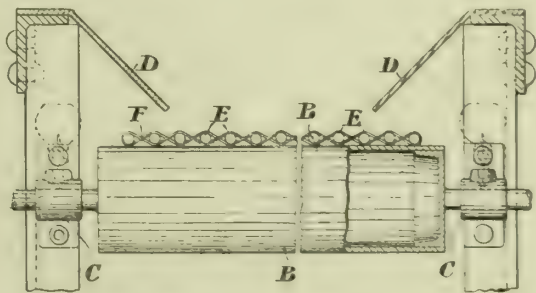
This invention—a patent of addition to No. 6700 of 1909—relates to a modification to permit of the anti-vibratory device therein described being applied to inverted incandescent burners. For this purpose, the end of the bunsen burner containing the gas-orifice is secured or screwed to the gas-bracket in a pending position; and the vibratory portion of the burner separated from, and connected to, the portion containing the gas-orifice by a concentrically arranged spiral spring is screwed into the tube attached to, and supporting, the carrier for holding the inverted mantle in position.

Conveying Incandescent Coke.

WANGEMANN, P., of Berlin.

No. 11,604; May 17, 1909.

A coke-conveyor, according to this invention, consists of a band composed of wire rope having a core of heat-resisting material—such, for instance, as asbestos. It has already been proposed, the patentee states, to employ bands consisting of wire rope, in cases where coke had to be conveyed only a short distance; but in all these cases it has been necessary to quench the incandescent coke during conveyance, as the core of the rope has not been adapted to resist heat. The result has been that "the conveying device has been attacked by the acids taken up by the quenching water from the hot coke, and has, moreover, been injured by the scouring action of the quenching water in combination with the fall of hot ashes." By means of apparatus in accordance with this invention, on the other hand, it is claimed that coke can be conveyed for any distance without any risk to the wire rope, "so that any number of retorts may be served by means of a single conveyor band."



Wangemann's Hot-Coke Conveyor.

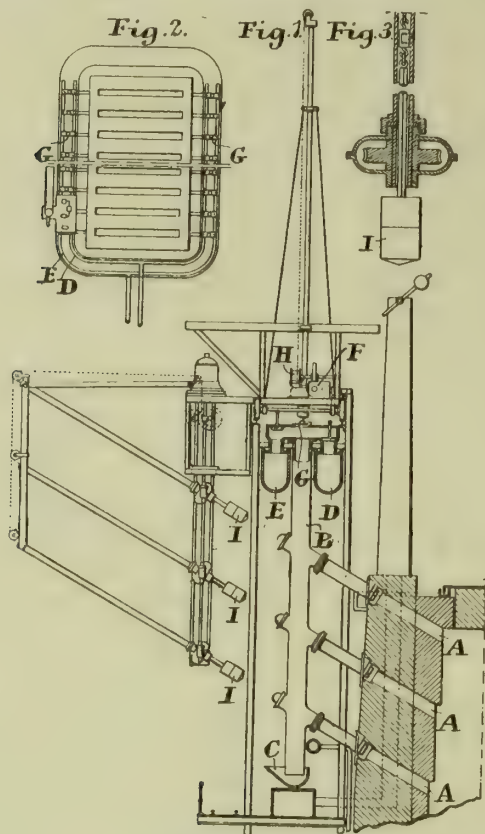
The endless conveyor band, as shown, moves over guide-rollers B laterally mounted at C. A projecting piece of sheet metal D conducts the coke to the middle of the conveyor band, which is composed of a number of wire ropes E, each having a core of (say) asbestos. The separate wire ropes are united by cross-weaving F. In order to carry off from the roller the heat constantly taken up from the conveyor band, the rollers may advantageously be cooled by an internal water-cooling device so arranged as not to moisten the conveyor band. For this purpose, the bearings of the rollers may consist of hollow trunnions for the supply and outflow of the cooling water.

Cleaning Devices for Stand-Pipes.

SCHNIEWIND, F. W. C., of New York.

No. 10,481; May 3, 1909.

The object of this invention is to provide effectively disposed means for cleaning out pipes or conduits—particularly the conduits or pipes through which are passed the volatile products produced by the distillation of coal; in fact, it was particularly designed for cleaning out the vertical stand-pipes and lateral communicating escape vents and connecting pipes for the volatile products of coke-ovens.



Schniewind's Stand-Pipe Cleaner.

Fig. 1 is an elevation (partly in section) of a portion of a large-capacity coke-oven structure equipped with the pipe-cleaning mechanism. Fig. 2 is a diagrammatic plan showing the arrangement of the various escape and connecting pipes of one complete coke-oven structure and the cleaning mechanism therefor. Fig. 3 is a sectional elevation showing the construction and arrangement of one of the cleaning devices and its supporting and driving connections.

The main illustration represents the fire-brick walls of an oven and the removable top wall of one of the retorts, at each end of which are formed a plurality of inclined escape vents or passages for the volatile products of the coking operation. The upper one of these vents leads from the extreme upper end of the retort and the others from lower levels. At the outer ends of the vents A are provided stuffing boxes, into which extend pipes connected at their upper ends by ball and socket joints to the vertical stand-pipe B, for that end of the retort—there being one of these stand-pipes at either end of each retort. The lower end of the stand-pipe dips into a receptacle C, into which the portion of the volatile products which condenses in the stand-pipe may flow. The lateral extension of each main-pipe is preferably sloped so that the condensed material will not tend to obstruct the lateral connection.

The upper end of each stand-pipe is connected to a pair of parallel mains D E; and valves provide for the connection of the upper end of each stand-pipe to one or the other of the mains, as desired. It will be understood, says the patentee, that the mains may be one a "rich" gas main and the other a "poor" gas main; and the valves of each connection are operated accordingly as the gas passing into the connection from the pipe B is "rich" or "poor."

Above the structure is supported a pair of lower track rails running at the side of the battery and an upper rail running above the inner rail; and a carriage having wheels running in contact with the upper and lower rails supports the cleaning mechanism proper—a vertically moving cleaner and three cleaners which move in a direction parallel to the vents A and the inclined pipes.

In operation, when it is desired to clean the stand-pipe B, the carriage is moved into the proper position to bring the cleaner over the pipe, and the motor F is set in operation; the cover G being removed to permit the entrance of the cleaner into the pipe. The motor then rotates the cleaner (which may be in the form of a spiral cutter or other device), while at the same time, through the winding drum H, it controls the descent of the cleaner. The operation of cleaning the pipes and vents A is analogous. The cleaners I are entered through the suitably placed openings in the stand-pipe, and then fed through the pipes and vents to their inner ends.

With the arrangement shown, the cleaners for the lateral pipes and vents, as well as that for the main pipes, tend to move down under the action of gravity; and this is supplemented by the rotary action of the cleaners when of the screw type. It will be observed, the patentee remarks in conclusion, that, with the flexible means controlling the

advancing movement of the cleaners, if any one cleaner is temporarily checked in its forward movement (as by an excessive local accumulation of material in the pipe cleaned by it), such checking will not interfere with the operation of the other cleaners.

Fluid-Meter.

GIBB, A. L. S., of the Punjaub, India.

No. 12,946; June 2, 1909.

This invention has for its object to provide a meter for fluids in which is used as a determinant of quantity the difference in pressure due to the difference in velocity at two different radii of a vortex formed in the fluid. This pressure difference being, of course, a direct function of the mean velocity of the fluid forming the vortex or the part of it used; and being unaffected by the static pressure of the fluid, a given difference indicates at all times a given definite rate of discharge. If, therefore, a stream of fluid be caused to flow as in a vortex or part of a vortex, the pressure difference will indicate the mean velocity of flow of the fluid and, consequently, the volume.

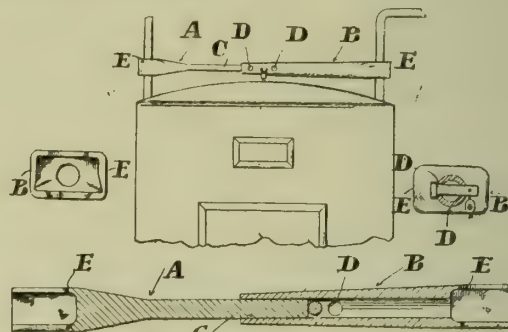
Apparatus made according to the invention therefore comprises essentially a closed chamber so shaped as to induce the formation of a vortex or part of a vortex, and into which, and out of which, the stream—say, from a pipe—is directed, and in which, at such a distance from the point of entry that the vortex may be properly established at the inner and outer circumference of the annulus (and preferably in radial line), are ports for the connection of gauges showing pressure difference, and which may be of any of the known forms used in connection with the "Venturi" meter. In order that the maximum pressure difference may be attained, and the percentage of error consequently reduced to a minimum, the breadth of the chamber radially is preferably made greater than its depth axially; and it is obviously also preferable that its area bear such relation to that of the pipe to which it is connected that the loss of head may be a minimum.

Gas-Meter Pipe Couplings.

MORRIS, H. J., of New Britain, Conn., U.S.A.

No. 16,084; July 9, 1909.

This invention relates to a protective device for gas-meters, and more particularly to devices for locking the coupling nuts connecting the pipes with the meter; the primary object being the provision of a device which will prevent the uncoupling of the meter from the supply pipe so that gas may be obtained without due registration, as well as prevent unauthorized persons tampering with the meter connections without breaking the device.



Morris's Meter-Pipe Coupling.

In order to prevent the tampering with or disconnecting the meter from the supply pipe, there is provided a protective device comprising sections A and B; the latter formed with a hollow stem, into which telescopes the solid stem C of the section A. Contained in the hollow stem portion of the section B are diametrically opposed registering openings D, arranged at intervals to receive a locking pin, against which the inner end of the stem C abuts when the sections have been adjusted to span a predetermined point. The pin is retained in place by a seal, the illicit removal of which would at once be detected.

Each section is provided with a spanner or pocket E, for enclosing the coupling devices for connecting the inlet and outlet pipes to the gas-meter. The opposed inner side faces of the spanner heads are bevelled to accommodate the swollen portions of the pipes at the points where they have connection with the coupling.

Ilkley Gas Undertaking.—Last Wednesday week, members of the Ilkley District Council made an official inspection of the stoking and coal and coke handling machinery which has just been introduced into the gas-works at a cost of £4200. The inspection was followed by afternoon tea, provided by Mr. J. W. Benson, the Chairman of the Gas Committee, who, in the course of a few remarks, said the Ilkley Local Board brought about the purchase of the gas-works in 1893, at a cost of £55,000, and were the first Local Board in England to compel a Gas Company to sell against their will. The Ilkley ratepayers had every reason to be grateful to the men who brought about the purchase, as they had yet to pay their first penny of the cost. And, apart from this valuable consideration, ever since the works were purchased a sum equal to £1000 per year had been transferred from the revenue of the undertaking to the district fund in relief of the rates. With the machinery just installed, they would be able to provide gas for a town three times the size of Ilkley—which, he thought, the most sanguine in regard to Ilkley's development would admit was far enough to go to provide for future contingencies.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Incandescent Gas in the Rare Birds' House at the Zoological Gardens.

An Ounce of Fact is Worth More Than a Ton of "Terminological Inexactitude."

SIR,—Some time last winter, a number of incandescent gas-burners were installed in the rare and delicate birds' house at the Zoological Gardens; and during the summer I visited Regent's Park and questioned the attendant who is in charge of these birds on the subject. The attendant informed me that the reason for introducing the lights into the house was that in the winter time there is so little day light in this country that the birds, previous to the introduction of the gas lights, did not eat sufficient food to "keep body and soul together." But since the fixing of the gas-burners, which are actuated by means of pneumatic switches from the outside of the house in the early hours of the morning and at dusk, there has been a great improvement in the health of the birds, and much less mortality among them.

A few days ago I wrote to Mr. D. Seth-Smith, the Curator of Birds, at the Zoological Gardens; and below I give a copy of his reply to my letter:—

Zoological Gardens, Regent's Park.
Nov. 27, 1909.

Douglas Helps, Esq., A.M.Inst.C.E.

Dear Sir,—I am in receipt of your letter of the 26th inst., in reply to which I may state that we still use incandescent gas-burners in our small birds' house. The light is turned on at 7 a.m.; and the birds commence to feed at once. Again in the evening the gas is lighted for about two hours.

The digestion of some foreign birds is so rapid that they cannot go the whole of a long winter night in England without food; hence the value of the incandescent gas light to us.—Yours faithfully,

D. SETH-SMITH,
Curator of Birds.

Now, the largest birds confined in this house are birds of paradise; and others are of the smallest and most delicate kind of foreign birds which it is possible to keep in captivity. I, therefore, do not think that we could have better testimony than the above to the value of incandescent gas lighting, or a better reply to some of the wild statements of our friends the electricians as to the harmful character of gas lighting.

I have before me a catalogue issued by an electric supply company, which contains, among others, the following statements:—

Gas in burning gives off quantities of sulphuretted hydrogen which vitiate the air. . . . Gas is a baneful product charged with all sorts of lung complaints, poisoning all members both of the animal and vegetable kingdom. . . . It is detrimental to health to sleep directly over a room in which gas has been burning for any length of time. . . . The average gas-burner consumes as much oxygen as four or five human beings.

With regard to the latter statement, we know, at least, of one electrical undertaking which was compelled to withdraw it, and what would the gas examiners and the medical officers in our several towns say if the gas we distribute gave off quantities of sulphuretted hydrogen? We know that if one-hundredth of 1 per cent. of this gas were present in our gas, it would be detected by the statutory test prescribed in our Acts of Parliament.

Reading Gas Company, Dec. 2, 1909.

D. H. HELPS,
Engineer and Manager.

The Strike at Genoa.

SIR,—In your article on the strike at Genoa, you quote from an Italian newspaper as to a street incident in which Mr. Morton was mobbed. The form your translation takes is misleading, and liable to give quite a wrong impression of what actually took place.

Mr. Morton was not "chased." A more literal translation renders the passage ". . . they surrounded and followed him throughout the length of the Carlo Felice, pursuing him with hisses, cries, and insulting words, until he reached the front of the Hotel de Gènes." The word "chased" gives the impression that my brother ran, which, of course, is absurd. In a letter to me, he says: "I walked all the way from the Municipio to the Hotel de Gènes with the howling mob at my heels; two little *guardie* on either side begging me to go down a side street or get into a carriage. . . . Another hundred yards might have been awkward, as it came to bricks just before I got to the hotel; and if I had lost my temper there would have been something to pay in the crowd."

27, Hamilton Terrace, N.W., Dec. 1, 1909. A. ANDERSON MORTON.

Christmas Presents and Bribery.

SIR,—Although the Prevention of Corruption Act has now been in force since Jan. 1, 1907, and there have been twenty convictions in various parts of the United Kingdom, there still appears to be some uncertainty as to the legality of Christmas boxes. The late Attorney-General, it may be recalled, stated that "Christmas boxes, which really have that character, and are openly and honestly given as such, cannot be within the Act." The question what Christmas boxes are honestly and what corruptly given was not touched by Sir J. Lawson Walton.

Sir Edward Fry (who is the President of the Secret Commissions and Bribery Prevention League) has given his opinion that there is "no doubt that most Christmas boxes given by tradesmen to servants are given as inducements to show favour to the tradesmen. So plainly is this thought to be the case that those tradesmen who hesitate to make these presents are wont to declare that, unless they break the law, they will lose their custom; and thus they complain of the painful dilemma between honesty and gain. It is equally clear to me that a gift made as an inducement to a servant to show favour to a person

dealing with his master, and made without the master's assent, is corruptly given. The very essence of the servant's duty is to serve his master without favour or disfavour to any third person; and therefore the gift tends to lead the servant astray, and so corrupt him. It follows that the only safe course for those who wish to make Christmas gifts to servants is to do so with the express consent of the master, if such consent can be obtained; and if it be not obtained, then to abstain from making the gift. Some dealers, acting upon this view, have issued circulars to the servants of their customers, pointing out the danger of continuing the habit of giving Christmas boxes, and inviting the servants to procure their masters' signature to an enclosed form assenting to the payment of the gift. Whenever a master assents to the receipt of a present by his servant, it is obvious the payment and receipt are not corrupt, and not therefore within the meaning of the Act."

It was suggested by Sir Edward Fry that those masters who are willing to allow their servants to receive Christmas boxes should confine their consent to gifts of a fixed and limited amount, and that they should consent not generally, but only from year to year.

The Committee of the League would be glad if you could find space to reprint the above authoritative statement in the public interest, as, active though the League may be, and growing in importance as it undoubtedly is, it cannot reach the great masses of the public without the co-operation of the Press.

THE SECRETARY, SECRET COMMISSIONS AND BRIBERY
PREVENTION LEAGUE,
3, Oxford Court, Cannon Street, Nov. 30, 1909.

LEGAL INTELLIGENCE.

ALLEGED DAMAGE THROUGH A TAR-PAINTED ROAD.

ASHFORD COUNTY COURT.—Monday, Nov. 29.

(Before His Honour Judge SHORTT.)

Ellen v. Kent County Council.

This case, it may be remembered, came before his Honour on the 1st ult., and was adjourned on account of his illness (see *ante*, p. 414). It was a claim by Messrs. G. Ellen and Sons, farmers, of Charing, for £26 16s. 6d. damages sustained by the death of a cow, alleged to have been poisoned by tar from a main road under the defendants' control washing into a stream from which plaintiffs' cows drank. The case aroused considerable interest, as it was believed to be the first of the kind which had arisen in the United Kingdom.

Mr. STUART BEVAN (instructed by Messrs. Kingsford, Drake, and Coke, of Ashford) appeared for the plaintiffs; Mr. H. J. BRACHER, solicitor, of Maidstone, represented the defendants.

At the previous hearing, evidence was given that the main road opposite the plaintiffs' farm had been tar-painted in May last, and that a few days afterwards a thunderstorm occurred, causing some of the tar to be washed into the ditch. One of the cows died the following day; and Mr. Gillard, a veterinary surgeon of Ashford, as the result of a post-mortem examination, attributed the death to poisoning by coal tar. Mr. Lander, who had made an analytical examination of the viscera of the cow, also expressed the opinion that death was due to the cause named. The defendants suggested the possibility of the poisoning being due to the creosoting plant on the farm or to the creosote in the spikes of the stile fence in the ditch; and evidence was now brought forward on behalf of the plaintiffs that this was improbable, as apple trees and grass flourished between the creosoting plant and the ditch, and that the creosote around the stile points had been thoroughly dried before being put into the ground.

Mr. H. P. Maybury, Surveyor to the Kent County Council, stated that the tar was put on to the main road by machine, and would have been so hard on the surface that rain or even heavy traffic would have had no effect. Ridiculing the allegation that the cow was poisoned by the water washing off the tarred road, witness quoted an instance where, two miles from Ashford, a stream from which cattle had been drinking throughout the summer was solely and directly fed by water from the surface of the tarred road. In the course of his evidence, witness gave particulars as to the wide use of tar on roads—over 500 out of a total of 800 (odd) miles of main road in Kent having been tarred this year, and nearly all the main roads of Surrey.

In answer to his HONOUR, witness stated that tar-painting was the finishing, but necessary, touch in the repair of the main road, and that such treatment was essential for efficiency and economy, in view of the present high-speed traffic.

Mr. W. J. A. Butterfield, F.I.C., said he had had much experience with the bye-products of gas manufacture, including tar and creosote; and he disagreed with the contention that a cow could have been poisoned by drinking water that had been washed off a tarred road. He explained that ordinary gas tar consisted of 70 per cent. of pitch, which was an absolutely innocuous material and insoluble in water. Asked by his Honour—in regard to this statement—if it would be injurious in drinking water, witness replied in the negative; adding that years ago pitch was used for coating barrels of drinking water for storage on board ship. The remaining 30 per cent. of the tar consisted of tar oils and ammoniacal liquor. The amount of the latter depended on the efficiency of the separation at the gas-works. On an average, there was about 8 per cent. of liquor and about 22 per cent. of tar oils, which consisted of neutral oils containing a certain amount of tar acids or phenols; the best known being carbolic acid. He should say that about 3 per cent. of average coal tar might be tar acids. All the phenols that were readily extractable by water would be taken out at the gas-works in the process of condensation. Therefore there was not much possibility of the tar acids being extracted from the superficial tar surface on the road. Questioned as to the poisonous effect of creosote, witness said that creosote oil was the proportion of tar oils

containing the maximum amount of phenols or tar acids. These would be obtained by distillation. He had analyzed the water sent to him by the County Surveyor, which was a sample taken from the ditch supplied by the surface water of the tarred road; and he was unable to find any sulpho or ferro cyanide, but only a tiny and negligible quantity of arsenic—about one part in a million. There were no other mineral constituents of a poisonous nature; no phenols or tar acids. Witness detailed the analysis he had made of a quantity of tar from the Rams-gate Gas-Works, similar to that used in tar-painting the road in question, and he found 6 per cent. of ammoniacal liquor (less than the average), which was equivalent to half-a-grain of ammonium sulpho-cyanide to a gallon of tar. Assuming all the rain water flowed off the tarred road into the ditch in question, he made the computation that there were 40 gallons of water to every gallon of tar. Making an experiment on this basis, he ascertained that the water, after vigorous agitation with the tar, was a comparatively innocuous fluid. There would be nothing like such vigorous agitation in rain water flowing off a tarred road. If the washings from the road contained any appreciable amount of sulpho-cyanide or tar acids, the grass on the side of the road would be killed; but in the case in question, it was remarkably healthy. He was also of the opinion that a cow could drink a considerable quantity of the water without harm. Detailing the constituents of creosote, witness said creosote oil contained about 9 per cent. of phenols or tar acids, and the water floating above it something like 2 per cent. Coal tar creosote had the whole of the tar acids originally present in the tar in such a concentrated state, and the phenols were in such light combination, that it was more injurious than the tar itself. Respecting the statement made at the previous hearing that the cow ate lumps of tar, witness said this was improbable and inconceivable, as the tar which was applied to the road was a heavy viscous tar, and it would adhere to the cow's nostrils and to the inside of the stomach. In answer to the veterinary surgeon's statement that there were corrosive marks on the skin of the cow, witness said these would be caused by creosote and not by tar. He had made the experiment by placing portions of tar, creosote, and the creosote water on separate places on his arm, and found that tar could be removed without leaving a mark or having caused any sensation, whereas creosote caused much smarting, and made a corrosive mark; the effect of the creosote water being less severe. Witness gave the result of his experiment to show how tar and creosote would be acted upon by the gastric acids of the stomach; saying that he stirred the tar and creosote in a mixture of dilute hydrochloric acid and pepsine, maintaining a high temperature, and he ascertained that the tar kept its viscous state, whereas the creosote became limpid and more like a dark brown fluid similar to that which the veterinary surgeon said he had found in the cow's stomach. In conclusion, witness expressed the opinion that it would be impossible to poison a cow by water washed from a tarred road, and that the cow must have consumed several gallons of the tar itself to have obtained the fatal amount of cresol found by Dr. Lander in the stomach.

Cross-examined by Mr. BEVAN, witness said his experiment with the artificial gastric juice was a fair test. He kept up a temperature of 102° Fahr.; and, though he had not reckoned the alkaline effects of the intestinal juices or of saliva, he was of opinion that the tar had had a thorough alkaline treatment at the gas-works. He thought that stirring would have the same effect as mastication. Asked whether the acids in the tar would not have the same poisonous effect as creosote, witness said they would be partially neutralized by the oils, &c., which were in greater quantity than in creosote.

His HONOUR reserved his decision until the next Court; saying that the question was too important to decide without careful consideration. He consented to grant either side the right to appeal when the decision had been given.

CUTTING OFF GAS—QUESTION OF DISCOUNT.

At the Liverpool Assizes, Mr. Peter M'Guffie, of the Woolton Hall Hydropathic Establishment, brought an action to recover £5000 as damages from the Woolton Gas Company for wrongfully cutting off his supply of gas.

Mr. Horridge, K.C., M.P., in opening the case, explained that the Company allowed discount on their accounts when they were paid within the first month after the completion of the quarter to which they related. There was a notice appended to the accounts to this effect. When plaintiff took up his residence at Woolton Hall in 1897, he found that, as the accounts were rendered after the expiration of the first month following the quarter for which the account was due, he was never able to secure his discount. He subsequently made an arrangement with the Company by which he was to receive discount if he paid on the first call of the collector after the account was sent in. This had been the regular practice for several years, though difficulties had occasionally arisen in securing the attendance of the collector, and the plaintiff had to send to the Company's office to get the matter attended to. The accounts, which ought to have been rendered in January, 1908, were not received until February. When the collector called in March, plaintiff paid £33 odd on his lighting account, discount being allowed; but as the cooking and heating account could not at the time be found, the collector said that he would call again. Some days later the collector called, and when offered payment of the accounts, refused to allow the discount on them. Thus the matter remained in dispute until November, when the Company wrote threatening to discontinue the gas supply, and to institute proceedings unless the arrears were paid. Plaintiff replied: "If you carry out your threat to interfere with my gas supply, you will have to answer for damages for more than your gas plant is worth." Defendants, however, cut off the supply; and Mr. M'Guffie was put to considerable expense in providing temporary lamps and in the subsequent installation of electric light. His Lordship (Mr. Justice Bray) asked whether plaintiff had not thought it advisable to pay under protest, and then to take proceedings to recover the money. Mr. Horridge said he had considered that, but thought it was unreasonable to expect him to pay a demand which was wrong, and then incur the expense of recovering in the Courts. Plaintiff, in his evidence, said the result of cutting off

the gas when there were a number of guests in the place, was that the business had been completely destroyed. In cross-examination by Mr. Sanderson, K.C., on behalf of the Company (who pleaded that they were justified in the action they took), plaintiff said it was through no fault of his if the accounts were constantly in arrear. The money was always ready for the collector. It was true that he was summoned in January last for his rates in advance, when, in consequence of the worry over the cutting off of the gas supply, he was trying to make arrangements to get rid of the hydro.

At the conclusion of Mr. M'Guffie's evidence, Counsel and his Lordship held a consultation; and on returning into Court, his Lordship, addressing the jury, said they would not be further required in the case. A settlement had been arrived at between the parties, the terms of which need not be stated.

ALLEGED WRONGFUL APPROPRIATION OF WATER.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, Nov. 23.

(Before Mr. Justice PARKER.)

Borough of Portsmouth Water-Works Company v. London, Brighton and South Coast Railway Company.

This was an action brought by the plaintiffs to prevent defendants from taking water from a spring, termed the "Railway" spring, yielding 600,000 gallons a day, on their land at Bedhampton, near Portsmouth; and the proceedings down to the end of the plaintiffs' case were reported last week, pp. 626-28.

Mr. BUCKMASTER, K.C., and Mr. TOMLIN (instructed by Messrs. Bramsdon and Childs, of Portsmouth) appeared for the plaintiffs; and Sir ALFRED CRIPPS, K.C., Mr. YOUNGER, K.C., and Mr. PRIOR (instructed by Mr. P. V. Rose) represented the defendants.

The Defendants' Case.

Sir ALFRED CRIPPS said it would be convenient, before calling his evidence, to indicate the view he should present. Accepting for the moment the evidence which had been given as to the existence of the spring in question, he should not dispute that it came within the category of a running spring, so as to give a lower riparian owner a right *jure nature* to the flow of water to which he had been accustomed. But one question, as to which there might be a good deal to be said, was whether this millpond was a natural or an artificial stream. It might have been originally natural, and the effect of what had been done to it might be to alter its character. He should next have to go through the various documents to show that any rights which were originally vested in the plaintiffs or their predecessors had long ago been released or waived as between themselves and the Railway Company. The first document was the conveyance to that Company in 1898; and he admitted that there was a good deal to be said for the plaintiffs' view. But, on the other hand, if the spring was a mere small and insignificant one, which could be covered, as one of the witnesses described, by a 3-gallon measure, a different conclusion might be drawn. He thought it would be shown that the spring had altered very materially in recent years. After dealing in some detail with the deed of 1848, Counsel said he might pass on to the years 1896-8, when the Bidbury springs were enclosed; and he remarked that it was curious that the Railway spring was not enclosed at the same time, if it had the importance now suggested. He submitted that the enclosure of the Bidbury springs, and the sinking of the borehole, must have tended to affect the Railway spring. His evidence would be to this effect.

Mr. BUCKMASTER remarked that no such suggestion was made in the pleadings, or the evidence would have been directed to that point.

Sir ALFRED CRIPPS said he should not object to any further evidence being called, if necessary. Next came the agreement of 1901, which he submitted showed that the water coming from this spring was not considered of importance by the plaintiffs, and was given up or released in exchange for the right to carry their main under the railway line. It was inconceivable that if there had really been in existence at that time a spring giving half-a-million gallons daily, no mention should have been made of it. The letters written by Mr. Ashley in 1903 were quite consistent with this view, and also the letter of Mr. Wilkinson, the Secretary, in 1905.

The reference to these letters, and the circumstances under which they were written, led to some discussion as to the question really at issue in the action, as defined by the pleadings. In the result,

Sir ALFRED CRIPPS suggested that the two Companies might very fairly have divided the water between them; but matters had now come to such a pass that it was necessary that their respective rights should be decided.

Witnesses were then called for the defendants.

Mr. C. L. Morgan, M.Inst.C.E., the Chief Engineer to the Railway Company, produced various plans. He said he had been well acquainted with the site in question since 1896, but did not notice the site of the Railway spring until 1898, when the Bidbury springs were enclosed. The upper part of the millpond then became practically dry; and, so far as he remembered, there was no appreciable quantity of water rising there. When the 36-inch main was laid, his Assistant, Mr. Lopes, had charge of that part of the line. In his view, the laying of that main led to the water from above the railway coming through into the millpond. There was water all about there ready to burst out. The Bidbury springs being above the Railway spring, drawing from them would tend to rob it. Witness pointed out on the photograph where the camp-sheeting stood before the pond was filled up. It was part of the wing wall of the bridge; and it was about 8 feet from the centre of the cylinder. He never saw any flow of water, through the camp-sheeting or otherwise, until the 1902 agreement was being considered. It was then a wet place, with the water more or less quiescent; but now it was a stream which they could not muzzle, running about 700,000 gallons per day. He was quite sure that in

1902 no one had any idea of the enormous quantity of water to be obtained there. The Railway Company's relations with the Water Company had always been very friendly; and they had rendered every possible assistance in preserving the water from contamination. The Water Company's siding on the embankment was constructed in 1902-3. The Railway Company's land was filled in, and the bridge removed, in the early part of 1903; the camp-sheeting being left as it was. In September, 1902, when negotiating the agreement of that date, the question of the right to this water was first mooted. He gave evidence on the Bill of 1906, and the plaintiff Company did not get the powers they asked. Witness described in detail the plans and sections he had put in, one of which showed the subway. He saw originally that there was no clay puddle round the pipe. In his view, the clay was put in to prevent water following the line of the pipe in the subway. By the deposited plans for the Act of 1845, the Railway Company could have put their line right over the site of the spring in question. He was quite satisfied that the quantity of water now coming from the spring was far larger than in previous years.

Cross-examined: From 1896 to 1902 he had no occasion to visit this spot in connection with water. He first saw the bed of the pond dry some time after 1898; but he could not fix the date. In 1902, the agreement was negotiated for the purpose of enabling the Water Company to enclose the water at this spot—to exclude the surface water and utilize the spring water. His idea was that the water then there was small in quantity—nothing like a stream. He thought there was a spring there before the Bidbury springs were dealt with, and that it had dwindled away, and was restored when the 36-inch main was laid. The boring at Bidbury would have a considerable effect. If the upper mill was worked in 1901, it would be by the overflow from the Wyatts and the Bidbury springs. His view was that the cutting of the subway brought up subterranean water, which ran through and came out at the Railway spring. If water were found in cutting the subway, it would not necessarily require to be pumped; it might run away of itself.

Wednesday, Nov. 24.

In further cross-examination, Mr. Morgan said he furnished information for the purpose of the statement of defence, but he could not be responsible for the form in which it was put. In his opinion, if the cylinder were removed, and the previous conditions restored as far as possible, the flow of water would still continue, because it had been led there, and cleared the faults or fissures through which the water came to the cylinder. He still adhered to the evidence he gave before the House of Lords Committee in 1900, which was founded on the view that the surrounding soil was soft, and somewhat of the nature of a quagmire. There was no physical boundary to the Railway Company's property across the old millpond before it was filled in. The witness was cross-examined at some length as to how any relief of pressure by the cutting of the subway under the railway could have increased the flow of water at the Railway spring; and it appeared to be his view that such increase was due to what had become surface water by rising in, or close to, the subway. He did not consider it a good plan to put clay round a steel pipe to preserve it; he should prefer to paint it.

Re-examined: His view had always been the same as he had now expressed it. Any relief of pressure above the Railway spring—as, for instance, at Bidbury—would tend to reduce the flow below. He repeated in summary the evidence he had given in chief.

Mr. Frank Morris, Permanent Way Inspector at Bedhampton, said he had occupied this position for sixteen years, and knew the *locus in quo* thoroughly. After the Bidbury springs were enclosed and piped, the pond under the bridge became dry, including the site of the Railway spring. In 1901, the 36-inch main was brought under the railway; and he remembered getting a message from the Contractors' agent in July or August, and went to the place. Where the men were at work on the south side of the line, he saw water in the trench at a point just at the junction with the southern rail. He saw and spoke to Mr. Pettit with reference to the water; and Mr. Pettit said they had struck a valuable spring, and he had better inform the Railway Company. Witness thanked him, and said he would do so. There were 3 or 4 inches of water spread over the bottom of the trench, in which it was coming up. He reported the matter to the Chief Inspector, Mr. Burt, who came down next day. As the work went on, the water increased.

Cross-examined: As the trench became deeper, it was more filled with water. That which he saw in the trench was flowing away down towards the pond. Mr. Pettit called his attention to the water; and having reported the matter to his Chief, he had nothing more to do with it. He (witness) first drew attention to the water, as it was more than he had seen there before.

Mr. William Burt, Chief Permanent Way Inspector of this portion of the line from 1892 to 1902, said when he first knew the place the water was standing under the railway bridge; but after the Bidbury springs were enclosed, the ground became dry on the site of the Railway spring. He heard from the last witness of the water being found in the excavation, and went down to see it. It was coming through the paling boards and from the bottom of the trench. It was nearly under the 6 feet rail of the down road, and came in about 6 or 7 feet below the surface of the lines.

Cross-examined: Where he saw the water was some distance from the camp-sheeting. He never saw the Railway spring until it was enclosed. When the water was drawn off, before 1898, he walked under the bridge, to see that it was all right.

Mr. George Lopes, formerly Assistant-Engineer on the portion of the defendants' line in question, said he remembered the Bidbury springs being enclosed, and the pipes being laid under the railway bridge. The southern side of the line then dried up, and there was no water of any consequence there. In 1901, he visited the site of the subway, as the result of a report from Mr. Burt. There was a good stream of water there; but he could not estimate the quantity. In 1902 he went there again, to meet some gentlemen from the Water Company, when there was a scheme for enclosing the spring. The ground had then become wet and swampy from this water coming from the subway.

Charles Wheeler, an assistant-ganger, said that after the pipes were laid from the Bidbury springs, the pond under the railway bridge

became dry, and as far as the bank the Water Company were going to put in. He remembered the 36-inch main being laid, and water being found in the trench. It was dirty water coming from the bottom. They dug a channel for it to run off, and used a hand-pump almost every day.

George Shepherd, a ganger for a good many years on this section of the line, also stated that after the Bidbury springs were enclosed the upper part of the pond under the bridge, and near to it, became dry. He corroborated the previous witness as to the water coming into the excavation for the 36-inch main. He said he had never seen the Railway spring until the cylinder was put down.

This concluded the evidence for the defendants.

Mr. BUCKMASTER asked leave to call further evidence as to the condition of the upper part of the millpond after 1898.

His Lordship allowed this, in spite of an objection by Mr. Younger.

Mr. William Bailey was then recalled. He said he knew the Upper Mill and dam well. It was a breast wheel; and if the wheel were working, the level of the pond could not be more than 6 inches below the level of the dam. The mill was worked, to the best of his recollection, between 1898 and 1901.

Cross-examined: The weir had always been the same height. He would not swear absolutely that the mill worked between 1898 and 1901. When the pond was full, there would be about 4 feet of water above the Railway spring, and he should estimate 2 feet at the camp-sheeting.

After some discussion on this point,

Mr. YOUNGER summed up the case for the defendants; reading passages from the evidence on each side, and contending that the plaintiffs' witnesses must have been mistaken in their recollection of what had been observed. He also submitted that the millpond was an artificial, rather than a natural, stream, and that but for the reservation in the conveyance of 1848 the plaintiffs would have had no rights at all to this water. He thought the issues depended mainly on the construction put on the deed of 1848 and the agreement of 1901.

Thursday, Nov. 25.

Mr. YOUNGER continued his address this morning; dealing in more detail with the conveyance of 1848, and pointing out that this portion of the railway was then already open for traffic. He argued that any rights the plaintiffs' predecessors might have had to the water in the stream were in the nature of an easement, and not a *jus naturalis*, and as such, could be, and were, released by the deed of 1848. Finally, assuming he was wrong on all other points, he submitted that the plaintiffs were only entitled to such a quantity of water from this spring as flowed from it in 1902; and what that quantity was, it was now impossible to determine.

Justice PARKER suggested that, on this view, it might turn out that neither party was entitled to touch the spring, for fear of interfering with the rights of the other.

Mr. YOUNGER said it might be, on the other hand, that they were entitled to use it in common. He submitted that this was the true view of the case, and that the plaintiffs had failed to make out their claim to the whole of the water now rising in the cylinder.

Sir ALFRED CRIPPS asked leave to call his Lordship's attention to the case of Holywell, in Flintshire (2 Ch., 1889). He suggested that the Railway Company were entitled to use for their own purposes any water from the spring, so long as they allowed as much to flow down as formerly.

Mr. BUCKMASTER, in reply, said the defendants had from the first asserted their right to take and use the whole of the water, and denied the plaintiffs' right to it. It was this that led to the action. Their view evidently was that there never had been a spring at the spot in question before 1902; but this was absolutely inconsistent with the large body of evidence given on behalf of the plaintiffs. This he proceeded to summarize by references to the notes, which showed how the defendants had changed front during the progress of the case, and practically abandoned their own pleadings. He submitted that it was a case of fact on one side and hypothesis on the other. He dealt with the deed of 1848, and the agreement of 1901, which he suggested could not have been intended to release any rights possessed by the plaintiffs, as his friend contended, and did not, in fact, do so. With regard to the suggestion made, that there was more water flowing now than formerly, he pointed out that nothing of the sort was pleaded, and it ought to have been. It had not been put in issue. At any rate, the onus of proof was on the defendants; and they had not discharged it.

Judgment was reserved.

Responsibility for Money in Prepayment Gas-Meters.

At the Bromley Petty Sessions last Tuesday, the Bromley and Crays Gas Company brought a claim against R. Dellaboy, of Oakley Road, Bromley Common, for £1 os. 10d. for gas consumed through a prepayment meter. It was stated that the defendant wrote to the Company on a Friday that he was going to give up possession of the premises at midday on the following Monday; and he asked them to send their collector to remove the money from the meter. The Company, it was alleged, sent the collector on the day named after twelve at noon. In the meantime, the house, which had been left untenanted from the previous Saturday night, had been broken into and the money taken from the meter. The defendant denied liability; but the Bench held that he was liable in view of the fact that he had failed in the usual contract to the effect that he was responsible for the money for the gas consumed until it was collected by the Company.

Dinnington and District Gas Company.—Notice appeared in the "London Gazette" last Tuesday of the intention of the Dinnington and District Gas Company, Limited, to apply to the Board of Trade for a Provisional Order to authorize them to maintain and continue their works, and supply gas in Dinnington and other parishes or townships in the West Riding of York.

MISCELLANEOUS NEWS.

READING AND THE JOINT STANDARD BURNER BILL.

Committee Suggest the Inclusion of other Clauses.

The Reading Town Council, at their monthly meeting last Thursday, adopted without discussion the following report of the Finance and General Purposes Committee on the subject of the Gas Companies (Standard Burner) Bill.

The Town Clerk submitted a letter from the Secretary of the Reading Gas Company, stating that the Company had decided to join with other owners of gas undertakings in the promotion of a Bill, to be known as the "Gas Companies (Standard Burner) Bill," for substituting the "Metropolitan" argand No. 2 burner for the burner at present prescribed for the purpose of testing for illuminating power under the Gas-Works Clauses Act, 1871. He reported that he had conferred with the Gas Examiner for the Borough (Dr. Ashby) on the subject. The Gas Examiner submitted a report with reference thereto, in which he said:

The proposed new standard burner has the power of making gas burned in it appear to give more lighting power to the extent of about 1·8, or nearly 2, candles than it would have in the present standard burner. Hence a gas of not much more illuminating power than 12 candles could be supplied which would appear to reach the present limit of 14 candles. Even if the price of gas were reduced in consequence of the adoption of the new burner, the public would not reap the full benefit of the reduction, because, as had been clearly shown by Mr. Dibdin, when gas of a lower illuminating power is burned in a flat-flame burner a greater quantity of it has to be used in order to obtain the illumination given by a richer gas than corresponds to the reduction of the lighting quality of the gas. That is to say, if the illuminating power of a gas is reduced by one-eighth, an extra quantity (considerably more than one-eighth of the poorer gas) must be consumed to obtain the same amount of light as was given by the higher quality gas. In other words, the illuminating value of the poorer gas is much less than its illuminating power. Now that burners with incandescent mantles can be used for lighting, the intrinsic illuminating power of gas may perhaps be considered to be of not so much importance as when flat-flame burners were almost universally used; but it must be borne in mind that there is no power to compel everybody to use incandescent burners, and that they are not suited for every purpose or position, so that the lighting quality of gas is still of much importance to many persons. But if the illuminating power of gas has become of somewhat less importance than it has been hitherto, it is nevertheless a fact that the question of its heating power has become of much greater importance: First, because the quality of the light given by incandescent mantles is largely dependent upon it; secondly, because gas is now so largely employed for power production by means of gas-engines; and thirdly, because it is now so widely used for heating and cooking purposes. If, therefore, the direct illuminating power of gas is to be lowered, I am of opinion that a standard of calorific power should be fixed for it by Act of Parliament, as has been done by section 39 (1) of the Gaslight and Coke Company's Act, 1909, which fixes the standard calorific power of the gas supplied by that Company at 125 calories net per cubic foot. This is a matter of even greater importance when a mixture of coal and water gas, without any limit as to the proportion of the latter, is supplied, as is done by the Reading Gas Company, seeing that the calorific power of water gas is considerably lower than that of coal gas having good illuminating power. The times for making official tests of the illuminating power of gas are fixed by section 28 of the Gas-Works Clauses Act, 1871, which is incorporated in the Reading Gas Acts, at 5 to 10 p.m. from the first day of October to the thirty-first day of March, and from 8 to 11 p.m. from the first day of April to the thirtieth day of September. These times would be almost useless for testing the calorific power of gas, inasmuch as they would exclude nearly the whole of the time when gas is generally used for power production, and a great portion of the time when it is employed for heating and cooking purposes. Therefore any proposed Bill should provide for the official testing of, at any rate, the calorific power of gas during the whole of the period when it is usually made use of for the above-named purposes. The Evans closed 100-inch photometer is the apparatus prescribed for testing the illuminating power of gas in Reading. This is an obsolete form of photometer which generally tells in favour of the gas. So if the proposed new standard burner were used in it, the result would generally be doubly against the interest of the users of the gas. If the "Metropolitan" argand burner No. 2 is to be the prescribed standard burner, it must be used only with a suitable photometer, and not with an unreliable apparatus like the Evans closed photometer. I am of opinion that the Bill in question ought to be opposed unless the Town Council can obtain from the Reading Gas Company concessions. I recommend that the Town Council should communicate with the Councils of all other places affected by the proposed Bill, with a view to their all acting in concert in securing these proposed concessions.

The Committee resolved to instruct the Town Clerk to communicate with the Secretary of the Reading Gas Company inquiring whether the Company will be prepared to agree to the insertion in the Bill to which their letter now submitted relates of clauses (a) prescribing a standard calorific power, (b) prescribing a method and apparatus for testing the illuminating and calorific power, and (c) extending the times for making the official tests, in accordance with the several recommendations in that behalf contained in the report of the Borough Gas Examiner now submitted.

The Special Purposes Committee of the Plymouth Town Council had before them on Thursday last a letter from Mr. H. B. Heath, the

Secretary of the Plymouth and Stonehouse Gas Company, informing the Council of the Company's application to Parliament, in conjunction with other gas undertakings, for authority to adopt the standard burner recommended by the Departmental Committee appointed to inquire into the testing of gas as the prescribed burner for testing for illuminating power. The Committee adjourned consideration of the matter till a copy of the Bill was before them.

THE EXPLOSION IN GRANGE ROAD, BERMONDSEY.

Metropolitan Water Board Share Damages.

At the Meeting of the Metropolitan Water Board last Friday, the Law and Parliamentary Committee presented a report on the subject of the liability for the damage caused by the explosion in Grange Road, Bermondsey, on the 30th of December last year, which caused the death of two children, and considerable damage to the surface of the road. It will doubtless be remembered that at the inquest held upon the victims the jury were unanimously of opinion that the deaths were caused by explosions due to the ignition of coal gas and air which had collected in a disused sewer, the gas having been ignited by the use of a lighted tarred rope by the employees of the South Metropolitan Gas Company; that the escape of gas was due to the fracture of a rider pipe connecting the parallel gas-mains in the road, which rider had become fractured by the washing away of the soil consequent upon an escape of water from a 4-inch spur attached to one of the Board's mains; that this spur became broken owing to the fact of its being partly fixed in the brickwork of the shaft leading to a new sewer put down by the London County Council, who were, in the opinion of the jury, responsible for the inclusion of the spur in the brickwork; and, finally, that the deaths were due to the negligence and want of reasonable precaution and care on the part of the Council, the Board, and the Gas Company, who should be held jointly liable. As a result of these findings, a writ was issued by the Bermondsey Borough Council, who are liable for the repair and maintenance of the road in question, against the three bodies named; and 36 claims were also lodged against the Water Board, either individually or jointly with the Council and the Gas Company, by the owners and occupiers of premises in the road, claiming damages against the Board in respect of injuries alleged to have been sustained by them in consequence of the explosion.

The Committee reported that they had fully considered the whole matter, and the Board's advisers had conferred with representatives of the County Council and the Gas Company thereon; the result being that the Company had proposed a settlement of the present claims on the following terms: The Board to pay one-eighth of the total amount at which the claims may be settled, such proportion not to exceed £1000, and to be indemnified by the Council and the Company against all claims in respect of the accident. The Committee expressed the opinion that, while denying all liability in the matter, the Board would be well advised to effect a settlement on the terms stated, especially having regard to the fact that both plaintiffs and defendants include representatives of the ratepayers. They therefore forwarded the necessary estimate to the Finance Committee, who submitted it as chargeable to the revenue account, and recommended its approval.

At to-day's Meeting of the London County Council the Main Drainage Committee deal with the matter in the course of their report, as follows.

On the 30th of December, 1908, a gas explosion occurred in Grange Road, Bermondsey, as a result of which two children lost their lives, other persons were injured, the roadway and tramway track were partially destroyed, and some damage was done to the roadway, adjoining buildings, and the gas and water mains. Several actions for damage or personal injury against the Council, the Metropolitan Water Board, and the South Metropolitan Gas Company have been commenced—including one by the Bermondsey Metropolitan Borough Council for the reinstatement of the roadway, &c. It would be extremely difficult to decide as to the party responsible for the explosion; and we think it most undesirable, therefore, that public money should be expended in obtaining a decision of the Courts in the matter. Negotiations between the solicitors to the parties concerned have been in progress for some time; and, as the result, a draft agreement on the matter has been prepared. It is obviously undesirable that all the details of this agreement should be made public. But it is proposed, *inter alia*, that the cost of settling the claims and actions be divided among the three contracting parties in an agreed proportion; that the several parties pay the costs incurred by them up to the date of the agreement in defending any actions brought against them in the matter; and that each party release the other from all claims which they might have against each other arising out of the explosion. We think the draft agreement should be approved, and we have, therefore, forwarded to the Finance Committee a special estimate to cover the expenditure involved.

The Committee recommend, and the Finance Committee agree, that the special estimate of expenditure on maintenance account, of £4000 in respect of the settlement of the claims and actions and for incidental expenses in connection with the explosion, be approved; and that an agreement be entered into with the Metropolitan Water Board and the South Metropolitan Gas Company, on the basis approved by the Committee, on the 25th ult., relative to the settlement of the claims and actions referred to in the resolution.

Gas Engineers and their Pupils.—At the monthly meeting of the Burnley Town Council last Wednesday, Mr. Irving took exception to the minutes of the Gas Committee in reference to the Gas Engineer (Mr. J. P. Leather) taking a pupil; and he moved an amendment that no premium should be paid to the official, but direct to the Corporation. Mr. Collinge seconded the amendment. Alderman Hough pointed out that a youth seeking to enter the gas profession would not be accepted as a member of a gas engineers' association unless he had been apprenticed to a gas engineer and not to a corporation. The amendment was lost.

PROPOSED PURCHASE OF THE HOYLAND GAS-WORKS.

At the Monthly Meeting of the Hoyland Nether Urban District Council last Tuesday, the most important question dealt with was the proposed purchase by the Council of the undertaking of the Elsecar, Wentworth, and Hoyland Gas Company.

The Clerk (Mr. W. E. Raley) produced the agreement between the Council and the Company, and gave an outline of it, so that the public might at least know the salient features. He said that, after much consideration, the Council had decided to agree to the purchase price of £27,000. They were also to take over £1000 of loan capital in the Company, and to pay for stock-in-trade, &c., at the valuation agreed upon by two valuers at the time of taking over the works; the date fixed for the completion of the necessary arrangements being Dec. 31, 1910. The Council would collect all the accounts outstanding and belonging to the Company at that date, and would charge 2½ per cent. for collecting the same. The Council agreed to keep on, for at least three years, the present Manager (Mr. W. Stenton), and the Secretary (Mr. A. F. Hall), on their signing the usual conditions of service. In the agreement the Council undertook to introduce a Bill in Parliament next session for the purchase. If the Bill was not passed next session, the date of taking over the gas-works would be postponed for twelve months. If the Bill was not permitted to go through, the agreement was void. Each party was to pay its own costs; but in case extraordinary expenses were incurred by the Company at the request of the Council, these would be paid by the Council.

In proposing that the seal of the Council be affixed to the agreement, the Chairman (Alderman Kenworthy) said the matter had been fully thought out; and the decision to purchase had not been arrived at in a hurry. The negotiations had extended over two years.

The resolution was carried; and the statutory meeting of the Council was fixed for the 13th inst.

QUALITY OF COVENTRY GAS.

At a Meeting of the Coventry Town Council last Tuesday, an explanatory statement was offered in answer to remarks which have been made with regard to the quality of the gas.

The Chairman of the Gas Committee (Mr. W. H. Batchelor) said that in the report of the Committee of Feb. 15, 1905, which was adopted by the Council, it was stated that the gas, when purified by oxide of iron instead of lime, would contain only 40 grains of sulphur per 100 cubic feet. This statement was based upon reports to the Committee by the Gas Engineer and the late Sir George Livesey, and was in accordance with evidence given before the Departmental Committee of the Board of Trade which was appointed to inquire into, and report upon, the testing of the illuminating power and purity of gas supplied by the Metropolitan Gas Companies. In the report of the Departmental Committee, it was recommended that obligations with regard to sulphur in gas, other than sulphuretted hydrogen, should be abolished. On this report, the Metropolitan Gas Companies applied for, and obtained, an Act of Parliament abolishing the sulphur clauses. It was only necessary to explain why the Coventry gas contained 60 to 70 grains of sulphur per 100 cubic feet instead of the 40 grains stated in the report of the Gas Committee. The Metropolitan Gas Companies were unable, before the abolition of the sulphur clauses, to make any working tests of gas purified by oxide of iron only, because they would have been liable to penalties for supplying gas containing sulphur above the statutory limit. The Gas Engineer was in the same position in Coventry; so that only laboratory tests could be made, which did not reveal the true result on a working scale. In regard to the Metropolitan Gas Companies, the official tests made during the year after the abolition of the sulphur clauses showed that the sulphur compounds rose to a maximum of over 60 grains per 100 cubic feet; but, notwithstanding this, and probably owing to the fact that the tests were not made public, there were no complaints from the consumers. After this knowledge was obtained, Parliament granted relief from sulphur restrictions to many gas companies; and in no case since had sulphur restrictions been inserted in a Gas Act. This would indicate that Parliamentary Committees did not attach importance to the sulphur compounds being so high as 60 to 70 grains per 100 cubic feet. Since then, however, the Metropolitan Gas Companies had been able to reduce the sulphur compounds to nearly the quantity stated by the late Sir George Livesey—namely, about 45 grains per 100 cubic feet. Two of the Companies made large quantities of carburetted water gas, which practically was free from sulphur, and by its addition to coal gas reduced largely the quantity of sulphur in the mixture. The third Company made only coal gas; but by adopting a strict supervision of the coal at the pit's mouth, to ensure its being thoroughly cleaned from pyrites, they had been able to reduce the sulphur compounds to a similar extent. The Gas Engineer did not think it practicable, in their own case, to supervise the cleaning of the coal at the pit's mouth. Moreover, as a large proportion of the Coventry coal was bought already washed, it must be fairly free from pyrites. There were probably, therefore, only two methods at present that could be adopted to reduce the sulphur compounds. First, by reverting to purification by lime. This would entail a very large outlay for new purifiers. There would be the old nuisance from the smell of the foul lime when boxes were changed; and, further, the injury to workmen owing to the effect which the spent lime had upon the eyes. Secondly, by the use of a considerable quantity of carburetted water gas. This would reduce the sulphur compounds, but increase the carbonic oxide. The latter increased the danger from poisoning by escaping gas. The Gas Committee, times without number, had had the question of sulphur compounds before them, and had invariably come to the conclusion, from members' personal notice, that there was not any disagreeable result from the sulphur compounds being present in higher percentage than was the case prior to 1905, when the change in purification was made, and that it was not desirable to revert to lime purification or a large increase in the use of carburetted water gas.

THE GAS FATALITY IN ISLINGTON.

Inquest on the Victims.

Last Wednesday, Mr. Walter Schroeder, the Deputy-Coroner for Central London, opened an inquiry, at the Chapel-of-Ease, Holloway Road, into the circumstances attending the deaths, on the 27th ult., of Ivy Dorothy (10), Flossie Violet (7), and Eva Lucy (18 months), daughters of Mr. and Mrs. Turner, occupying two rooms in the basement of No. 11A, Stonefield Street, Islington. The fatality was supposed to have been caused by the inhalation of carbon monoxide gas.

Mr. R. VAUGHAN WILLIAMS (instructed by Messrs. Monier-Williams, Robinson, and Milroy) appeared on behalf of the Gaslight and Coke Company; Mr. A. G. COLVILLE (Messrs. Adams and Colville) represented the parents of the deceased.

Robert George Turner, the father, a plumber and gas and hot-water fitter, deposed that on the 27th ult. he left home at 7.30 a.m., leaving his three children in bed; his wife at the same time going to a situation she held. There were two gas-brackets in the front room, one in the back room, and a large cooking-stove in the kitchen. These were in good order. The gas was supplied through a prepayment meter, which contained some gas. When he got up on the Saturday morning, there was a smell which was something like that produced by water being upset on to hot cinders. His wife also perceived it, and said it was gas. Having had fourteen years' experience, he knew it was not. Nevertheless he went into the cellar and tried all the pipes with lighted paper, and could not find any escape. He had previously upset some hot coffee into the fender, and he thought the smell might be due to this.

Lucy Turner, the wife of preceding witness, corroborated her husband's evidence. She said there was a peculiar smell in the room where the children were. The doors were fastened, so that the children could not get out; but she did not think they were bolted.

By Mr. VAUGHAN WILLIAMS: The windows of the front room were not open. The smell was not in the room; she only detected it when she opened the door which led into the area.

Harriet Kendall, an occupier of rooms on the second floor of the house, said there was a very nasty, foul smell—a gassy smell like sewer gas, not pure gas—coming up the stairs on the Saturday morning in question; and she concluded that it came from the street. She called the attention of the people on the floor beneath to it. As it continued, she sent a post-card to the Gas Company's offices in Goswell Road.

William Edward Campbell stated that on his attention being called to the children he ran down the area steps and got into the room by the window, which was not fastened. He then detected a strong odour of gas. He examined the fittings and brackets, and saw that the taps were not turned on. In his opinion, the gas came from the lobby where the meter was kept. He had not perceived any smell, either outside or inside the house, before that day.

Susan Pears, the caretaker, said that about half-past ten on the Saturday morning there was gas coming from the basement of the house. It was a kind of tarry smell—just like tar burning. She did not detect it before half-past ten. The door was on the left-hand side of the house. There were two doors—one leading to the street, and another below the little lobby.

Dr. F. W. Kerbey said he was called to the house just before one o'clock on the morning of the occurrence, and proceeded to the basement, where he found the children, whose condition he described. He had that day made a post-mortem examination of the bodies, and had come to the conclusion that death was the result of poisoning by carbon monoxide gas.

At this stage the inquiry was adjourned, and was resumed on Friday.

Mrs. Annie Lewis, living next door to the house in which the fatality occurred, said she detected a smell of gas in her house at seven o'clock in the morning on the 27th of November, and asked a lodger to turn the gas off at the meter. He did so; but the smell becoming stronger, she sent to the offices of the Gas Company, and at a quarter-past twelve a man came down who said he would have the road examined immediately. Directly the matter was brought to the attention of the Company, they sent some men down. There was no delay.

Two police constables deposed to being called to the house and seeing the children. They stated that everything possible was done, by way of artificial respiration, to restore consciousness, but that it was of no avail.

Mr. VAUGHAN WILLIAMS said every inquiry had been made by the Gas Company, and he tendered every witness they could find who could assist the Coroner.

George Edward Tipper, a service layer, said he arrived at the house about half-past two, lifted the flagstones, and detected a smell of gas. He opened the road until he came to a place where he found a main was broken in half; it was about 3 ft. 6 in. from the kerb. There was a crack right along the main. Under the direction of the Inspector, he at once proceeded with the repairs. He and his mate opened 14 or 15 feet of the roadway, which was in good condition.

Mr. Henry Sutton Reeson, the Distributing Engineer to the Gaslight and Coke Company, said he heard of the occurrence through a telephone message at his private house. He communicated at once with the Goswell Road premises, and then proceeded to Stonefield Street; arriving there just before eight. He examined the pipe, and found it was a perfectly good one. [A piece was produced in Court.] It was made of cast iron, was 3 inches internal diameter, and varied from 9-32nds of an inch on one side to 7-16ths of an inch on the other. It was embedded in the ordinary subsoil, which at the point of breakage was somewhat loose. There was no doubt the gas travelled along the line of least resistance towards No. 10A and thence into No. 11A. The pipe had been laid since 1863; but when in suitable soil pipes had lasted 150 or 200 years, and were then perfectly good. He should say the leakage of gas would be from 12 to 15 cubic feet per hour. It was a mixture of coal gas and water gas. He thought the cause of the accident was the subsoil surrounding the pipe at the point of fracture not holding it so rigidly as the soil on either side, so that it might have been broken by vibration caused by a passing vehicle. There was nothing in the case upon which to definitely form an opinion. A depth of 2 ft. 5 in. was by no means too shallow. Frost might have got down

to the main, though he did not suggest it; but, of course, in frosty weather mains were more liable to breakage than at other times. The Gas Company supplied an area of 62 square miles through cast-iron pipes, running into 2184 miles, varying in diameter from 3 to 48 inches, and there were 2000 miles of service-pipes.

In reply to Mr. COLVILLE, witness said he did not think the leakage could have gone on for an unlimited time. There was no standard of age for the pipes. It was impossible to detect an escape at a particular spot, especially when it arose from a broken main.

Re-examined by Mr. VAUGHAN WILLIAMS, witness said that advantage was always taken of road making and repairing by other bodies to examine the gas-mains. The Company's employees were instructed to report any leakages they might casually discover when walking about; and they would gladly give rewards to outsiders who furnished correct information of escapes. He knew of no means by practical science to prevent them.

William Bedford, Assistant-Inspector, William Rigby, foreman fitter, and William John Carey, fitter, deposed to going to the scene of the accident immediately on hearing of it.

Mr. William Galton, an Assistant Borough Surveyor of Islington, said he knew the road in question very well. It was a flint road, and was last coated in 1903. There was not much heavy traffic on it.

Mr. T. Wallace Agar, a Sanitary Inspector, said he examined the drains at the house, and found they were perfect.

The CORONER having summed up the case,

The FOREMAN OF THE JURY said: We are all agreed that the children met their death accidentally through an escape of gas; and we think it unfortunate that they were left alone.

The CORONER: You do not state what was the cause of the breakage?

The FOREMAN: No; we take the evidence given as to that by the expert.

RATES AND GAS, ELECTRICITY, AND WATER CHARGES.

We have received from Mr. James Carter, the Borough Treasurer of Preston, a copy of his tabulated statistics of the rates levied, together with the charges made for gas, electricity, and water, and profits and losses on municipal undertakings in a number of Provincial towns and a few Metropolitan boroughs, for the year 1909-10. There are in all ninety-four places referred to, which is three more than in the previous compilation—the new-comers being Ipswich, Merthyr Tydfil, and Sheffield. The populations range from 760,357 (Liverpool) down to 21,406 (King's Lynn).

The rateable values are highest in Westminster (£6,387,726), Liverpool (£4,791,862), Manchester (£4,293,284), Kensington (£2,437,280), and Leeds (£2,143,464), and lowest in King's Lynn (£85,851), Bacup (£86,779), Brighouse (£87,856), and Stafford (£91,081). The places most heavily rated are: East Ham, 9s. 11d. in the pound; Norwich, 9s. 11d.; Wolverhampton, 9s. 5d.; Sheffield, 9s. 4½d.; Middlesbrough, 9s. 4d.; Swansea, 9s. 4d.; Preston, 9s. 2d.; West Ham, 9s. 2d.; Bristol, 9s. 1d.; Brighouse, 9s.; Halifax, 9s.; Rotherham, 9s.; and Stockton-on-Tees, 9s. Those which have the lightest rates are: Oxford, 4s. 6d. in the pound; Bournemouth, 5s.; and Lancaster, 5s.

Out of the rents of property and profits transferred from municipal undertakings, the rates are reduced in the following towns to the extent of 1s. or more in the pound: Macclesfield, 1s. 5½d.; Nottingham, 1s. 5d.; Stockport, 1s. 4½d. (water profits placed to reserve fund); Darlington, 1s. 3½d.; Warrington, 1s. 3½d.; Burnley, 1s. 2d.; Stafford, 1s. 1½d.; Bolton, 1s. 1d.; Batley, 1s. 1d.; Hull, 1s. 0½d.; Salford, 1s. 0½d.; and Swansea, 1s. On the other hand, small profits in aid of rates were contributed by Brighton, 1d. in the pound; Huddersfield, 1d.; Leamington, 1d.; Bootle, ½d.; West Hartlepool, ½d. (electric light profits to reserve fund); East Ham, ½d.; and Hampstead, ½d. Out of the total of ninety-four places included in the list, fourteen made no profit for the reduction of the rates; and a separate table gives forty-one instances in which the rates have been increased in consequence of losses in undertakings which were intended to be remunerative. The largest individual loss chronicled has arisen in connection with docks at Preston (£40,000), the next highest figures have reference to water; while gas does not appear at all in this particular part of the return. Water losses at Bacup were responsible for an addition of 2s. in the pound to the rates, and at Swansea of 3s. 3½d. Electricity losses added a 3d. rate at York.

Coming to the table giving the charges for gas and water, we find that the price of gas for domestic supplies is again highest at King's Lynn—3s. 6d. per 1000 cubic feet; while as usual it is the lowest at Widnes, at 1s. 2d. per 1000 cubic feet, with, of course, an even lower rate for very large consumers and engines. The following towns also enjoy the privilege of a gas supply for domestic lighting at 2s. or less per 1000 cubic feet: Sheffield, 1s. 4d.; Plymouth, 1s. 9d.; Bath, 1s. 11d.; Belfast, 1s. 11d.; Huddersfield, 1s. 11d.; Lancaster, 1s. 11d.; Sunderland, 1s. 11d.; Gateshead, 1s. 11½d.; Newcastle, 1s. 11½d.; Bradford, 1s. 11½d.; Cheltenham, 1s. 11½d.; Bury, 2s.; Bristol, 2s.; Darlington, 2s.; Halifax, 2s.; and Tynemouth, 2s. The charge per B.T.U. for domestic supplies of electricity ranges from 8d. (average) at Reading and 6½d. at Bournemouth to 3d. at Ashton-under-Lyne, Merthyr Tydfil, Wolverhampton (average), and West Ham (flat-rate). The charge for water for domestic purposes on a house of £15 rateable value is highest in Heywood—3s. in the pound (charges on gross rental). It is lowest in the following towns: King's Lynn, 7d.; Liverpool, 7½d.; Brighton, 9d.; Leamington, 9d.; and Southampton, 9d. The other places in which the charges are less than 1s. are: Bournemouth, Gloucester, Oxford, Plymouth, Reading, Walsall, Widnes, and York. At Preston (Mr. Carter's own town), the rates are 9s. 2d. in the pound; and they are relieved to the extent of 7d. by the rents of property and the profits transferred from the reproductive undertakings. The price of gas is 2s. 11½d. per 1000 cubic feet; of electricity, 4½d. per unit; and of water, 1s. 2d. in the pound on £15 houses.

There is a table showing the amount estimated for the current year to be transferred to the borough, district, or other fund from the various profitable undertakings.

FINANCES OF THE METROPOLITAN WATER BOARD.

The Present Position—Criticism by a Ratepayers' Representative.

When Lord Welby, the Chairman of the Finance Committee of the Metropolitan Water Board, was dealing with the estimates for the year 1908-9 at a meeting held in the summer of last year, he told his colleagues that they might expect a large deficit at the end of the twelve months. The accounts which have lately been issued show, however, that the Board's financial position is not quite so bad as was anticipated. Instead of an increase of less than £70,000 in income and an adverse balance of £78,000, there has been a gain of £33,000 in the ordinary receipts, and the deficit is only £25,000. The total receipts on revenue account were £2,878,540, compared with £2,845,660; water-rates and meter-rents yielding £2,774,120, against £2,752,179, and the miscellaneous income being £91,218, against £79,867. The working expenses, which amounted to £1,361,955 in 1907-8, rose to £1,385,569; the principal increases being in rates and taxes, salaries, and superannuation allowances. The Board now pay under the first heading £397,935; the payments under the other two amounting to £203,902. The surplus carried to net revenue account is £1,492,971, compared with £1,483,705 before. Adding £2475 for interest, the first-named figure is brought up to £1,495,446, which has to meet charges amounting to £1,520,725; leaving a deficit of £25,279, which it is hoped to liquidate out of future profits. During the year, a sum of £611,691 was spent on capital account, compared with £362,530 before. There was an additional expenditure on reservoirs, but less outlay in connection with the distributing plant. The total capital expenditure now stands at £49,169,251, compared with £48,537,140; and the outstanding debt is £48,872,063.

The financial position of the Board was criticized by Mr. Charles Marshall, the President of the Fulham Ratepayers' Association, and a member of the Council of the London Association for the Protection of Trade, in a letter which appeared in the "Financial News" on Monday last week. In a previous letter to the Press, Mr. Marshall had asked where were the Board's profits, and the explanation given for the disappearance of those formerly made by the Water Companies was that the Board had to pay interest on a far larger sum than the Companies' working capital. In reply to this, Mr. Marshall said: "The annual interest charge of the Board is £1,425,977. The Water Companies also had to meet interest charges; and yet, after doing so, they could show a profit in one year of £1,300,000—not very far short of the total interest charge, which is represented to be an undue weight on the Board. These figures suggest that a comparison of the expenditure of the Board with that of the Companies would supply a clue to the mystery of the vanished profits, and, in the public interest, a demand ought to be made for this information." After dealing with a few items from the Board's accounts, the writer closed his letter with the following remarks: "To me it appears that the Metropolitan Water Board is a colossal example of the consequence of handing over commercial undertakings to official bodies; and I think that a searching inquiry ought to be made into its financial affairs. Can the ratepayers continue to afford this expensive system of administration? Unfortunately, what is everybody's business is nobody's business. Even the Board will serve a good purpose if it warns the nation against handing over to any public administrative body great undertakings whose usefulness depends upon their efficiency."

At the meeting of the Board on Friday, the Finance Committee presented a report by the Accountant (Mr. Arthur Newton) on the collection of water-rates from April 1 to Sept. 30 last. The following summary shows the result of the aggregate collection, the allowances, and the arrears:—

	Domestic Supplies.	Meter Supplies.	Building Supplies.	Total.
Arrears, March 31	£47,800	£224,517	—	£272,317
Two quarters' charge to Sept. 30	1,147,791	350,852	£11,467	1,510,110
Additions	25,127	5,425	—	30,552
	£1,220,718	£580,794	£11,467	£1,812,979
Less rebates	29,934	6,207	—	36,141
Total	£1,190,784	£574,587	£11,467	£1,776,838
Amount collected to Sept. 30	£1,044,039	£310,791	£11,467	£1,366,297
Allowances—				
Empties	73,927	282	—	74,209
Reduced rates	16,166	7,294	—	23,460
Bad debts	3,181	650	—	3,831
Arrears carried forward	53,447	74,833	—	128,304
Do.	—	180,737	—	180,737
Total	£1,190,784	£574,587	£11,467	£1,776,838

Mr. Newton explains that the £180,737 carried forward in respect of meter supplies practically represents the quarter's charge to the 30th of September, which cannot be ascertained until after the close of the quarter, and is therefore necessarily in arrear.

Twineham (Sussex) Water Supply.—The consent of the Local Government Board has been given for the raising of £1215 for purposes of water supply. The Rural District Council of Cuckfield has been informed of the fact, and the work of laying the mains is to be proceeded with.

Electric v. Gas Lighting in Hastings Streets.—The conversion of the public gas lighting into electric lighting at Hastings, to which reference has already been made in the "JOURNAL," appears to be arousing great dissatisfaction among the inhabitants, who, as usual, resort to the columns of the local paper as a means of ventilating their grievances. The Editor of the "Hastings and St. Leonards Observer" has, however, been so overwhelmed with communications on this subject, that in the issue for the 27th ult, he advised correspondents to send their complaints to the Town Clerk, as he could not publish any more letters.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The members of the Western District of the Scottish Junior Gas Association were entertained to-night by Mr. F. L. M'Laren, of Dumbarton, with a very informative paper on "Producers and Internal Combustion Engines." The subject is one upon which Mr. M'Laren is intense. His knowledge of the characteristics and capabilities of producer gas is not surpassed by anyone in Scotland, if indeed anywhere. The special branch of the subject to which he has devoted years of study is that of marine propulsion. He was connected with the running of H.M.S. *Rattler* by gas last year, accounts of which were given in the "JOURNAL" from time to time; and he has gone the length of having a boat built for himself, and equipped with a set of producers and engines of his own design, by means of which he is confident that he will be able to prove the superiority of gas over steam propulsion. The information he gave and the conclusions he has arrived at as the result of his experiences indicate the farthest to which producer gas has reached; and therefore they are of value to those in charge of gas undertakings, in respect that they now know the extent of the competition they have to meet in the power field.

At the monthly meeting of the Edinburgh and Leith Gas Commissioners on Monday, the first business was the taking of the statutory declaration by the new members. These included the new Lord Provost of Edinburgh—Mr. W. S. Brown—who becomes Chairman of the Commissioners. He was introduced by Provost Smith, of Leith. Lord Provost Brown assured the Commissioners that, whatever the value of his services to the Commission might be, he was quite prepared to devote the time and attention which were necessary in the discharge of the duties. Ex-Bailie Bryson, of Leith, was re-elected Convener of the Works Committee, and Bailie Inches, of Edinburgh, was re-elected Convener of the Finance and Law Committee. In the room in which the Gas Commissioners meet there is a chair which was occupied by Sir Walter Scott when he was Chairman of the Edinburgh Gas Company. Bailie Inches has had put upon the chair a silver plate bearing an inscription. He formally made the presentation of the plate to the Commissioners. Lord Provost Brown conveyed to Bailie Inches the thanks of the Commissioners for his kindness and consideration. The inscription upon the plate is as follows: "This chair was used by Sir Walter Scott, Bart., when Chairman of the Edinburgh Oil-Gas Light Company, founded in 1824, whose property was subsequently purchased by the Edinburgh Gaslight Company on the 10th March, 1828."

The Town Clerk of Glasgow has prepared a memorandum to the Parliamentary Bills Committee with reference to the Glasgow Gas Consolidation Order. He states that the Corporation Gas Acts authorize borrowing for gas purposes to the amount of £3,972,268. Of this amount, however, £900,000 was utilized for electricity, with the consent of the Secretary for Scotland, so that the authorized borrowing powers for gas purposes really amount to £3,072,268. The sum actually borrowed for gas purposes is £2,142,268; and sinking fund thereon is paid as follows: On £1,115,000, 1 per cent.; on £685,000, 2½ per cent.; on £70,000, 3 per cent.; and on £272,268, 1½ per cent. It is proposed to

equate the sinking fund; and a rate of 2½ per cent. has been inserted in the new Order. The sinking fund on loans under the existing arrangement amounts annually to £48,248, and the proposed sinking fund of 2½ per cent. on outstanding loans will amount to £48,201. Dealing with the Corporation gas annuities and the sinking fund thereon, the Town Clerk states that the face value of the annuities granted to the shareholders of the old Gas Companies amounted to £415,000. These annuities have been redeemed or converted, until they now amount to £259,127, and the power conferred upon the Corporation by section 24 of the Glasgow Corporation Order, 1901, for the conversion of gas and water annuities is not interfered with by the Order. By this Act the Corporation were obliged to set apart a sinking fund of 1½ per cent. on the then market value of the annuities, estimated at £1,000,000. The sinking fund already paid in terms of this Act is £43,664. The market value of the annuities, so far as not redeemed or not converted, is now £600,000; and the proposal in the Order is that on this amount a sinking fund of 2 per cent. should be paid—the sum on which sinking fund is to be paid being gradually reduced as annuities are from time to time redeemed or converted. The amount of sinking fund now paid annually in respect of these annuities is £10,916. Two per cent. on the market value of the annuities, so far as not converted or not redeemed, as proposed in the Order, is £11,792. The total sinking fund at present paid by the Gas Department in respect of loans and annuities is £59,165; and on the basis of a 2½ per cent. sinking fund in respect of the present market value of the existing annuities (being the proposals of the new Order), the total sinking fund payments hereafter for gas purposes would be £59,992. The Parliamentary Bills Committee recommend: (1) That the powers presently possessed by the Corporation to manufacture certain of the articles mentioned in clause 7 (2) of the Order be retained, but that the words "dynamos and ranges" be deleted therefrom; (2) that a new clause, permitting the Corporation, if they think fit, to give discounts and rebates to consumers for the prompt payment of gas charges, be inserted in the Order; (3) that the clauses relative to the power to manufacture and supply non-illuminating gas be deleted, and that clause 7 be made sufficiently wide to enable the Corporation to manufacture and supply non-illuminating gas; and (4) that the Order as now proposed to be amended be approved.

On the evening of Saturday last, a fire broke out in a large bin of coke at the Dunfermline Gas-Works. It took the firemen twelve hours to subdue it. The seat of the fire was in the centre of the heap; and a great quantity of the material had to be shifted before it could be got at.

The Gas Committee of the Perth Town Council have appointed a deputation to visit Derby for the purpose of inspecting stoking machinery in the gas-works there.

Three Saturdays ago, when in Dunfermline with the Scottish Junior Gas Association, I had a look at the site of the old gas-works, in one corner of which there stands the house in which Dr. Andrew Carnegie, the Scottish-American millionaire, was born. The house and the gas-works site are the property of Mrs. Carnegie, who acquired them at the time when the gas-works were transferred to the new site. The house is kept as a show place; and the site of the gas-works has been enclosed and laid out in grass. It is now announced that the park is to be made a public one, and Mrs. Carnegie will erect an ornamental

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 664.

Issue	Share.	When ex-dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue	Share.	When ex-dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Oct. 14	10	Alliance & Dublin 10 p.c.	17-18	..	5 11 1	195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
298,955	10	"	7	Do. 7 p.c.	12½-13	..	5 7 8	561,000	Stk.	"	10	Liverpool United A	223-225	..	4 8 11
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	718,100	"	"	7	Do. B	166-168	..	4 3 4
200,000	5	Oct. 28	6½	Bombay, Ltd.,	5½-6	..	5 8 4	306,083	"	June 25	4	Do. Deb. Stk.	104-106	..	3 15 6
40,000	5	"	6½	Do. New £4 paid.	4½-4¾	..	5 9 1	75,000	5	Nov. 26	6	Malta & Mediterranean	4½-5*	..	6 0 0
50,000	10	Aug. 26	15	Bourne- 10 p.c.	28-28½	..	5 5 3	560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	99-102	..	4 18 0
311,810	10	"	7	mouth Gas B 7 p.c.	16½-16¾	..	4 3 7	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
75,000	10	"	10	and Water Pref. 6 p.c.	15½-15¾	..	3 16 2	541,920	20	Nov. 11	3½	Monte Video, Ltd.,	12½-13	..	5 7 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	253-256	..	4 17 8	1,775,892	Stk.	July 29	4½	Newcastle & G'tesh'd Con	106-108	..	4 3 4
300,000	"	"	12½	Do. New	190-192	..	4 19 0	513,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	93-94	..	3 14 6
50,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13-13½	..	5 3 8
206,250	"	June 11	4	Do. 5 p.c. Deb.	100-102	..	3 18 5	300,000	Stk.	Nov. 26	8	Oriental, Ltd.,	137-139	..	5 15 1
220,000	Stk.	Sep. 10	11	Brighton & Hove Orig.	208-213	..	5 3 3	60,000	5	Sep. 10	8	Ottoman, Ltd.,	68-68½	..	5 6 6
266,320	"	"	8	Do. A Ord. Stk.	150-152	..	5 5 3	31,800	53	Aug. 26	13	Portsea Island A	137-139	..	4 19 0
461,000	20	Oct. 14	10	British 4½ p.c.	42½-43½	..	4 11 11	60,000	50	"	13	Do. B	129-131	..	4 19 3
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c.	118-120	..	5 0 0	100,000	50	"	12	Do. C	120-123	..	4 17 7
165,700	"	"	4½	Do. C 5 p.c.	88-90	..	5 0 0	114,800	50	"	10	Do. D and E	101-103	..	4 17 1
82,278	"	"	5½	Do. C 5 p.c. Deb.	106-108	..	5 1 10	398,490	5	Oct. 28	7	Primitiva Ord.	64-72	..	4 18 5
55,000	"	June 25	3½	Do. 3½ p.c. Deb.	88-90	..	3 17 9	796,983	5	July 29	5	Do. 5 p.c. Pref.	58-62	..	4 13 0
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	13½-14	..	5 0 0	483,903	100	Dec. 1	4	Do. 4 p.c. Deb.	94-96	..	4 3 4
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	96-98	..	4 1 8	1,000,000	10	Oct. 14	8	River Plate Ord.	164-166	..	4 15 7
100,000	10	"	—	Cape Town & Dis., Ltd.	2½-3½	..	—	312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	97-99	..	4 10 10
100,000	10	"	—	Do. 4½ p.c. Pref.	5½-5¾	..	—	250,000	10	Sep. 29	8	San Paulo, Ltd.,	14½-15	..	5 6 8
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	47½-48½	..	6 3 9	62,500	10	"	6	Do. 6 p.c. Pref.	11½-12½	..	4 18 11
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82-84	..	5 7 2	125,000	50	July 1	5	Do. 5 p.c. Deb.	51-52	..	4 16 2
157 155	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	108½-110½	..	4 10 6	135,000	Stk.	Sep. 10	10	Sheffield A	230-232	..	4 6 2
1,493,280	Stk.	Aug. 26	5½	Commercial 4 p.c. Stk.	109-111	..	4 13 8	269,984	"	"	10	Do. B	230-232	..	4 6 2
500,000	"	"	5	Do. 3½ p.c. do.	103-105	-1	4 15 3	523,500	"	"	10	Do. C	230-232	..	4 6 2
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	70,000	"	Oct. 14	10	South African	12½-12¾	..	7 16 11
800,000	Stk.	"	5	Continental Union, Ltd.	97-99	..	5 1 0	6,429,895	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	119-121	..	4 8 1
200,000	"	"	7	Do. 7 p.c. Pref.	139-141	+1	4 19 3	1,895,445	"	July 13	3	Do. 3 p.c. Deb.	81-83	..	3 12 3
492,270	Stk.	"	5	Derby Con. Stk.,	121-123	..	4 1 4	209,321	Stk.	Aug. 26	8	South Shields Con. Stk.	149-161	+5	4 19 5
55,000	"	"	4	Do. Deb. Stk.,	103-105	..	3 16 11	605,000	Stk.	Aug. 12	5½	Sth Suburb'n Ord. 5 p.c.	119-121	..	4 10 11
143,995	"	Oct. 2	5	East Hull 5 p.c. Ord.	97-99	..	5 1 10	60,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
486,090	10	July 14	12	European, Ltd.,	242-243	-½	4 17 0	117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	122-124	..	4 0 8
354,060	10	"	12	Do. £7 ros. paid.	18-19	-½	4 14 11	502,310	Stk.	Nov. 11	5	Southampton Ord.	109-111	..	4 10 1
15,141,545	Stk.	Aug. 12	4½	Gas 4 p.c. Ord.	102½-103½	..	4 10 1	120,000	Stk.	Aug. 12	6½	Tottenham A 5 p.c.	135-135	..	5 1 9
2,600,000	"	"	3½	Light 3½ p.c. max.	87-89	..	3 18 8	453,940	"	"	5½	Do. B 3½ p.c.	111-113	..	4 15 3
3,799,735	"	"	4	and 4 p.c. Con. Pref.	103-105	..	3 16 2	149,470	"	June 25	4	Edmonton 4 p.c. Deb.	100-102	..	5 18 5
4,193,975	"	June 11	3	Coke 3 p.c. Con. Deb.	82-84	..	3 11 5	182,380	10	June 11	8	Tuscan, Ltd.,	9-9½	..	8 8 6
28,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	92-94	..	5 6 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	100-102	..	4 18 0
62,500	"	"	0½	Do. do. 5 p.c.	117-119	..	5 9 3	236,476	Stk.	Aug. 14	5	Tynmouth, 5 p.c. max.	110-112	..	4 18 0
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	178-18	+½	6 3 3	255,616	Stk.	Aug. 26	6½	Wands B 3½ p.c.	139-141	..	4 14 0
131,070	Stk.	Sep. 10	6½	Ilford A and C	144-146	..	4 9 0	79,416	"	June 25	3	Worth 3 p.c. Deb. Stk.	73-75	..	4 0 0
65,781	"	"	5	Do. B	108-110	..	4 10 11	895,872	"	Aug. 12	5½	West Ham 5 p.c. Ord.	125-125	..	4 6 0
65,500	"	June 25	4	Do. 4 p.c. Deb.	102-104	..	3 16 11	210,000	"	"	5	Do. 5 p.c. Pref.	125-127	-1	3 18 9
4,940,000	Stk.	Nov. 11	8	Imperial Continental	175-177	..	4 10 5	253,300	"	June 25	4	Do. 4 p.c. Deb. Stk.	108-110	..	3 12 9
1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	94-96	..	3 12 11								

Prices marked * are "Ex div."

marble fountain in the centre of it; also that a house which adjoins that of Dr. Carnegie's birthplace is to be taken down, and a building erected in which is to be housed the numerous mementoes, in the shape of gold keys with which public libraries have been opened, caskets containing addresses and Burgess tickets, and the like, of which Dr. Carnegie has been the recipient.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, Dec. 4.

Although orders direct from consumers have not been plentiful, the demand has continued good throughout the week, and values are fully maintained. Supplies have, however, been sufficiently abundant to meet all requirements, and no further advance has been scored; the closing quotations still being £11 3s. 9d. per ton f.o.b. Hull, £11 5s. per ton f.o.b. Liverpool, and £11 6s. 3d. per ton f.o.b. Leith. Influenced no doubt by the better tone in the market for prompt shipment, makers have resumed their former attitude respecting delivery next year. They are once more asking £11 10s. to £11 12s. 6d. per ton, according to position, f.o.b. at the best ports, but so far these enhanced prices are not reported as having been paid.

Nitrate of Soda.

This article remains quiet, but holders on spot refuse to reduce their quotations below 9s. 3d. per cwt. for ordinary, and 9s. 6d. for refined quality.

Tar Products.

LONDON, Dec. 6.

Markets for tar products have been quiet during the past week. Pitch has been very steady indeed; and although Continental consumers are not inclined to buy at present and report that they have been receiving very low offers from this side, yet makers decline to sell except at an advance on to-day's quotations. This the dealers are not prepared to pay until they receive more encouragement from the other side. Creosote is very dull. The large London manufacturers decline to sell, because they have already placed a considerable quantity; but business has been reported at a shade over 2½d. in London. In the North, from 2d. to 2½d. has been accepted, according to place and delivery. Benzol is steady, and manufacturers in the North have advanced their figure to 6d.; but, except for prompt delivery, they cannot obtain this price. In London, there is very little obtainable; it being reported that a fair quantity has been sold for motor purposes. Fifty-ninety per cent. benzol is steady both in the North and London. Toluol is firm in the North, where as much as 9d. naked, delivered to consumers' works, is reported to have been paid; but some quantity was offered at this figure and declined. Solvent naphtha is still firm; and in London it is scarce. Heavy naphtha is quiet; and there is not

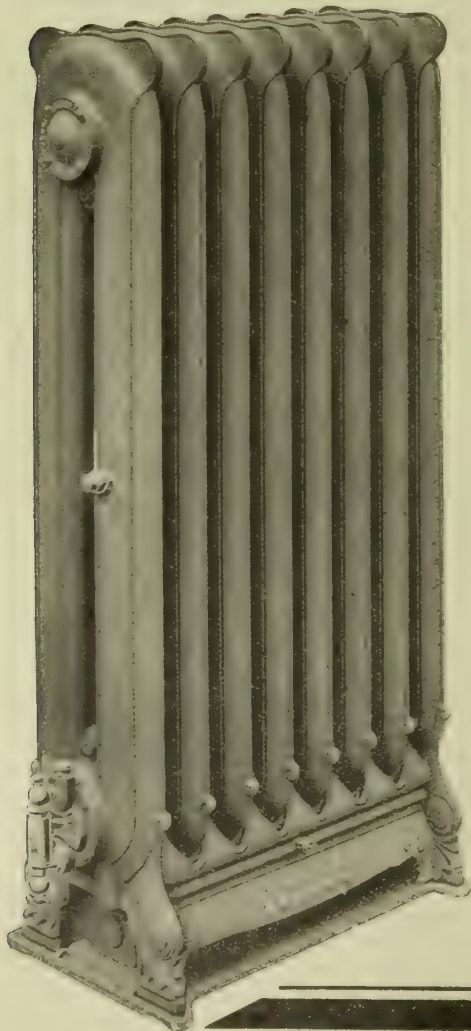
very much demand for same. Carbolic acid is still weak, and Continental makers in particular decline to purchase.

The average values during the week were: Tar, 13s. to 17s., ex works. Pitch, London, 26s. 3d. to 26s. 6d.; east coast, 25s. 6d. to 26s.; west coast, 25s. to 26s. f.a.s. Mersey ports, 26s. f.o.b. others. Benzol, 90 per cent., casks included, London, 6½d.; North, 6d.; 50-90 per cent., casks included, London, 7½d.; North, 7d. Toluol, casks included, London, 9½d. to 9¾d.; North, 9d. Crude naphtha, in bulk, London, 3½d. to 4½d.; North, 3½d. to 4d.; solvent naphtha, casks included, London, 1s. 0½d. to 1s. 1½d.; North, 11¾d. to 1s. 0½d.; heavy naphtha, casks included, London, 10¾d. to 11½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2½½d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east coast, 10¾d., west coast, 10¾d. Refined naphthalene, £4 10s. to £8 10s.; salts, 40s., packages included and f.o.b. Anthracene, "A" quality, 1¼d. to 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been steady throughout the past week, and during the last day or two has shown a slight improvement. The principal London Gas Companies advanced their price to £11 6s. 3d. for prompt; while for outside makes, upon Beckton terms, £11 was offered for prompt delivery and declined. In Hull, a very good price was paid for a tender parcel for prompt delivery; and the market for ordinary qualities is about £11 2s. 6d. In Liverpool, the price is £11 3s. 9d. to £11 5s. In Leith, the manufacturers are asking £11 6s. 3d. to £11 7s. 6d. for prompt, and £11 10s. to £11 12s. 6d. for forward.

Instow Water Supply.—There is a prospect of an early settlement of the long-discussed question of the water supply of Instow, in North Devon. The matter has engaged the attention of the Barnstaple Rural District Council for several years, and a number of plans have been suggested and discarded. Recently the Council entered into negotiations with the Northam District Council and the Barnstaple Water Company, and obtained from both an estimate of the cost of supplying water to the town. The Company estimated that the extending of their mains to Instow and the villages of Fremington and Bickington, and making the necessary provision for the supply of these places, would cost £6500. A return of 10 per cent. on the outlay would have to be guaranteed by the Council; but the total amount of the water-rates paid by the consumers would be deducted from the sum guaranteed—the balance being payable by the Council. The mains, reservoir, and plant would be maintained by the Company at their expense. The Rural District Council decided to refer the matter to the Instow Parish Council, who were advised to seriously consider the Company's offer. Meanwhile, as stated in our "Parliamentary Intelligence" last week, the Company have given the necessary notice of their intention to apply for a Provisional Order authorizing the carrying out of the works and the inclusion of Instow within their limits of supply.



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JOHN WRIGHT & CO.,
The Radiator Experts,
Essex Works, BIRMINGHAM

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade is more active. The demand has been full, and the prices generally firmer for the last few days, with an increase in values in some cases. In the steam coal trade, best Northumbrians have been quoted at about 11s. per ton f.o.b. For second-class steams, from 9s. 3d. to 9s. 6d. per ton is the current price; and for steam smalls from 5s. 3d. to 6s. 3d. Shipments have been heavy of late, until more inclement weather checked them slightly. In the gas coal trade, there is now about the fullest demand in the year; for the great companies are stocking for the weeks of heaviest consumption near the turn of the year. Durham gas coals vary in price from 9s. 6d. to 11s. 1½d. per ton f.o.b. for the ordinary classes, according to quality. "Wear" specials are quoted up to 11s. 6d. per ton. There is apparently less desire to sell over next year, though one or two of the great producers of gas coals have sold a considerable quantity forward. The tenders are now being sent in for the Stockholm gas coal contract; and it is expected that the quotations will be somewhere near the current prices. Best Durham coals have, however, been quoted higher in one or two instances. Coke is firm; and gas coke is strong, although the output is now very full. Good gas coke is from 13s. to 13s. 6d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

Trade has improved wonderfully. All sorts of coal are in good request in the meantime; and the prices may be quoted as: Ell 9s. 3d. to 10s. 6d. per ton f.o.b. Glasgow, splint 10s. 9d. to 11s., and steam 9s. 3d. to 9s. 6d. The shipments for the week amounted to 323,593 tons—an increase of 27,554 tons upon the previous week, and of 57,130 tons upon the corresponding week of last year. For the year to date, the total shipments have been 14,040,900 tons—an increase of 681,567 tons upon the corresponding period.

Comparative Tests of Gas and Electric Lighting at Hyde.

Some interesting particulars have just reached us in regard to some comparative tests of gas and electric lighting at Hyde. They were carried out at the hall of the Philanthropic Society from the 20th of October to the 25th of November (five weeks); the number of hours' burning being 42½. The quantities of gas and electricity used were registered by meters. One 250-candle Graetzin inverted gas-lamp consumed 350 cubic feet of gas, which, at 2s. 9d. per 1000 cubic feet, less 7½ per cent., came to 10½d. One 100-candle Osram electric lamp used 6 units of electricity, which, at 3½d. per unit, less 10 per cent. discount, came to 1s. 7d. As a light of 100-candle power produced by electricity cost 1s. 7d., to obtain one of 250-candle power will cost 3s. 11½d., or four-and-a-half times the price of gas. Notwithstanding these figures, the Society have decided to light the large hall only by electricity, and to light and heat the remainder of the buildings with gas.

Incandescent Gas Lighting for Darenth Asylum.

At the meeting of the Metropolitan Asylums Board last Saturday, the Works Committee reported that in March last the Engineer-in-Chief was instructed to make experiments with a view to ascertaining what improvements and economies could be effected in gas lighting, especially by the use of mantles; and, with the sanction of the Asylums Committee, the experiments were conducted in the first instance at the Darenth Asylum. The Committee have recently received from the Engineer a report on the matter. He points out that the lighting is done almost entirely by means of flat-flame burners, and is therefore inefficient and extravagant; the average weekly consumption of gas during the six darkest weeks of the year being 364,749 cubic feet. To remedy this, he suggests that incandescent fittings of suitable types, but necessarily varying in character and intensity, according to the different portions of the asylum where they will be required, should be obtained, at an initial outlay of £273 11s. 6d., exclusive of fixing and making some slight alterations to gas-piping which he does not anticipate will involve any serious expenditure. He estimates that the annual outlay on the renewal of mantles, chimneys, &c., should not exceed £50; and he states that if the proposed alterations are carried out, the consumption of gas would be reduced to at least half, while three times the amount of light would be obtained. Taking the price of gas at 2s. per 1000 cubic feet, the substitution of modern incandescent fittings should, he says, result in a saving of £18 per week during the darkest weeks of the year, and proportionate economy during the remainder. In view of the report, the Works Committee recommended that the Managers should substitute incandescent gas burners for lighting the asylum, at an initial expenditure of £273 11s. 6d. on the necessary lamps and fittings, and that application should be made to the Local Government Board for sanction to obtain lamps and fittings without in the first instance advertising for sealed tenders. This was agreed to.

Coalite a Failure in the Kitchen Range.—A recent number of the "Chemical Trade Journal" contained an article advocating the use of coalite as contributing to the reduction of the smoke nuisance. In the current issue, a correspondent, referring to the article, says he has tried coalite in his living-rooms with good results, but in the kitchen range it is voted a failure. He complains that "it emits no flame around the oven, and baked food requires considerably longer to cook and becomes tough." He points out that if coalite is unsuited to kitchen ranges it cannot be regarded as a solution of the smoke problem. Appended to the letter is a note in which the Editor denies having stated that coalite was the ideal fuel for the domestic fire, but simply indicated that fuel of this type would help forward considerably the solution of the smoke problem. He sympathizes with his correspondent, and can only offer him the somewhat scanty consolation that, "pending the time when gaseous fuel will be the order of the day, the kitchen range should and ought to be adapted for the use of smokeless fuel."

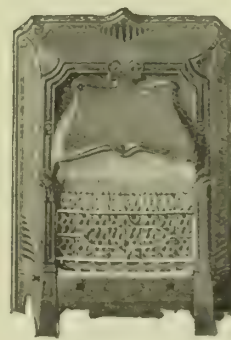
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- ☛ BECAUSE of their interchangeability of parts: **14** sizes, **5** designs, and only two sets of parts required for renewals.
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Criticism of the Walsall Electricity Undertaking.

A Local Government Board inquiry was held by Mr. R. H. Hooper at Walsall last Tuesday, regarding an application by the Corporation for sanction to borrow £35,000 for the purpose of extending the electricity undertaking, and for authority to use a further portion of the site of the old gas-works in connection with the matter. It was explained by the Town Clerk that the electricity question had caused the Town Council a great deal of anxiety, having regard to the amount of money already expended; and a Special Committee was appointed to co-operate with the Electricity Committee, and to inquire whether it was possible to do without spending this £35,000. The final recommendation of the Joint Committee was unanimously in favour of the extension, though the Committee included several gentlemen who had previously strongly opposed it. The Town Clerk proceeded to show that the demand for electricity was increasing. The Inspector pointed out that there was an outstanding debt on the undertaking of £90,000; and they were seeking to secure a further £35,000. He regarded it as a very serious thing that for some years the capital charges had gone up steadily. With their increased output, the capital charges ought to have been reduced. They were faced with a very serious financial difficulty, and should "cut their coat according to their cloth." Last year there was a loss on the undertaking of nearly £900; there was but little reserve fund; and altogether the position was very weak. It was unfortunate for Walsall that it had an obsolete system; but they had no funds whatever to deal with desirable improvements. He suggested that the application might be reduced from £35,000 to £22,000 by leaving out certain portions of the scheme. Mr. Morse opposed the application on behalf of the South Staffordshire Tramway Lessee Company; and submitted that this Company had offered to supply the Corporation more economically than under the proposed scheme, and contended that it would be in the interests of the ratepayers and the Corporation if the offer were accepted.

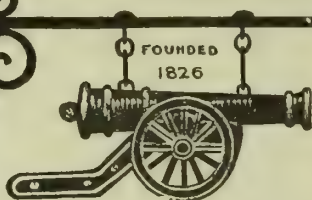
Gas Matters at Leeds.—Alderman Tetley, referring in the Leeds City Council to the recent fire at the Meadow Lane Gas-Works, expressed thanks to Superintendent Tose and the fire brigade for their energy in preventing the spread of the fire. He also acknowledged the energy of the Managers of the department for the manner in which they had made it possible to keep the department going, pay the wages of the men, and supply customers. Mr. Wood objected to a proposal of the Gas Committee appointing a Sub-Committee to obtain information on the question of adopting vertical retorts and other improvements, with power to visit and obtain such advice as may be necessary. He contended that there was sufficient machinery at the gas-works of the city to cope with the probable increase in the consumption for some years to come. Installing new machinery would mean the scrapping of thousands of pounds' worth of useful plant. The minutes were, however, adopted.

Wages at Rochdale Gas-Works.

A long discussion took place at last week's meeting of the Rochdale Town Council on the question of the wages paid to labourers employed at the gas-works. Mr. Walker, in moving the adoption of the minutes of the Gas and Electricity Committee, stated that they considered the stokers with £1 19s. 4½d. per week were receiving a wage equal to that paid in other towns for similar kind of work. They proposed that labourers, purifier men, and some other men, should have an advance of 1s. 6d. per week; that other men should be advanced from 5s. 3d. to 5s. 6d. per shift; and that some should be advanced to 30s. per week. The resolution about the advance of 1s. 6d. to the labourers had, however, been rescinded. This had been done, not because the Committee did not desire to advance the wages, but because they thought there were so many other Committees of the Corporation employing labourers that a Special Committee ought to be formed from all the Committees to consider the question of advances to these men. Mr. Sharp moved an amendment similar to the one he did at the Gas Committee meeting—namely, that the minutes pass with the exception of the one proposing to appoint a Special Committee. It was his point that they had no class of labourer employed elsewhere under the Corporation such as they had at the gas-works. On the matter being put to the vote, 30 were for the amendment and 9 against. Therefore the minutes were passed with the deletion involved by the amendment; the feeling appearing to be that each Committee should be left free to manage its own business.

Public Lighting of St. Austell.—Tenders from the Gas Company and the Electric Light Company for the public lighting of the town were considered by the St. Austell District Council at their last meeting. The Gas Company offered to light the streets at a cost of £2 5s. per lamp per annum; double-burner lamps to be charged £3 10s.—the price to include the lighting and extinguishing of the lamps, the cleaning of the lanterns, and the renewal of mantles and chimneys. The Electric Light Company's price was £1 7s. 3d. for single and £2 14s. 6d. for double lights, with the addition of a sum of £15 per annum for attention to the lights. The Gas Company asked for an allowance of 13s. per night for all nights on which the light is not required; and the Electric Light Company wanted an allowance of 7s. for such nights. At present, the lighting is being done by electricity; and the Gas Company offered to couple up the existing lamps to their mains, and supply incandescent burners and mantles, provided the Council installed suitable lamp-posts and wind-proof lanterns. The Lighting Committee recommended the acceptance of the Electric Light Company's tender. Mr. Hodge pointed out that there was something more to be considered in this matter than the saving of money. The first thing was light; and in positions where gas and the electric light could be compared, the latter did not come out at all favourably. The recommendation of the Committee was adopted.

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Belfast Gas Undertaking.—The Chairman of the Belfast Gas Committee (Mr. J. A. Doran, J.P.), in moving the adoption of the Committee's minutes, referred to the increase in the consumption of gas, and told the Council that he thought a great deal of this increase was due to the recent exhibition in the Ulster Hall, for since then they had supplied a great many gas stoves and rings. In about five months every department they had would be in occupation; and he did not know, unless something was done very soon, how they would be able to supply the whole city. They had not as yet received the report of their experts regarding the extension of the gas-works, as they were at the present time engaged in making their investigations.

Halifax and the Gas Supply of Hipperholme.—Replying at the monthly meeting of the Halifax Town Council to a question as to why the power of the gas tested on the 2nd ult. at Halifax was 18.66 candles, and at Hipperholme only 15.03 candles, the Chairman of the Gas Committee (Mr. J. Collinson) pointed out that the illuminating power of gas varied considerably according to the weather conditions; and that in the transmission of gas such a distance as that from Halifax to Hipperholme there was a loss of at least 2 per cent. Halifax guaranteed to Hipperholme 14-candle power; and the average of the four tests given in the minutes was 15-candle power at Hipperholme and 17.68 candles at Halifax. The gas was enriched with benzol instead of cannel coal, which was very expensive; and with benzol the loss in transmission was greater than with cannel.

Torpoint Water Supply.—The question of the water supply was again under the consideration of the Torpoint District Council at their meeting last Thursday, owing to the receipt of a letter from the Local Government Board inquiring as to the present position of affairs relative to the proposed augmentation of the supply. The Water Committee recommended that a reply should be sent to the Board to the effect that an augmentation of the supply would involve obtaining parliamentary sanction and an outlay of at least £15,000; and that as the borrowing powers of the Council are only £22,424, and the present supply is continuous and satisfactory, the Council were of opinion that they would not be justified in incurring, nor was there any necessity for doing so, such a heavy expenditure on one project. The Council adopted the recommendation of the Committee, and instructed the Clerk to write to the effect indicated.

Chertsey Gas Company.—The report submitted at the annual meeting of the Chertsey Gas Company stated that the Directors had pleasure in reducing the price of gas from July last 3d. per 1000 cubic feet to consumers who used it for power only. The business of the Company during the past year had increased; and a further expenditure of capital had been found necessary for the completion of a new holder, extensions of the mains, &c. The maximum sliding-scale dividends of 12 and 9 per cent., less income-tax, were recommended on the different classes of shares. The Chairman (Mr. W. Moir) said the report was an excellent one; and there was a good prospect of maintaining these dividends and still leaving a good balance. After providing for the dividend, they had now a balance of £1615. The report was adopted; and the Secretary (Mr. John Moir) and the Manager (Mr. H. J. Hamilton) were thanked for their services.

Wellington Water Scheme.—A few days ago, Mr. H. Shelford Bidwell, a Local Government Board Inspector, conducted an inquiry in Wellington respecting an application by the Urban District Council to borrow sums amounting to £6400 for the purposes of water supply, including the execution of works in the parishes of Wellington Rural district and Wrockwardine, and the construction of a reservoir near the present Wrekin reservoir, with a capacity of 175,000 gallons. Mr. J. W. Littlewood (Clerk to the Council) said they required the loan in two sums of £5000 and £1400, the repayments to extend over a period of thirty years at least. A borehole was put down some time ago; but sanction for a loan for this had been held over until the Council had a more general scheme. The payments for the borehole were being made out of current rates; and the cost was between £600 and £700. A provisional agreement had been entered into with Lord Forester to purchase a small piece of land for filter-beds. Plans had been prepared by Mr. Riley, and approved by Messrs. Wilcox and Raikes. Mr. Riley gave a history of the matter, explaining that in summer there was generally a shortage of water, the reservoir being at times half-full in the dry season. They had complaints of a shortage of water supply in the higher parts of the districts; and then the borehole was made. This was sanctioned by the Local Government Board subject to the preparation of a complete scheme.

Tonbridge Council and the Gas Company.—Some weeks ago, the Tonbridge Gas Company complained to the Urban District Council that certain of the street-lamps had been left alight by the Council's employees after the metered lamps had been turned out; and subsequently a resolution was passed by the Council asking the Company to "withdraw the suggestion that the Council was a party to the abuse of confidence," which they thought was conveyed by the terms of the Company's letter. The Lighting Committee reported at the last meeting of the Council that they had received a letter from Messrs. Gorham, Warner, and Son, on behalf of the Gas Company, inviting (without prejudice) a Committee of the Council to meet the Directors, and discuss the question of lamp lighting and extinguishing. The Committee said they had instructed the Clerk to reply that until a withdrawal had been received with regard to the Directors' allegation that the Council or the Surveyor had been party to an abuse of confidence, it was impossible to consider the suggested meeting. The Clerk reported to the Council that a letter had since been received from Messrs. Gorham, Warner, and Son to the effect "that the Council might rest assured that neither now or at any time had their clients intended their letter to read that the members of the Council or the Surveyor were personally parties to an abuse of confidence." Mr. Gates said this letter arrived since the Committee met, and placed a different complexion on the matter. Mr. Clark thought the Council ought to have an apology in addition to the withdrawal. The Clerk reminded the Council that there was some little question as to the proper reading of the letter when it was before the Council; and he thought they could hardly ask for an apology. The Chairman said the letter was not now before the Council; it would come up at a future meeting. The report was adopted.

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The upkeep of mantles is very little & I consider the "Bland Light" is the best and most economical gas burner in the market.

Yours faithfully,
Wm Watson.

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63, Queen Victoria Street, LONDON, E.C.; and

20, Fennel Street, off Corporation Street, MANCHESTER.

Lambert Brothers (Walsall), Limited, was registered as a private Company last Tuesday, with a capital of £50,000, in 4000 shares of £10 each and 2000 shares of £5 each, to adopt an agreement with R. E. Lambert, the Rev. F. F. Lambert, I. C. Lambert, and H. M. Lambert, and to take over the business of engineers and tube makers carried on by the vendors at Walsall as Lambert Brothers.

The employees of the South African Lighting Association, Limited, had their annual King's Birthday entertainment in the Town Hall, Port Elizabeth, on the 10th ult., under the presidency of Mr. William Arnott, the Manager. A varied and interesting programme, which included some lantern views shown by Mr. Arnott, was gone through and greatly enjoyed. The entertainment was regarded by many as the best that had been held; and at its close a hearty vote of thanks was accorded to those who had provided it. During the evening, tea and other refreshments were served.

At a recent meeting of the Cardiff Technical Schools Committee, a discussion ensued relative to an application made by a number of gas-fitters employed at the gas-works to attend the plumbers' class. The local plumbers opposed the request on the ground that consent would lead to encroachments upon their trade. Mr. Lovat-Fraser suggested that a deputation should be appointed to wait upon representatives of the local Plumbers' and Gas-Fitters' Associations with a view of amicably settling the matter. On a division, it was decided by five votes to two to allow the gas-fitters what they asked for.

In the course of the proceedings at last Wednesday's meeting of the Liverpool City Council, Mr. Muspratt asked whether the current used for motors by the Corporation had only risen by 20 per cent., whereas the number of motors installed had increased by 50 per cent.; and, if so, whether this did not point to unnecessary installations in many cases. Sir Charles Petrie replied that the number of motors (with which were included radiators) in use in October, 1908, was 61, and in October, 1909, 94—an increase in number of 50 per cent. The power used in the month of October, 1908, was 6278 units; and in October, 1909, 7467 units—an increase of about 20 per cent. As the apparatus referred to was chiefly used for ventilating fans and heaters, the supply varied from time to time with the weather and the conditions under which the buildings in which the appliances were fixed were used.

The "Manchester Courier" stated, in a paragraph, early last week that during the last few days two cargoes of German coke had been landed at the Millom Iron-Works pier from Flushing. This coke was for use in iron smelting at the Millom Iron-Works. "It was reported," added our contemporary, "about a fortnight previously that a contract had been fixed up by West Coast smelters for 10,000 tons of German coke at 2s. per ton delivered less than East Coast coke could be obtained for. At present, Darlington coke is running from 21s. to 22s. 6d. per ton delivered. Most of the coke used on the West Coast is from the Durham ovens; and it has to pass over three systems of railway—the North-Eastern, the London and North-Western, and the Furness Railways. The carriage is high; and this has been a handicap to the trade on the West Coast for years. German coke has been used before with satisfactory results."

APPLICATIONS FOR LETTERS PATENT.

- 27,043.—YARROW, M., "Manufacture of retorts." Nov. 22.
 27,085.—CHIPPERFIELD LAMP SYNDICATE, LTD., and BROWNING, E. M., "Governing gas." Nov. 22.
 27,157.—WHITTAKER, E., "Extraction of tar or other impurities from coal gas." Nov. 23.
 27,158.—WHITTAKER, E., "Cooling and washing coal or other gases." Nov. 23.
 27,178.—KRICHBAUM, W. F., "Pressure regulators." Nov. 23.
 27,220.—AKT.-GES. BROWN, BOVERI, ET CIE., "Gas-turbines." Nov. 23.
 27,267.—E. DE LA BROUSSE ET FOUCHE, "Gas-turbines." Nov. 23.
 27,278.—OFENBAU G. M. B. H., "Gasholder." Nov. 23.
 27,280.—COLBRAN, J. B., "Inverted globe-holders." Nov. 23.
 27,281.—COLBRAN, J. B., "Casings for inverted lamps." Nov. 23.
 27,291.—GIBBONS BROS., LTD., MASTERS, R., and VAN MARLE, M., "Vertical retorts." Nov. 23.
 27,310.—CHANEY, W., "Manufacture of gas." Nov. 24.
 27,311.—GIBBONS BROS., LTD., MASTERS, R., and VAN MARLE, M., "Refractory bricks and the construction of the walls of vertical gas-retorts, gas-regenerators, &c., with same." Nov. 24.
 27,325.—HILGER, E., and POETTER G. M. B. H., "Gas-producers." Nov. 24.
 27,344.—GES. FÜR VERWERTUNG CHEMISCHER PRODUKTE M. B. H., "Bunsen burner with automatic air regulation." Nov. 24.
 27,351.—LAMPOUGH, F., "Exhauster." Nov. 24.
 27,381.—LEVY, A., "Inverted incandescent burner for acetylene." Nov. 24.
 27,420.—STEWART, J. & W., "Gas-producers." Nov. 25.
 27,428.—BAILEY, W., and CO., LTD., and BAILEY, W., "Connecting pipes." Nov. 25.
 27,437.—JACKSON, M., "Generating acetylene." Nov. 25.
 27,450.—SIMMANCE, J. F., and ABADY, J., "Vacuum and pressure gauges." Nov. 25.
 27,472.—FALK, STADELMANN, AND CO., LTD., "and CHARLES, W. J., "Holding globes." Nov. 25.
 27,482.—METAL JOINTING CO., LTD., and HARDEN, T., "Expansion device for lead pipes." Nov. 25.
 27,517.—HOOK, W. A. B., "System of charging and gas manufacture." Nov. 26.
 27,518.—BATES, A., "Inverted burners." Nov. 26.
 27,519.—BATES, A., "Incandescent gas-burners." Nov. 26.
 27,522.—WILLS, C. E., "Gas stoves and ranges." Nov. 26.
 27,533-4.—NICHOLSON, V. R., "Internal-combustion engines." Nov. 26.
 27,567.—LACHNER, M., "Gas-stoves." Nov. 26.

PARKINSON

GAS-HEATED

Steam Radiators

ARE

UNEXCELLED

FOR THE

Efficient and Economical Heating of

CHURCHES, SCHOOLS,

PUBLIC BUILDINGS,

SKATING RINKS,

SHOPS, &c., &c.

EXTRACT FROM LETTER JUST RECEIVED:—

"The Radiators which I fixed in the Wesleyan Chapel and Schools are giving the **greatest satisfaction**. Any inquiries you have refer to me, and I will refer them to the Chapel Committee, from whom they will get the **greatest praise**. They are at present recommending them to the Baptist Church. . . Other Radiators in the town fixed in offices, &c., are all giving satisfaction."

YOUR INQUIRIES WILL BE ESTEEMED.

THE PARKINSON STOVE CO.,^{LTD.}

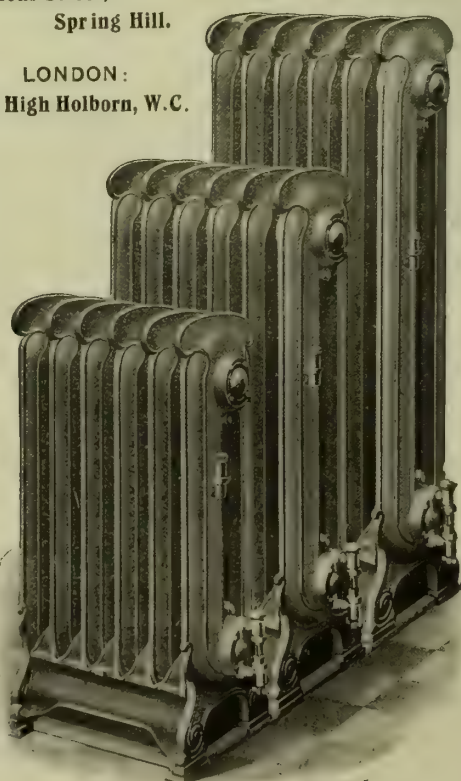
(Incorporating Maughan's Patent Geyser Co.)

BIRMINGHAM:

Stour Street,
Spring Hill.

LONDON:

129, High Holborn, W.C.



In reply to a question in the Liverpool City Council, Sir Charles Petrie stated that the amount expended to date on the Fazakerley Gas-Works was £15,877.

The action which the Automatic Light Controlling Company, Limited, commenced against a French firm for infringement of their patents has been settled; the manufacturers having purchased their patent rights and paid their costs.

The Ilford Gas Company held their annual whist drive and social on Thursday evening last, when nearly a hundred members of the staff and friends spent a very enjoyable evening. Mr. W. B. Farquhar, the Engineer and Manager of the Company, presented the prizes.

As a result of an electric cable fusing in Spencer Street, Birmingham, last Wednesday morning, a number of jewellers and other manufacturers in the immediate neighbourhood were for about an hour-and-a-half inconvenienced by the cutting off of the electric power. About seven o'clock, a police constable noticed that some 8 feet of the pavement had been forced up, and smoke was issuing from the crevices between the bricks in dense clouds. A number of workmen were promptly despatched to repair the damage; and as soon as the top layer of bricks was removed, the smouldering cable burst into flame, which, however, was quickly extinguished. Fortunately no personal injury was sustained.

A Local Government Board inquiry has been held at Burnley into an application by the Corporation to borrow £7500 for the provision of gas-meters. It was stated that it was proposed in future to instal five-light instead of three-light meters, charging the difference in cost to capital account.

With reference to the issue of £30,000 of new stock (1881) of the Brentford Gas Company which has been announced during the past few weeks in our advertising columns, our readers are reminded that 10 a.m. to-morrow week (the 15th) is the latest time for the receipt of tenders (which must be sent direct to the Company's offices at Brentford), and that applications may be made for sums of £10 or multiples thereof. The present price on the Stock Exchange for the existing stock of this class is £191.

We notice with satisfaction that the Reading Gas Company are inserting in a prominent position in the local Press extracts from letters (the originals of which are open to the inspection of any of the Gaslight and Coke Company's consumers) received from well-known medical men expressing approval of gas-fires. These should prove useful in removing such prejudice on the subject of gas heating from a hygienic point of view as may still linger in the minds of imperfectly informed persons. The Reading Gas Company are at the present time fixing from forty to fifty gas-fires a week.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situation Vacant.

UNDER MANAGER (Gas-Stove Works). No. 5160.

Situations Wanted.

COMMERCIAL MANAGER. "K 672," c/o Keith and Co., Edinburgh.
DISTRIBUTING ENGINEER (Pushing the Sale of Gas). No. 5162.
SECRETARY, MANAGER, AND ACCOUNTANT. No. 5115.

Lectures.

GAS MANUFACTURE AND BYE PRODUCTS COKING PROCESSES. Leeds University.

Plant, &c. (Second-Hand), for Sale.

EXHAUSTERS AND ENGINES. Oldham Gas Department. Tenders by Dec. 21.
AIR GAS PLANT (150-Burner). No. 5161.
COMPLETE GAS-WORKS, &c. Mr. Henry Gibbings, North Tawton, Devon. Tenders by Dec. 20.
GAS OR AIR COMPRESSOR. Snell, Coventry.

Stocks and Shares.

BRENTFORD GAS COMPANY. Dec. 15.

Meeting.

WEST HAM GAS COMPANY. Liverpool Street Hotel, Dec. 21, 12.30 o'clock.

TENDERS FOR

Fire-Clay Goods.

BRADFORD CORPORATION. Tenders by Dec. 16.
COWES GAS DEPARTMENT.
LEEDS GAS DEPARTMENT. Tenders by Dec. 18.
LEICESTER GAS DEPARTMENT. Tenders by Dec. 11.
SALFORD GAS DEPARTMENT. Tenders by Dec. 16.

General Stores—

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY. Tenders by Dec. 28.

Pipes, &c.

LEICESTER GAS DEPARTMENT. Tenders by Dec. 11.

Retort Mouthpieces.

SHEFFIELD GASLIGHT COMPANY. Tenders by Dec. 21.

Tar, &c.

BRIDGEWATER COLLIERIES COKE WORKS. Tenders by Dec. 21.

Steel Roofs, &c.

SHEFFIELD GASLIGHT COMPANY. Tenders by Dec. 21.

Sulphuric Acid.

DEAL AND WALMER GAS COMPANY. Tenders by Dec. 14.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to
WALTER KING, II, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

LUX'S GAS PURIFYING MASS.

See Advertisement on p. 649.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, Oldham, and 54 & 47, Westminster Bridge Road, London, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams:—"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

DONALD M'INTOSH,

110, CANNON STREET, LONDON.

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd., NYMEGEN, HOLLAND.

General Manager (for England and Wales)—

CHARLES E. FRY, LEAMINGTON,

General Manager (for Scotland)—

J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEEDS.
Correspondence invited.

OXIDE OF IRON.

(NATURAL.)

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.

with which is amalgamated WM. PEARCE & SONS, LTD.
86, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 341 AVENUE.

TAR WANTED.

Telephone: Central Manchester, 7002.

Telegrams: "UPRIGHT."

Apply, THOMAS HORROCKS

Albert Chemical Works, BRADFORD,
MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
and ELEVATING and CONVEYING PLANT, ROSE
MOUNT IRON-WORKS, ELLAND.

KRAMERS AND AARTS WATER- GAS PLANT.

K. & A. WATER-GAS COMPANY, LTD.
89, VICTORIA STREET, S.W.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
WAKEFIELD, AND SUNDERLAND.

METER INDICES

WITH AND WITHOUT DIALS.

A. ROUX & CO., Limited,
9, SOUTHAMPTON STREET, HOLBORN, W.C.
MOVEMENTS FOR CLOCKS, PHOTOMETERS AND
BAROGRAPHS, WHEELS, PINIONS, AND WORMS.
WORKS, HANDSWORTH, BIRMINGHAM.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
WAKEFIELD, AND SUNDERLAND.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS
ACT, and Decisions thereunder," 1s.; "TRADE
SECRETS v. PATENTS," 6d.; "DOCTRINE OF
EQUIVALENTS, Mechanical and Chemical," 6d.;
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MEWBURN, ELLIS, & PRIOR, Chartered Patent
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-
grams: "Patent London." Telex: 1030. No. 243 Holborn.

"NUGEPE" GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.

For all Joints in connection with Oil-Gas Plant
and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL,
LONDON, E.C., and 25, BRIDGE END, LEEDS.

AMMONIA.
Consumers in any form are invited to correspond
with CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.

APPLY TO THE

CHAIN BELT ENGINEERING CO.,
DERBY, ENGLAND,

FOR REALLY RELIABLE

ELEVATORS AND CONVEYORS

ALSO

DRIVING AND CONVEYOR CHAINS.

SULPHURIC ACID for Sale, specially
suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers,
Works: BIRMINGHAM, LEEDS, WAKEFIELD, AND SUNDER-
LAND.

"GAZINE" (Registered in England and
Abroad). A radical Solvent and Preventative
of Naphthalene Deposits, and for the Automatic
Cleaning of Mains and Services.

It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West
Moor Chemical Works, KILLINGWORTH, or through his
Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-
TYNE.
Telegrams: "Doric," Newcastle-on-Tyne. National
Telephone No. 2497.

GAS OILS.

MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Re-
fineries in America; also Petroleum Spirit for Gas
Enrichment. 18, EXCHANGE STREET, MANCHESTER, and
11, OLD HALL STREET, LIVERPOOL.

GAS PLANT for Sale—We can always
offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

W. EDGAR, Blenheim Works,
Hammersmith.
GAS APPARATUS MANUFACTURER
AND CONTRACTOR.
Telegrams: "GASOSO LONDON." Telephone: 14 HAMMERSMITH.

AMMONIACAL Liquor wanted.
CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

"HALLITE" Asbestos High-Pressure
Sheeting.
HALLITE DOUGLAS, LIMITED, 106, Leadenhall Street,
LONDON, E.C.

"FORTO" Incandescent Gas Mantles
Combine Brilliancy and Strength. British
Made. Send for List.
ISAAC EALES AND CO., Howard Street, BIRMINGHAM.
Telephone: Central, 5623.

WARNER & VAN DER BIESEN,
ZWOLLE, HOLLAND.
DIGGERS AND SUPPLIERS OF THE
FINEST DUTCH BOG-ORE.
(Natural Oxide of Iron.)

Best Percentages. For lowest Quotations to any Port,
Station, or direct into Works, please apply to—
LONDON OFFICES: 6, LEATHER LANE, E.C.

JOHN RILEY & SONS, Chemical Manu-
facturers, Hapton, near Accrington, are MAKERS
of Special SULPHURIC ACID, for Sulphate of Am-
monia Making. Highest percentage of Sulphate of
Ammonia obtained from the use of this Vitriol, which
has now been used for upwards of 50 Years. References
given to Gas Companies.

J. E. C. LORD, Ship Canal Tar Works,
Weaste, Manchester. Pitch, Creosote, Benzols,
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
Carbolic Acid, Sulphate of Ammonia, &c.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER
WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Re-
pairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS,
BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND
CONTRACTORS,
18 & 20, FARRINGTON ROAD, LONDON, E.C.
Telegrams: "DAGOLIGHT LONDON." Telephone: 2836 HOLBORN.

FIDDES-ALDRIDGE
SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges
at One Stroke.

See Advertisement, Nov. 9, p. III. of Centre.
ALDRIDGE AND RANKEN,
89, VICTORIA STREET, WESTMINSTER, S.W.
Telegrams: "MOTORPATHY, LONDON." Telephone: 5118 WESTMINSTER.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of
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Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY,
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Do you appreciate how much success
depends on well-considered and lucid present-
ment of your qualifications? I make a Speciality of the
preparation of Applications, and am continually re-
ceiving Complimentary Letters from clients.
Write now for Particulars.
HERBERT GREATORREX, Hackney, MATLOCK.

MR. W. B. MIMMACK, for many years
Secretary, Manager, and Accountant of the Crays
Gas Company (111 Millions), now in Amalgamation,
seeks APPOINTMENT in any or all of these Offices.
Address No. 5115, care of Mr. King, 11, Bolt Court,
FLEET STREET E.C.

GENTLEMAN, Energetic and Capable,
with Extensive Business and Travelling Expe-
rience, desires position as COMMERCIAL MANAGER.
Thorough Knowledge of Gas and Water Fittings and
General Ironmongery. Only responsible Position in
Sound Concern with Satisfactory Remuneration Ac-
cepted. Principals only dealt with.
Address "K 672" Keith and Co., EDINBURGH.

THE UNIVERSITY OF LEEDS.
(DEPARTMENT OF FUEL AND GAS ENGINEERING.)
ARRANGEMENTS are being made for
the Delivery of the following SPECIAL COURSES
of LECTURES, open to all Persons engaged in either
of the Industries concerned.
(a.) THE MANUFACTURE OF COAL GAS—Twenty Lec-
tures by Dr. Harold G. Colman, of London, on
Wednesdays, at Six p.m., and Thursdays, at Nine
a.m., during Ten Consecutive weeks com-
mencing Wednesday, Jan. 12, 1910. Fee £1 1s.
(b.) BYE-PRODUCTS COKING PROCESSES—Eight Lec-
tures by Mr. Ernest Bury, M.Sc., of the Brackley
Coke-Works, near Bolton, Lancs., on Satur-
days, at Three p.m., commencing Jan. 15, 1910.
Each Lecture to be followed by a Class for
Discussion. Fee £1 1s.
Intending Students are requested to send in their
names without delay to the Registrar of the University,
from whom further Particulars may be obtained.
W. F. HUSBAND,
Registrar.

INCREASE THE SALES OF GAS.
DISTRIBUTING Engineer, Competent
in Successful Details of above, is open to a
TEMPORARY ENGAGEMENT. Qualified to deal with
all Technicalities of Gas Supply, likewise with any
Opposition whatsoever to its many Uses; also to Educate
Consumers in the Correct Use of Modern Appliances,
assuring Satisfaction and Permanent Business. Dis-
tricts and Methods of Working Inspected and Reported
upon. Correspondence invited.
Address No. 5162, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

GAS STOVE AND RADIATOR WORKS.
UNDER Manager Wanted. Must have
thorough up-to-date Experience of Design and
Construction. Good Salary. State, in Confidence, all
Particulars and Testimonials. Only reliable Applica-
tions considered.
Apply, by letter, to No. 5160, care of Mr. King, 11,
Bolt Court, FLEET STREET, E.C.

CAST-IRON Pipes. Spigot and Socket
or Flanged. Special Quality—9 feet or 12 feet
Lengths. When buying, Write us.
A. LOWCOCK, Limited, SHREWSBURY.

GASHOLDERS—Splendid, 45 feet dia-
meter, and New STEEL TANK fixed complete,
to Plan and Specification. Also 50 feet Single-Lift
and 50 feet Double-Lift. Cheap, with STEEL TANKS.
Can be seen temporarily erected.
FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

PIPES—Stock of 4-inch Cast-Iron Spigot
and Socket PIPES at Manchester (new). Coated
with Dr. Smith's Composition. Special Low Price to
Clear.
Address No. 5157, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

FOR SALE—Power-Driven Blower Gas
or Air COMPRESSOR, with Regulating Holder
by the Keith and Blackman Company. Perfect Order.
For full Particulars, Apply to SNELL, 38, Binley Road,
COVENTRY.

FOR SALE—One 150-Burner National
Air-Gas Company's PLANT. Nearly New and
in Good Order. Has been little used. Can be seen in
London on Application.
Address No. 5161, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

THE Oldham Corporation Gas Com-
mittee have for DISPOSAL Two 60,000 Cubic Feet
per hour EXHAUSTERS (Anderson's), with STEAM-
ENGINES combined. First-Class Condition.
Particulars may be obtained from Mr. A. Andrew,
General Manager, Gas Office, Oldham.
Offers to be sent not later than Tuesday, Dec. 21,
1909.

By order,
J. H. HALLSWORTH,
Town Clerk.
Oldham, Dec. 2, 1909.

COWES URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for
Fourteen 21 in. by 15 in. Oval and Four 16 inch
Round RETORTS, together with other FIRE-CLAY
GOODS.
Specification and Form of Tender to be obtained
from the undersigned.
The lowest or any Tender not necessarily accepted.
E. H. MILLARD,
Engineer and Manager.

Gas-Works, Cowes,
Nov. 30, 1909.

TO RETORT MANUFACTURERS.
THE Bradford Corporation are pre-
pared to receive TENDERS for the Supply of
GAS-RETORTS and of FIRE-BRICKS and FIRE-
CLAY required in the fixing of such Retorts, during
the Year 1910.
Form of Tender may be obtained on Application to
Mr. Chas. Wood, Gas Engineer, Town Hall, Bradford.
Tenders, endorsed "Tender for Retorts," to be sent
to me so as to arrive on or before Thursday, the 16th of
December.

The Contract will be let subject to the Fair Con-
tracts Clauses of the Corporation, which may be seen
at the Town Clerk's Office, and which the accepted
Contractor will be required to sign.
The lowest or any Tender will not necessarily be
accepted.

FREDERICK STEVENS,
Town Clerk.
Town Hall, Bradford,
Nov. 27, 1909.

DEAL AND WALMER GAS COMPANY.

THE Directors invite Tenders for the Supply of SULPHURIC ACID, for the Manufacture of Sulphate of Ammonia, during One or Three Years from the 1st of January, 1910. Specific Gravity to be stated. The Acid to be delivered free to Deal Station—Sellers to pay carriage on returned empty Carboys. Estimated Yearly Quantity, 65 Tons. Latest Day for Tenders, Dec. 14.

The Directors do not bind themselves to accept the lowest or any Tender.

J. J. WILLIAMSON,
Secretary.

Gas Offices, Deal,
Dec. 1, 1909.

COUNTY BOROUGH OF SALFORD.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply of RETORTS, FIRE-BRICKS, &c., required at their various Works.

Full Particulars may be obtained on Application to Mr. William W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Fire-Clay Goods," to be delivered to me not later than Three p.m. on Thursday, the 16th of December, 1909.

L. C. EVANS,
Town Clerk.

Salford.

BRIDGEWATER COLLIERIES COKE-WORKS.

(THE EARL OF ELLSMERE.)

TENDERS are invited for the Tar produced at the above Works for a period of Six or Twelve Months from the 1st of January, 1910, delivered into Contractor's Tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley Branch of the Lancashire and Yorkshire Railway; or at the Brackley Siding, Little Hulton Mineral Branch, of the London and North-Western Railway.

The estimated quantity is about 2600 Tons per Annum. Tenders, endorsed "Tender for Tar," to be addressed to Mr. THOMAS M. BROWN, Bridgewater Coal Offices, 4, Chapel Walks, MANCHESTER, not later than the 21st of December.

Manchester, Dec. 7, 1909.

LEEDS CORPORATION GAS-WORKS.

THE Gas Committee are prepared to receive TENDERS for the Supply of FIRE-CLAY RETORTS, FIRE-BRICKS, FIRE-BRICK LUMPS, and FIRE-CLAY.

Specification and Form of Tender may be obtained on Application to the undersigned.

Tenders, endorsed "Fire-Clay Goods," addressed to the Town Clerk, Town Hall, Leeds, must be delivered not later than Saturday, the 15th inst.

The Committee do not bind themselves to accept the lowest or any Tender.

R. H. TOWNSLEY,
General Manager.

Gas Offices, East Parade,
Leeds, Dec. 4, 1909.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS from Iron-Founders, Gun-Barrel Manufacturers, Timber Merchants, Druggists, Rope Makers, &c., for GOODS to be delivered on the Company's Works, Great Brunswick Street, in such Quantities as may be required from time to time up to Dec. 31, 1910.

Samples of Goods required are open to inspection on the Works, Great Brunswick Street; and a Printed List of the Articles required can be had on Application to the Company's Offices, D'Olier Street.

Tenders, endorsed "Tenders for Stores," to be lodged in my Office on or before the 28th inst.

FRANCIS T. COTTON,
Secretary and Manager.

Head Offices; D'Olier Street,
Dublin, Dec. 4, 1909.

CORPORATION OF LEICESTER.

RETORTS AND FIRE-BRICKS.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the Supply and Delivery of RETORTS and FIRE-BRICKS for the Year 1910.

Specification, Quantities, and Form of Tender, can be obtained upon Application to the Engineer.

Tenders, addressed to Mr. Councillor Jennings, Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Dec. 11, 1909.

The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.

Offices: Millstone Lane,
Leicester, Dec. 1, 1909.

CORPORATION OF LEICESTER.

CAST-IRON PIPES.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the Supply and Delivery of the necessary CAST-IRON PIPES and CONNECTIONS, from 2 to 36 inches in diameter, required during the Twelve Months ending the 31st of December, 1910.

Specification and Form of Tender can be obtained upon Application to the Engineer.

Tenders, addressed to Mr. Councillor Jennings, Chairman, and endorsed "Tender for Pipes, &c.," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Dec. 11, 1909.

The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.

Offices: Millstone Lane,
Leicester, Dec. 1, 1909.

TO IRON FOUNDERS AND IRON ROOF CONTRACTORS.

STEEL ROOF.

THE Directors of the Sheffield United

Gaslight Company invite TENDERS for the Supply and Erection of a STEEL ROOF, 304 ft. long by 105 ft. 6 in. wide, in two spans of 71 ft. and 33 ft. 6 in., forming the roof over their No. 3 Retort-House at Neepsend Works.

RETORT MOUTHPIECES.

Also for the Supply and Delivery only of 252 RETORT MOUTHPIECES 24½ in. by 16½ in., Δ shape, fitted with Self-Sealing Lids.

Drawings may be seen, and Bill of Quantities with Specification and Form of Tender obtained, upon Application to the Company's Engineer, Mr. J. W. Morrison.

The Directors do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Tender for Roof," or "Tender for Mouthpieces," must be delivered by post to Mr. Hanbury Thomas, Managing-Director, not later than the first post on Tuesday, the 21st day of December.

WM. HAMBY,
Secretary.

Commercial Street, Sheffield,
Dec. 1, 1909.

NORTH TAWTON, DEVON.

IMPORTANT SALE OF FREEHOLD
GAS-WORKS, &c., &c.

To be Sold by Private Contract from

the 31st of December next, as a Going Concern, all that Valuable Property known as the "NORTH TAWTON GAS-WORKS, &c.," including all Stock-in-Trade, Mains, Services, Meters, 27 Public Lamps, 16 Stoves on Hire, and Three others in Stock, Piping and other Gas Requisites, with all Gas, Coal, Coke, and Tar remaining on the Premises at that date.

Further Particulars may be obtained from the owner Mr. HENRY GIBBINGS, NORTH TAWTON, to whom Sealed Tenders should be sent on or before the 20th of December next.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of the Company, so far as they relate to DEBENTURE STOCK, WILL BE CLOSED from the 13th to the 20th of December, 1909, both days inclusive.

The Interest for the Half Year to Dec. 31, 1909, will be payable on the 1st of January to the Proprietors Registered on the closing of the Books.

By order of the Board,

E. TOPLEY,
Secretary.

Chief Offices of the Company:
639, High Road, Tottenham,
Dec. 4, 1909.

WEST HAM GAS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of the Company, so far as they relate to DEBENTURE STOCK, WILL BE CLOSED during Friday, the 17th of December inst., for the preparation of the Interest Warrants for the Half Year ending the 31st of December, 1909, and will be RE-OPENED the next day for the ensuing Half Year.

A. G. SNELGROVE,
Secretary.

Gas-Works, Stratford, E.,
Dec. 1, 1909.

WEST HAM GAS COMPANY.

NOTICE is Hereby Given, that a SPECIAL GENERAL MEETING of the Proprietors of this Company will be held at the Abercorn Rooms, Liverpool Street Hotel, E.C. (Bishopsgate Street entrance), on Tuesday, the 21st day of December, 1909, at 12.30 p.m. o'clock precisely, to receive a report from the Directors of their proceedings during the Current Half Year.

By order of the Board,

A. G. SNELGROVE,
Secretary.

West Ham Gas-Works,
Stratford, E., Dec. 4, 1909.

HORLEY DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of the Company, so far as they relate to DEBENTURE STOCK and MORTGAGE DEBENTURES, WILL BE CLOSED at Ten o'clock in the Forenoon on Tuesday, the 7th day of December, 1909, for the Half Year ending the 31st of December, 1909, and will be RE-OPENED on Tuesday, the 14th day of December, 1909.

The Interest Warrants for the Half Year will be posted on the 31st of December, 1909, to the Proprietors Registered at the closing of the Books.

By order of the Board,

R. SEYMOUR TOBEY,
Secretary.

Offices: Station Road, Horley,
Surrey, Dec. 1, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

BRENTFORD GAS COMPANY.

SALE BY TENDER OF £30,000 NEW STOCK, 1891.

IN pursuance of the Brentford Gas

Order, 1891, Notice is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £30,000 of NEW STOCK, 1891, of the Company, to be paid up in full on or before the 15th day of January, 1910; such Stock being a portion of Additional Capital Authorized to be raised by Resolutions passed at an Ordinary Meeting of the Proprietors held on the 11th day of February, 1899, under the powers of the above-mentioned Order.

Particulars and Conditions of Tender may be obtained on Application at this Office; and Sealed Tenders must be sent in not later than Ten o'clock on the Morning of Wednesday, the 15th day of December next.

By order,

WILLIAM MANN,
Secretary.

Office: Brentford Gas Company,
Brentford, Nov. 1, 1909.

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Highest Results in Gas, & Excellent Coke.

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NEWBATTLE COLLIERIES,**NEWTONGRANGE, MIDLOTHIAN.****ALL the
BOYS CALORIMETERS**

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Above the Average in Weight and Quality
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Owners of the Birtley Iron Works and
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Makers of Cast-Iron PIPES and CONNECTIONS for Gas, Water, Steam, Electrical, Sanitary, and other purposes; also TANKS, COLUMNS of every description, Hydraulic, Gas, and Colliery PLANT, &c.

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CAST-IRON PIPES FOR GAS, WATER, & STEAM,
also VALVES of all descriptions.
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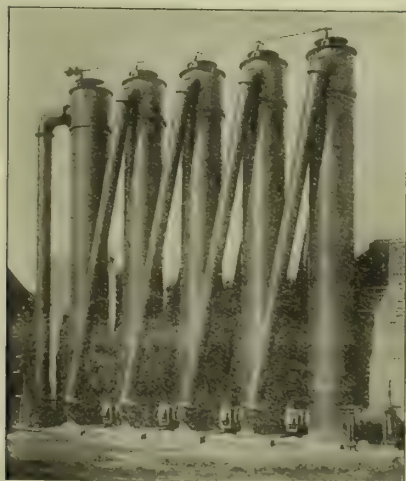
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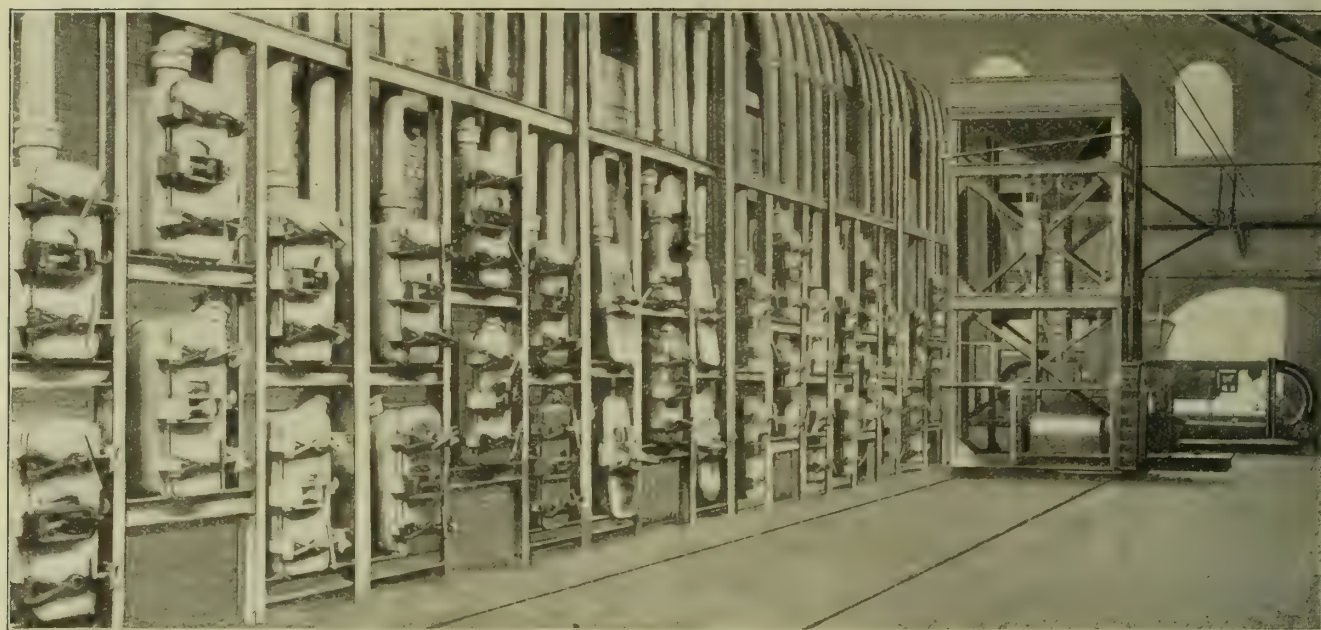
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OPERATING COSTS considerably lowered owing to greatly reduced number of operations.

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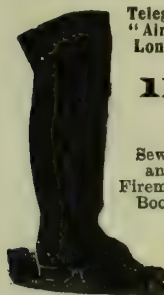


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Reference can be given to several Works where Regenerators are still working after a life of 10 to 15 Years.

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The Inverted Burner has met with great success, but it has by no means

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The Lucas Light was the first and original self-intensive high-power lamp, and its steady sale to-day proves its value.

200, 400, and 700-candle power from a single mantle, with gas at its usual pressure, and with the lowest consumption on record.

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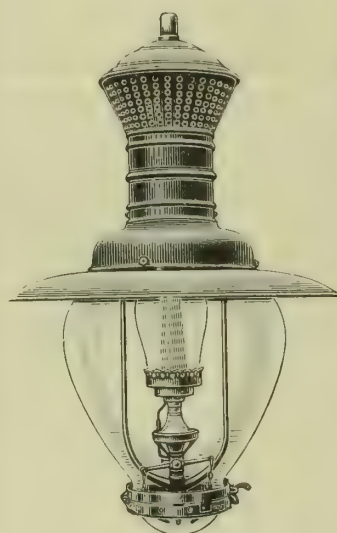
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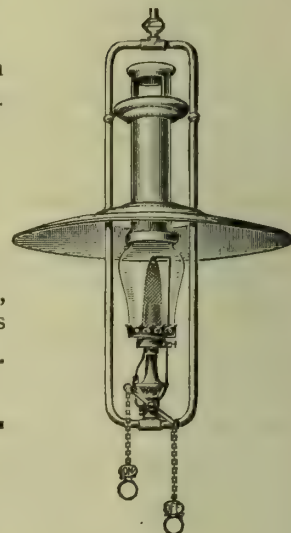
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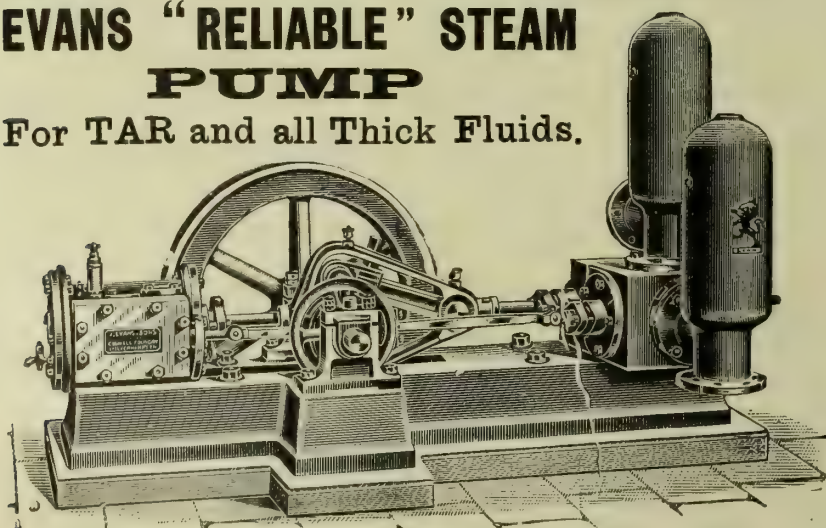
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AND
NAPHTHALENE REMOVER.

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ROBERT DEMPSTER & SONS,
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ELLAND, Yorks.

MAIN LAYING.

Paper by PERCY GRIFFITH, M.Inst.C.E., and BRUCE MCGREGOR GRAY, Assoc.M.Inst.C.E., before the Association of Water Engineers.

A. The Authors used *Flanged Pipes* for the Rising Main up the Steep side of the Barff, and their experience proved that this was not an advantage, as the rigidity of the Joints involved considerable difficulty in regard to the depth of the Trench, and a good deal of Cutting to make the final Connections at each end of the Pipe-Line.

B. In the case of the Delivery Main, the Joints were *Ordinary Socket Joints*, but made with Lead only. The only difficulty met with here was the necessity for pouring the Lead in at a suitable temperature to prevent it melting the Solid Lead Fillet, and running through into the Pipe.

C. In some of the Smaller Branch Connections, Lead Wool was used, and proved highly successful.

Particulars from

THE LEAD WOOL CO., LTD., SNODLAND, KENT.

ALL PREVIOUS RECORDS BROKEN (See below)

SPENCER'S PATENT HURDLE GRID

The very best Patent Grid on the Market for Holding Oxide Lightly.

IT IS THE FIRST AND THE ORIGINAL DEEP GRID INVENTED.



It is acknowledged by all the leading Gas Managers, that breaking up the Material, and suspending same in the Purifier as it were is the most practical of any system yet made use of.

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And the price of Hurdle Grids is very little more than Flat Grids, and do Three times the work, besides reducing back pressure on the Purifiers more than half.

The Hurdle Grids save their cost in less than 3 Years, and they can be fitted to any kind of Purifier.

The first of a Set of Six Purifiers, 20 feet square, fitted with Spencer's Patent Hurdle Grids. Started Feb. 7, 1906, and run until May 27, 1907, having passed 149,266,000 feet. The Oxide was quite loose and easy to empty. Also over 600 Purifiers have been fitted with these Grids in less than Three-and-a-Half Years. Hundreds of References can be had on Application. Send for Catalogue to—

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INVERTED BURNERS.



No. 3 "DARWIN." 3½ in. Fitting.

Have been remodelled, and we now offer you

BETTER BURNERS

AT

REDUCED PRICES

And guarantee the highest finish and Workmanship.

Independent Test by a well-known Gas Manager of
No. 3 Burner.

CONSUMPTION . . . 3.55 ft.
of Gas at 15/10ths Pressure,

CANDLE POWER . . . 122.76

These figures speak for themselves.

Breakage of Mantles and

MAINTENANCE CHARGES

Reduced to a minimum.

Made in 3 SIZES and 8 PATTERNS

BY

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A FACT!

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IN THE SAME TOWN.

DATA GIVEN.

COALEXLD LTD., LANCASTER.

PROFESSOR DR. STRACHE,
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RAISES the Calorific Value up to 3000 Calories.

REDUCES the CO₂ Contents to 2 per cent.

INCREASES the Capacity of the Unit-Time.

DIMINISHES the Steam Consumption.

INCREASES the Yield.

AUTOLYSATORApparatus for Use in Heating-Plants of All Kinds, registering continuously and visibly the CO₂.**GASOSCOPE**

Apparatus serving to Find out the Leakage in Gas-Mains.

Representative for England:—G. PETTIGREW, THORNABY-ON-TEES, ENGLAND.

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Employed in the Manufacture of
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for WATERWORKS Etc.

ARROL-FOULIS

Stoking Machinery

HYDRAULIC COKE PUSHERS

(HUNTER and BARNETT'S PATENT).

WILL DISCHARGE A RETORT IN ONE OPERATION

LARGE NUMBERS IN USE.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,
GLASGOW.

[See Illustrated Advertisement, No. 16, p. 42.]

Welsbach

LIGHT

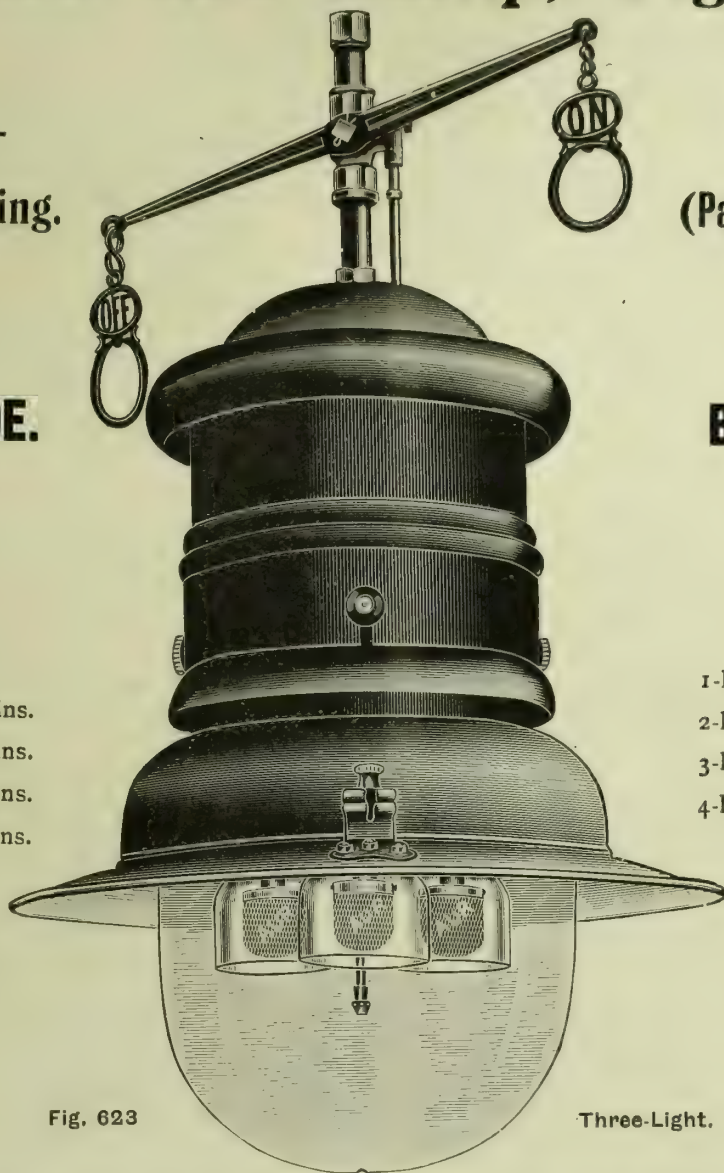
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

Fig. 623

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52 6	6/- extra.
2-light	8 feet	260	47 6	6/- extra.	4-light	16 feet	550	72 6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	29 3 6
" " " In Case lots per dozen.	19 6	57 9	57 9	93 -	Parabolic Reflector, extra	"	3 6	6/-	7 6
Case contains	80	18	18	12	Welsbach Mantles, each	6d.	subject as usual.		

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,
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Telephone 2410 NORTH.

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MAXIMUM EFFICIENCY GUARANTEED.

Inspection of Working Plants Invited.

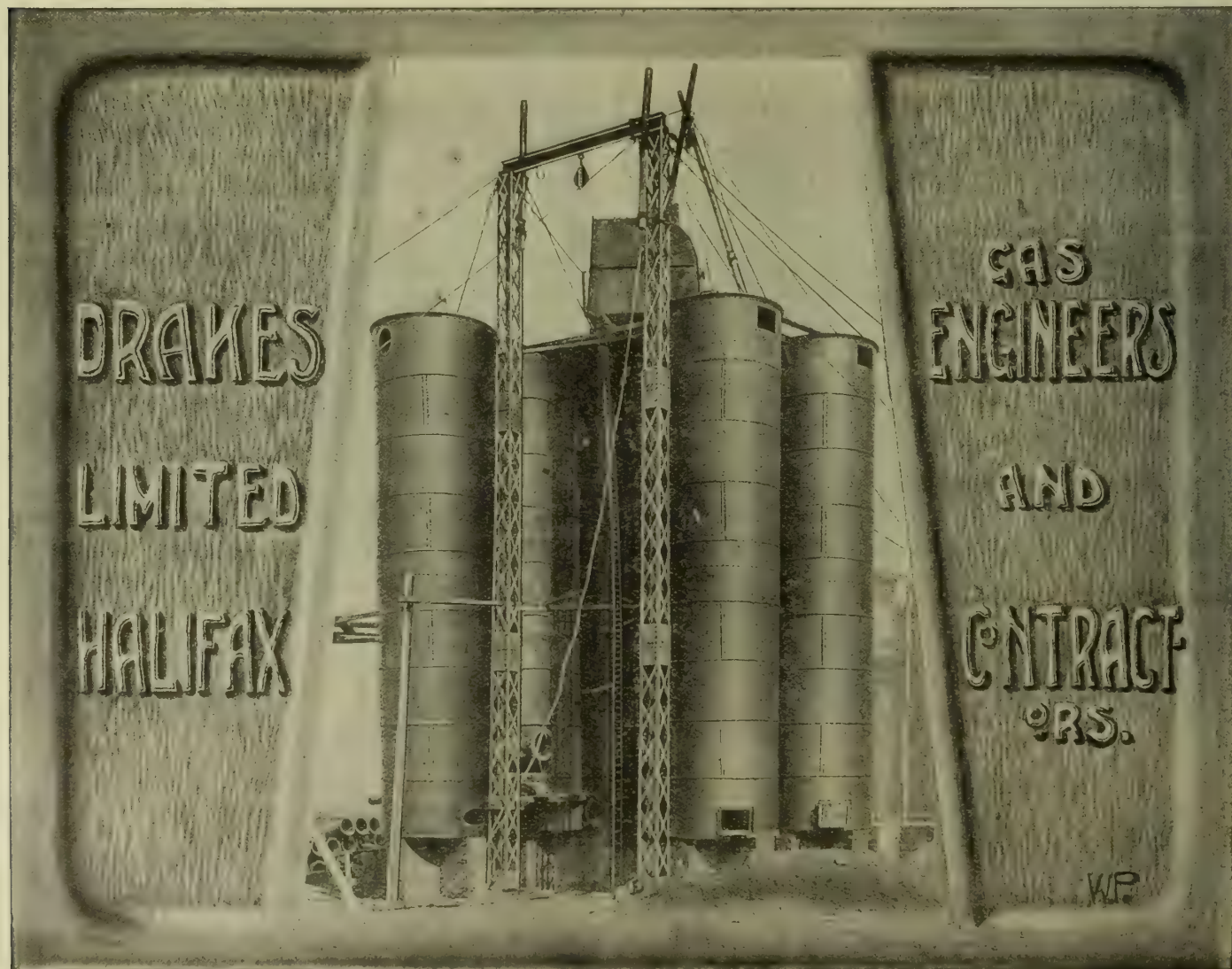
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Memo.

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are receiving large repeat orders for Home and Abroad for
their special quality of Gas Retorts, Fire-Bricks, &c.





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Prevents Stopped Ascension Pipes.

"The Cost is moderate and can be saved in a Single Season."

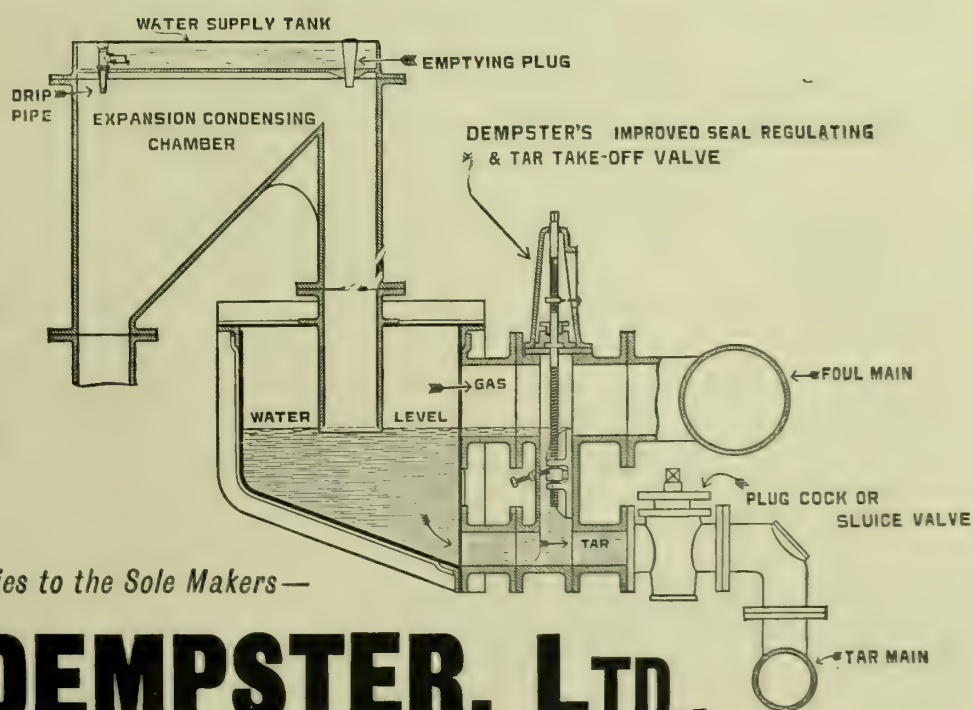
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"It will pay you to try them upon troublesome Pipes."

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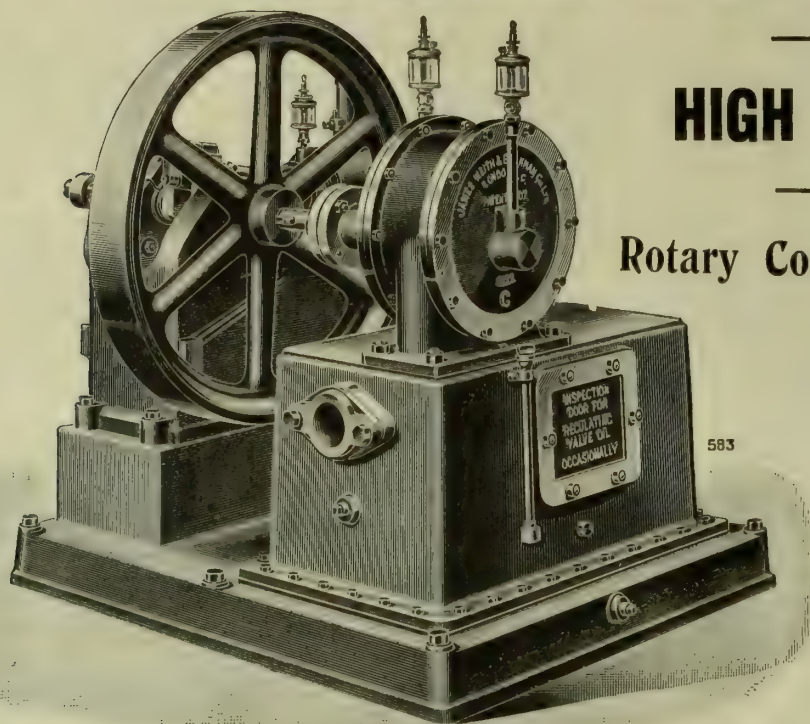
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HIGH PRESSURE GAS.

Rotary Compressor driven by direct coupled Gas-Engine on one base.



Made in various sizes for High Pressure Lighting or Boosting District Mains, &c., and arranged for any Pressure up to 5 lbs. per square inch.

Also made for driving by Steam, Belt, or Electric Motor.

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VOL. CVIII. No. 2431.]

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TEMPORARILY DURING ALTE-
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GAS-LEAK INDICATORS,

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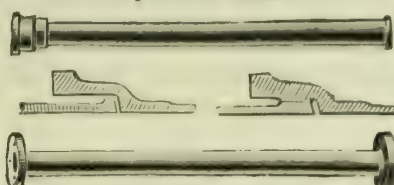
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For Hard Usage.

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Conveying Plants for Handling Hot Coke, Coal, &c. Coke Handled in Bults and without Breakage.

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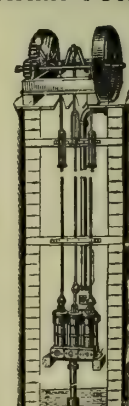
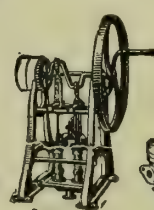
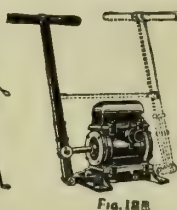
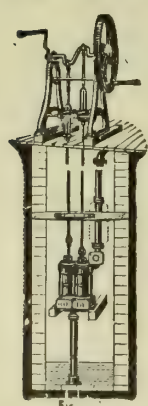
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Standard "Large" Size.
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BURNERS are used and
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The **ORIGINAL** Inverted Burners and Mantles

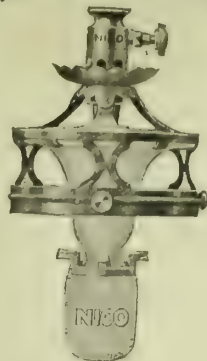
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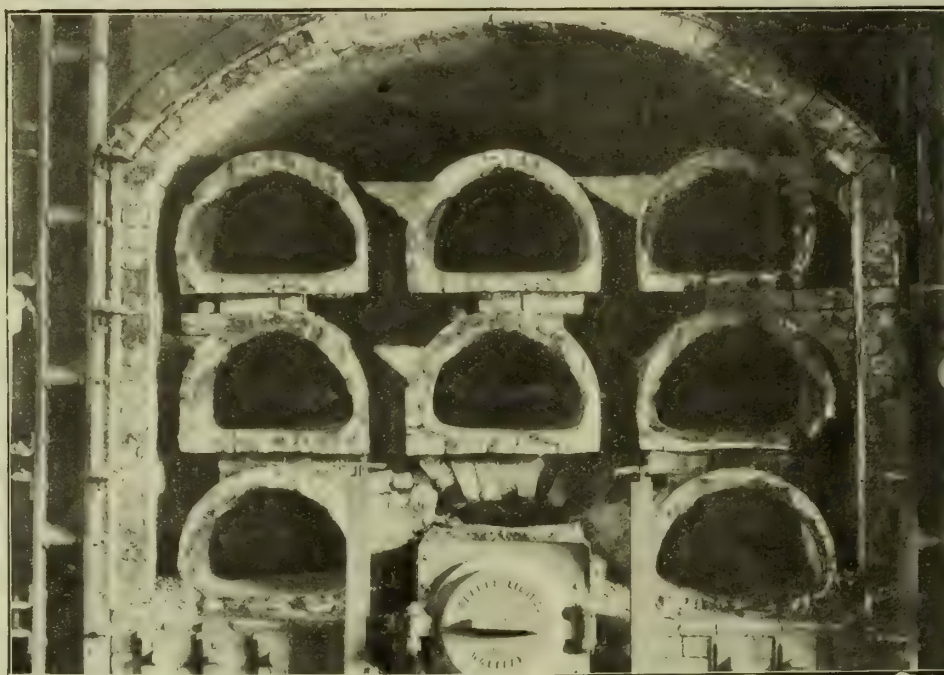
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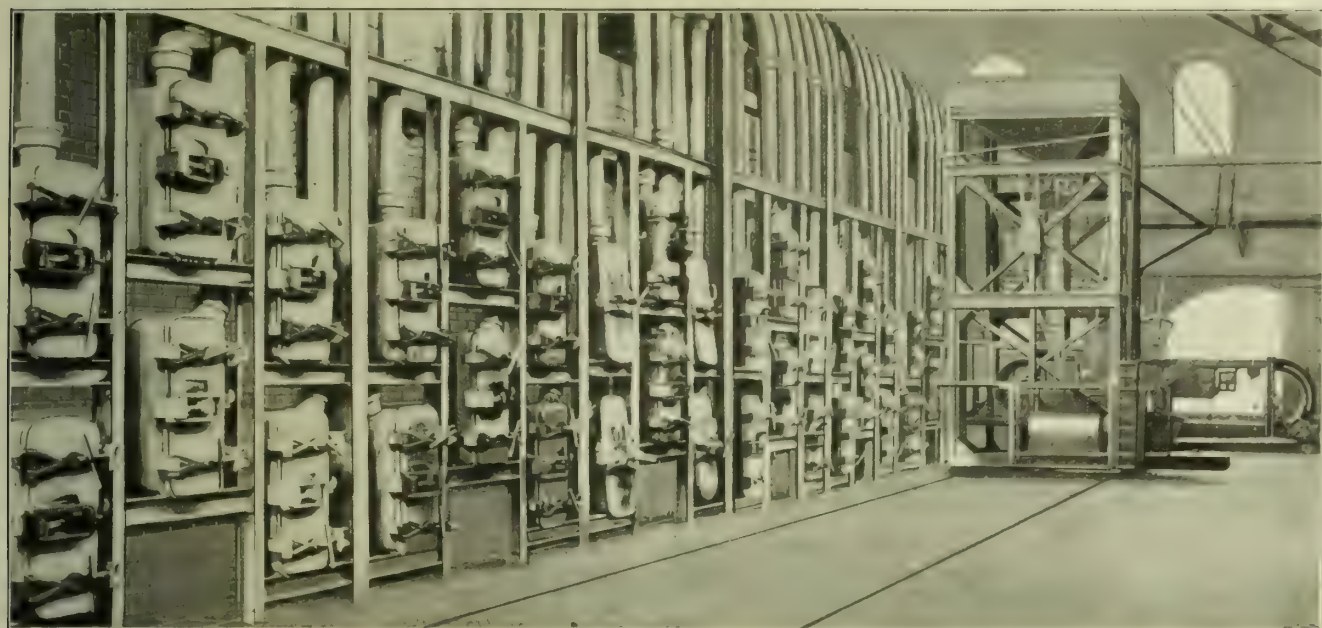
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COKE, GREY, DENSE, and MASSIVE, suitable for many metallurgical purposes and for malting.

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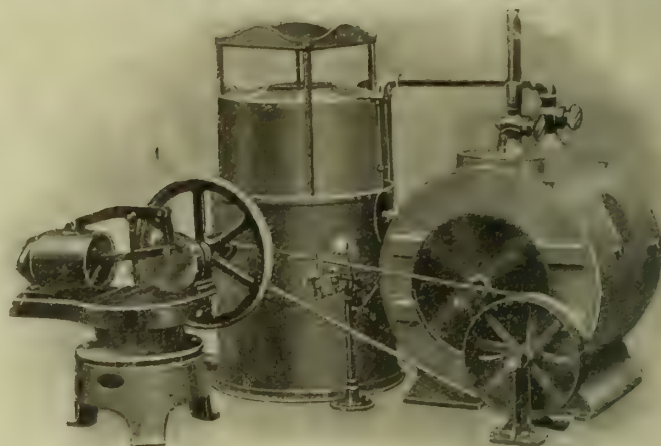
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Yield of Gas per ton guaranteed about 1000 cubic feet more than under present conditions, of guaranteed candle power.

Heats under absolute control throughout the whole length of the Retorts.

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25 per cent. greater yield of Ammonia.

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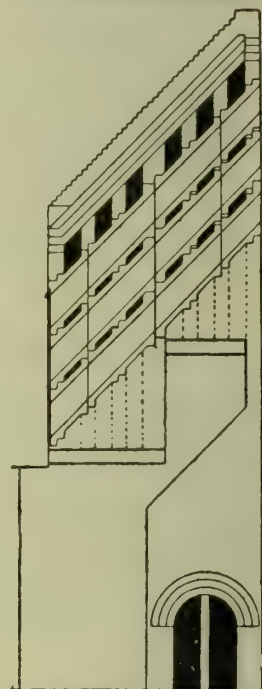
Stopped Pipes unknown.

Naphthalene always in solution.

45 per cent. less ground space required.

Constructional cost per Ton carbonized considerably less than with Horizontal or Ordinary Inclined Retorts.

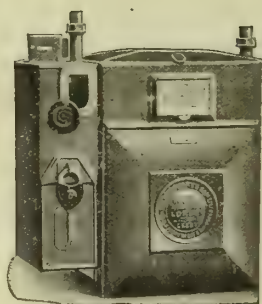
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¶ But they are known to those who have had occasion to seek for Mantles that will do what others will not do, that will stand high pressure and vibrations, and be available for use in all cases where the ordinary Mantle of commerce fails.

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Construction of

Entire Gas-Works & Coke Oven Plants, *Retort Furnaces,*

Furnaces for Chamber Settings New Coke Ovens
(Patent), (Patent),

With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia Works, and Cyanogen Extraction Plants.

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Chamber-Furnaces
HORIZONTAL, VERTICAL, INCLINED
FOR GAS AND COKE

SO FAR 97 CHAMBERS BUILT AND
BUILDING FOR A DAILY PRODUCTION
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IN POINT OF EFFICIENCY, COST OF
PRODUCTION AND RESULTS

BEST FURNACES IN THE WORLD.
2000 WORKMEN.

ENQUIRIES AT ONCE ATTENDED TO.

EVERITT'S Patent
TAR-FOG EXTRACTOR
AND
NAPHTHALENE REMOVER.

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ROSE MOUNT IRON-WORKS, LTD.,
ELLAND, Yorks.

MAIN LAYING.

Paper by PERCY GRIFFITH, M.Inst.C.E., and BRUCE MCGREGOR
GRAY, Assoc.M.Inst.C.E., before the Association of Water Engineers.

A. The Authors used *Flanged Pipes* for the Rising Main up the Steep side of the Barff, and their experience proved that this was not an advantage, as the rigidity of the Joints involved considerable difficulty in regard to the depth of the Trench, and a good deal of Cutting to make the final Connections at each end of the Pipe-Line.

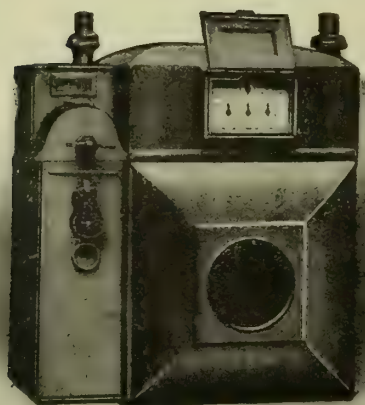
B. In the case of the Delivery Main, the Joints were *Ordinary Socket Joints*, but made with Lead only. The only difficulty met with here was the necessity for pouring the Lead in at a suitable temperature to prevent it melting the Solid Lead Fillet, and running through into the Pipe.

C. In some of the Smaller Branch Connections, Lead Wool was used, and proved highly successful.

Particulars from

THE LEAD WOOL CO., LTD., SNODLAND, KENT.

R. LAIDLAW & SON (EDINBURGH), LTD.
GAS METER MAKERS.

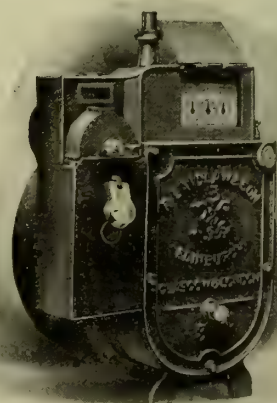


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Dry Meters in
Tinplate Cases.**

Thousands of our
Meters in use by the
largest Gas Companies
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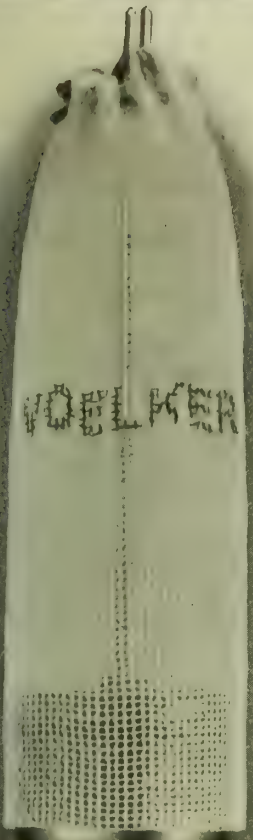
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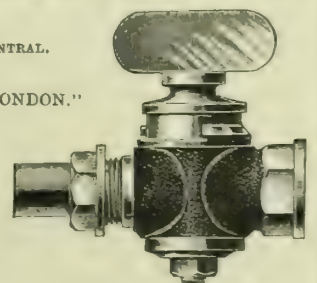
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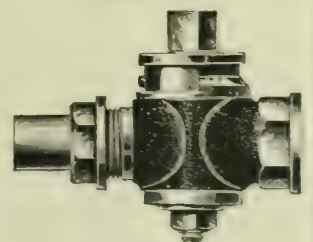
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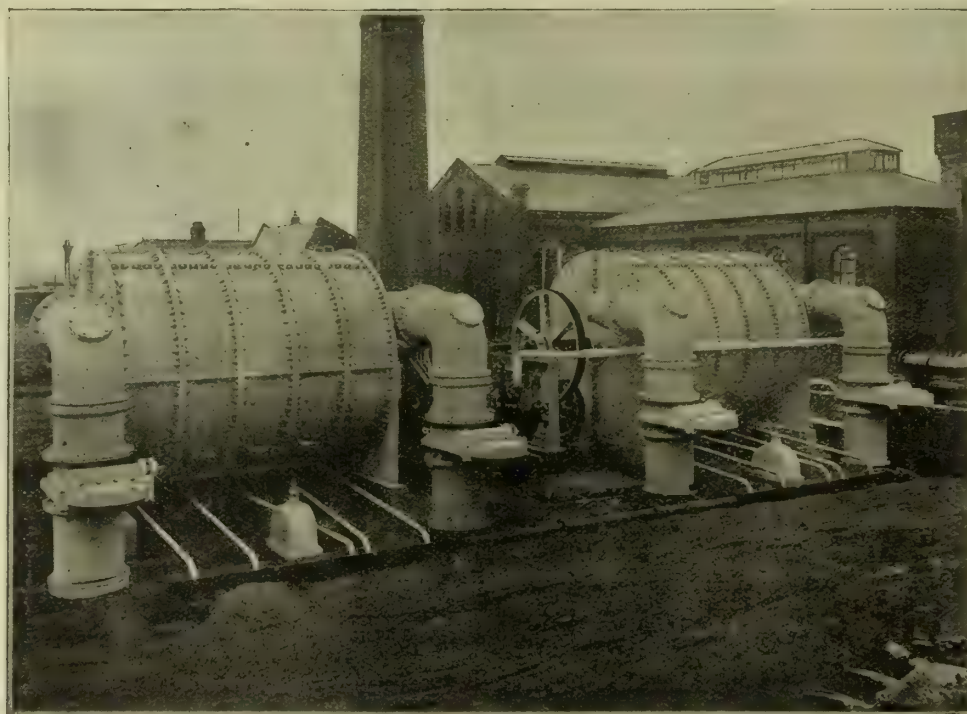
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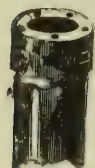
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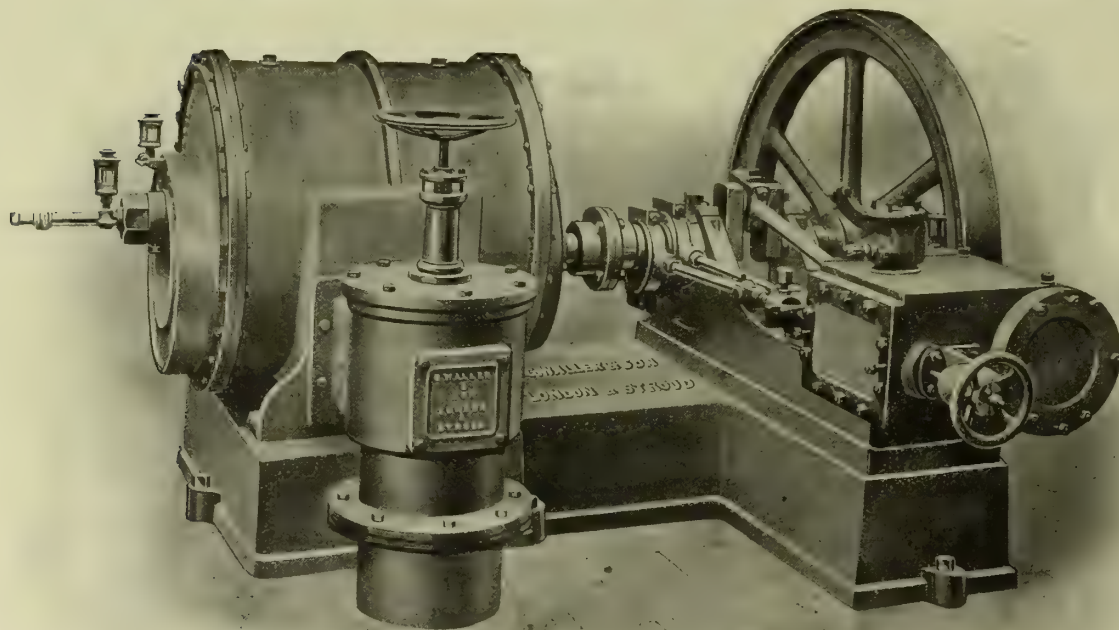
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VOL. CVIII., No. 2431.—TUESDAY, DECEMBER 14, 1909.

EDITORIAL NOTES—GAS, &c.

A Terrible Disaster.

UNPARALLELED in the history of gas manufacture, a catastrophe has occurred at the Grasbrook Gas-Works of the City of Hamburg which has, we venture to think, aroused the sympathies of gas engineers the world over with their professional colleagues of Hamburg, and with the stricken families of the men and women who met with their death by being crushed or burned. With characteristic thoughtfulness, the President of the Institution of Gas Engineers, Mr. James W. Helps, immediately the dire nature of the calamity became known to him, telegraphed (and afterwards supplemented the message by a letter), in the name of the British gas profession, an expression of profound sympathy with the city and all who were suffering in any way from the appalling misfortune. Certainly close upon fifty lives have been lost—thirty are known, some sixteen, it was estimated a few days ago, lie buried beneath the wreckage of the huge gasholder that was the seat of the catastrophe, and, in addition, there are some forty to fifty severely injured persons. A great amount of valuable property—representing the expenditure, much of it recent, of many thousands of pounds—has been destroyed, or rendered practically useless. The threads of the terrible story have been gathered together by us as completely as is possible at the present time; but the real cause of the disaster—the point round which technical interest will accumulate on reading the story—has yet to be determined, if it be possible to determine it now from evidence of workmen who were at the time distracted with fright, and from such testimony as the wreckage will reveal.

A gasholder—the largest of its type in the world, not, as our readers are aware, the largest gasholder in the world, as the daily papers have persisted in calling it—with its annular tank mounted on a concrete and masonry substructure, forming a store and canteen, and permitting of goods trains traversing underneath, was the seat of the disaster. The holder has a capacity of 7,060,000 cubic feet, has a diameter of about 250 feet, and rises 200 feet high. The contract price for the holder was about £50,000; and it has only been taken over from the contractors within the past few weeks. Only two facts are definite regarding the origin of the disaster. The one is that from this holder gas suddenly escaped in huge volumes; and the other, that the gas became fired. Seemingly there was not much, if anything, in the nature of an explosion; but the 3 to 4 million cubic feet of gas that there were in the holder at the time, escaping, formed huge sheets of flame, and set fire to anything and everything that was combustible in the neighbourhood, and to what was not combustible the fearful heat appears to have brought an at present unestimated amount of destruction—involving not only the new holder, but most of the property in its vicinity. This included an old gasholder house, in which was a holder containing 1,400,000 cubic feet of gas, which gas, on being liberated by the damage occasioned by the collapse of the holder house roof, was consumed, in one large, magnificent, roaring flame in a space of time measured by a few transient seconds. Never has such an accident occurred on a gas-works before; never has so much town gas been consumed in such huge volumes before. Eye-witnesses describe the spectacle as grand but terrible; the waste of life and property was more terrible still.

To return to the huge gasholder, with its store, canteen, and railway lines beneath the tank. All the evidence of spectators, actual or pseudo, as to the origin of the disaster is, as is usually the case in all big catastrophes, conflicting; and nothing can be deduced from the evidence that will at present allow any responsible person to speak with certainty as to the place from which the gas primarily escaped, and what untoward happening produced the escape. We must

wait for the official inquiry and report on the matter to see whether the technical ability that will be brought to bear in the attempt to discover the cause will be in any degree successful in getting beyond surmise. We sincerely hope it will be, if only to enable precautions to be taken against recurrence. It is also only right to suspend judgment on all points that are not obvious, in view of the reputations of the engineers and contractors concerned in the erection of the holder. One thing is perfectly obvious from the reports before us; and it is that the catastrophe has proved that the open store beneath the tank is a source of weakness, in the shape of danger, in the construction of the holder. Whether the gas commenced to escape from a blown cup, and was swept underneath into the store, where it found brief harbourage, or whether the gas found entrance into the store through a gradually developed crack in the upper part, it is clear it was from the arches surrounding the store that huge waves of flames passed, which were maintained by gas—from where? One can only suppose from the roof of the store through openings produced by the intense heat, or some prior cause. Certain it is, too, that in this store there is a big wreckage of masonry and iron work; and beneath that lives have been lost. Through the long years of gas supply, never has a holder with sunk tank or tank on the ground level produced such a disastrous record as has this new Grasbrook one. The form of its construction, with raised tank, has never recommended itself to British gas engineers, though as Mr. F. S. Cripps pointed out in the "JOURNAL" in 1901, an English invention anticipated by many years the German for the utilization as a store of the space beneath a gasholder tank; and it may be fairly positively stated that, now more than ever—whether or not the store of the Hamburg holder had part in the origin of the disaster, still it is known to have had part in the subsequent effects—there will be no disposition here to give the principle such favourable consideration as would lead to adoption. The cost of such a structure, too, must be considerable, far more than is justified by storage for material only; and the running of railway trains underneath such a structure requires more than economy of space to vindicate it. If pressure of space be the only support for adopting such a form of construction, British gas engineers would prefer the holder being built elsewhere. But these considerations are for the moment beside the main question, which is the cause of the Hamburg disaster. For this information, if it is ever discovered, there will probably have to be a little patience.

The Story of the Board of Trade Statistics.

THERE must be hearty congratulations to the department of the Board of Trade responsible for the preparation and issue of the returns relating to gas undertakings. It was only in June that we were dealing with the returns for the year 1907, referring to Gas Companies and to Local Authorities for the financial year ending March, 1908. Within six months, there are before us the returns relating to the Companies for 1908, and to Local Authorities for the year ending March, 1909. This latest issue excels previous performance, and is therefore a record. Having in view the mass of statistical collection, arrangement, and aggregation that the returns entail, it cannot be expected, nor will anyone be so unreasonable as to ask, that still greater speed shall be exercised. We do not want veracity sacrificed to undue speed. There are many who will be grateful for the unusual despatch shown on this occasion; and it is hoped—now it is seen what can be done—that the record will be maintained. The earlier the returns are issued, the greater their value. They are published on this occasion in time for use in the coming parliamentary session—a convenience that has been denied by the lateness of the returns in recent sessions—and will therefore be the more appreciated.

These returns are peculiarly interesting; but through a couple of errors that were made in the preceding ones, care

must be taken in collating the statistics. The total number of statutory undertakings included in the present returns is 790—an increase of nineteen, four of which are companies, and fifteen local authority concerns, some of the latter being only transfers from the former. The companies now number 499, and the local authorities 291. It is in taking the total figures at the end of the returns that care must be exercised in making comparison with the corresponding statistics in the previously issued ones. Taking the total figures of capital paid-up and borrowed, on comparison the £130,708,693 now shown represents the alarming increase of £16,843,643. But as was pointed out when the preceding returns were published, by some unaccountable reason—an oversight no doubt—the loan capital of the companies had been omitted from the total, which made a difference of £14,645,271 to the figure, which should have been £128,510,321, and not £113,865,050. If, therefore, we deduct the £14,645,271 from the £16,843,643, we have remaining as representing the actual increase in the capital paid-up and borrowed, £2,198,372, of which the companies are responsible for £1,474,543, the local authorities for £723,829. In several ways the local authorities appear to have been hardly hit during the year now under review. The total receipts of all undertakings amount to £30,519,639, which was an increase of £451,887, of which the companies took £445,823, leaving only £664 for the local authorities. The expenditure for all the undertakings was £23,474,709; being an increase of £750,605, of which the companies were responsible for £590,951, and the local authorities for £159,654. But against the increased expenditure, the companies had available £445,823 of increased receipts, while the local authorities had only £664. Again, if we turn to the quantity of gas sold, it is found that for all undertakings the quantity was 173,957,395,000 cubic feet, or an increase of 1,068,248,000 cubic feet. But inasmuch as the local authorities had an actual decrease in consumption in the year of 9,019,000 cubic feet compared with the preceding year, the companies take credit for a total advance of 1,077,267,000 cubic feet. The reason for the bad showing of the local authorities must be looked for principally, we fancy, in the depression in the manufacturing areas of Lancashire, Yorkshire, and parts of the Midlands. Still, taking the industry as a whole, progress was marked in business; and so, in view of the circumstances of the year, there is satisfaction.

Coming to the manufacturing figures, there is a cheering record. With an augmentation in the gas business, on a reduced consumption (taking the total figures) of 12,446 tons of coal, it is easy to trace manufacturing economies as expressed by an average increased production of gas per ton of coal. But for what there was in the way of an augmentation per ton, the local authorities have to take credit, though they have much to do yet to overtake the average production per ton of the companies. We are not going to attempt any explanation—it could at the best be but hypothetical—as to why the local authority undertakings are, on the average, so much in arrear of the companies in this regard, unless it be that so many of the local authority concerns are concentrated about the fields whence come the second-rate gas-making coals. However, the total coal consumption of the whole of the statutory undertakings was 15,394,307 tons—as said, a diminution of 12,446 tons. The companies exhibit an increase of 41,458 tons; and the local authorities a decrease of 53,904 tons. The figures as to gas made reflect the trend of carbonization effort. The total volume of gas produced was 189,918,737,000 cubic feet—or an increase of 1,432,044,000 cubic feet, though 12,446 tons of coal less were carbonized. Of this augmentation in make, the companies take credit for 1,285,404,000 cubic feet; the local authorities for 146,640,000 cubic feet, though the latter sold 9,019,000 cubic feet less than the year before.

Before treating of the question of make per ton, account has to be taken of the water gas made. The amount was 21,628,862,000 cubic feet, which is an increase of 1,368,979,000 cubic feet, of which the companies account for 1,305,259,000 cubic feet, and the local authorities for 63,720,000 cubic feet. Deducting the water-gas production, the companies made 103,429,223,000 cubic feet of gas from 9,281,738 tons of coal, which is equal to 11,143 cubic feet per ton. On the other hand, the local authorities made 64,860,653,000 cubic feet of gas, and used in doing so 6,112,569 tons of coal; the average make being 10,611 cubic feet per ton, or 532 cubic feet less than the companies. If the gas companies had only made the same quantity of gas per ton as the local authorities did, the 9,281,738 tons of

coal the former carbonized would have yielded 4,937,884,616 cubic feet less than it did. On the other hand, the 11,143 cubic feet per ton of the companies is a falling off of 52 cubic feet per ton in comparison with the preceding year; and this 52 cubic feet per ton on 9,281,738 tons of coal carbonized by the companies represents no less than 482,650,376 cubic feet. The make of 10,611 cubic feet per ton of the local authorities is a gain on the year of 106 cubic feet; and the 106 cubic feet per ton on the 6,112,569 tons of coal carbonized at the local authorities works represent an aggregate improvement of 647,932,314 cubic feet. Be it remembered, too, the local authorities carbonized 53,904 tons less coal than the year before. These figures indicate in rather striking fashion the effect of comparatively small variations of make per ton on the totals of coal carbonized.

Though the local authorities had the diminution named in consumption, they—like the companies—had an expansion in the bases of business. The mains laid for all undertakings (34,490 miles) increased in the year by 954 miles, of which the companies claim 519 miles, and the local authorities 435 miles. The number of consumers, 5,916,120, is an increase of 250,944, of which the companies have connected up 168,200, and the local authorities 82,744. In the preceding returns, there was an error of 10,000 in the public lamps credited to the companies, whereby there appeared to have been an abnormal gain for one year. The figure for both companies and local authorities should have been 690,264; and this has been increased during the year to 700,696—the difference representing an addition of 10,432, of which 4964 have gone to the account of the companies, and 5468 to that of the local authorities. While there is regret at the decline in the gas consumption in the case of the local authorities concerns, in all other respects there is solid ground for ample satisfaction, bearing in mind the circumstances of the periods to which the statistics refer.

Leeds University Gas Lectures.

THE Department of Fuel and Gas Engineering at the Leeds University, under the direction of Professor William A. Bone, D.Sc., F.R.S., have again made arrangements for courses of special gas lectures during next term, and which lectures, having regard to the synopses published elsewhere and the names of the responsible lecturers, we have every confidence in recommending to young gas engineers—especially those living in the North of England. We want an abundant success to attend these lectures, in order to give the Leeds University every possible encouragement. Those who are associated with the University, and are directly linked with the gas industry through the department, are keenly anxious that the work of the latter shall have the broadest possible base of utility for the industry. These lectures are one evidence of this, as they meet the requirements of young engineers engaged in gas-works whose circumstances will not permit them to devote the whole of their time to a period of University study. There are many assistants, juniors, and pupils in the gas industry to whom this will apply; and there are likewise many who will find that the fees for the course or courses of lectures are of such a moderate character that no one can call them prohibitive. Therefore, it is hoped that a good number will avail themselves of the opportunities for advanced study thus afforded. If the success of the courses last session may be taken as indicative of what will happen in the coming one, it may be predicted that a greater number of students will be enrolled, and that interest and value will be much enhanced. Last session the course of lectures was introduced. It was all new ground. Interest had to be aroused, and experience had to be gained. Nevertheless, no less than thirty-five students entered for the course of lectures by Dr. Harold G. Colman on "Gas Manufacture" and by Mr. Walter Hole on "Gas Distribution," and forty for the course by Mr. Ernest Bury, M.Sc., on "Bye-Product Coking Processes."

It may be remembered that the course on gas manufacture by Dr. Colman last session began with the intention that it should be completed in fourteen lectures; but this was found impossible, and so there was an extension to sixteen. Profiting by the experience then gained, the course in the coming session has been further extended to twenty lectures, so that Dr. Colman may deal more thoroughly with those technical features of the subject that do not lie upon the surface of daily practices. The lectures will be compressed into ten weeks; and, as the information published elsewhere shows, very convenient arrangements have

been made for students residing at a distance from Leeds. Those within reasonable distance who desire to enlarge their scope of study to bye-product coking subjects can do so through the Saturday afternoon course of eight lectures by Mr. Bury, who will be remembered as having read a most enlightening paper at the Dublin meeting of the Institution. It will be observed that a course of lectures on the lines of those delivered by Mr. Hole last session has been omitted from the programme this session, as, looking forward, the intention is to have a more extended series of lectures on the subject in 1911. These arrangements will permit of both the manufacture and distribution subjects being more adequately treated than was possible in the first series of lectures. The synopsis of Dr. Colman's lectures calls for no comment; but attention may be directed to the final sentence: "Discussion of present-day requirements for a public gas supply." Almost every phase of gas manufacture may be viewed from this particular platform; for the requirements of a gas supply to-day carry influences through—in fact, dominate—procedure from carbonization and the character of the evolved gas to delivery pressures. Both Dr. Bone and Dr. Colman have taken part in directing to the character of gas which carbonizing processes must be shaped to produce to best suit the needs of the day. But there is much work to be done in spreading comprehension of this matter; and the present lectures will be in part devoted to this work.

As to the future, we learn from Dr. Bone that arrangements are being made for special lectures—which will be taken in a series of courses spread over two or three years, and will deal with the different aspects of manufacture, distribution, and utilization of gas for lighting and heating purposes. It is probable, should there be the demand for them, that laboratory demonstrations will be arranged in connection therewith. It is the ambition of the Leeds University to make it the centre for the study of the science underlying gas practice, and to provide an opportunity for such study for as many as possible. We ask that a large measure of the support they now require for the perfecting of their schemes be accorded. The nature of that support may be described in one word—Students.

Misfortune—And After.

THE address that the new Chairman of the Continental Union Gas Company (Mr. J. H. Birchenough, C.M.G.) delivered to the proprietors last Tuesday reads almost like fiction; and yet it is all only too true. Never has a gas company been submerged so deeply in misfortune within the space of twelve months as has been this and the companion concern, the Union des Gaz. There has been the earthquake at Messina, the death in that tragic occurrence of the Company's Manager and many of the staff, the partial destruction of the works, the total cessation of business there, and uncertainty as to the future. The year through there have been labour ebullitions and outbursts at the Milan works. Within the past month, there has been the great strike of men at all the Italian stations. But the Directors and officials have, as all recognize, faced the cataclysm of misfortune with intrepid spirit; and though life and a certain amount of capital have been lost over Messina, and though treasure has been wasted through the costliness of the Italian strike, we do feel, and all our readers will feel who read the frankly-told tale of Mr. Birchenough, that there is a fair prospect of a new chapter now opening in the history of the Company that will be brighter than any that has preceded it. That, however, is the well-set hope. We will not here dwell on the Messina catastrophe. The Directors have already written off a considerable sum from the capital outlay represented there, by drawing upon the reserve and by asking the proprietors' consent—consent that was willingly accorded—to reduce the dividend from $6\frac{1}{2}$ to 5 per cent. for the past year; and they are now making preparations for a full technical report upon the situation of the Messina concern. Upon this matter, as upon all others, Mr. Birchenough was most comprehensive and judicious in his statements and explanations.

Much as the proprietors knew of the extortionate proclivities of their Italian workmen, and of the moderation of the Directors and yet firmness in claiming those rights to which the Union des Gaz have title as employers and as responsible for the conduct of a *quasi*-public service, the proprietors were not a little astonished to hear the Chairman's recital of the recent demands of the men, which, if conceded, would

have strangled the Company, and which, on being declined, brought about the strike, in which, happily, right throughout has prevailed over the inflated notions of the socialistic ultraists who were ever infusing their venom into the men, and over the violence by which the so-called leaders have sought to enforce their unreasonable demands. There is not a shadow of doubt—twenty-eight small strikes in eight months is a sufficient indication of the then prevalent unrest and ferment—that a trial of strength with the men was inevitable; and it was the men themselves who really gave the Company an opportunity for retrieving those elementary and essential rights to which they are entitled, but which had so long been denied them. In their hour of victory, the Directors and their executive officers have not claimed more than these. They have not desired to reduce wages or contract the privileges of the men in any way; but they have sought, and have obtained as the result of the men's own challenge, control of their own works and business, so as to fulfil their obligations in the best manner possible. They have, in short, gained by the costly strike one of the great essentials to the proper conduct of a business; and we shall be astonished if the men do not now see things in a somewhat new light.

Possibly, too, the workers will look with a little more graciousness on the proposal of the Board that there should be an economy-sharing scheme introduced. There is abundant scope for a project of the kind in these works—especially in those at Milan. Where stokers are only dealing with $2\frac{1}{2}$ tons of coal per man per day, and where other men on the works "labour" (British, German, and French gas workers must forgive the expression) on a somewhat like scale, there is plenty of room for a profitable—profitable for Company and men—advance in efficiency. The men under the old order of things have shown no bashfulness in asking for as much as possible, nor any unwillingness in receiving as much as possible; but they have never offered anything in return. The more they have had, the more they have wanted; and the less they have been prepared to give. In future their progress in financial benefit may be in their own hands, by the simple process of recovering waste from inefficiency. We hope the men will be wise in this matter, though there is, looking into the records, some room for fear. Anyway they have courted the lesson they have received; and there is no question about the good that has been wrought. This, and the proposed introduction of a general law by the Government for the prevention of strikes and for compulsory arbitration, give better hopes of peace; but the laxity in Italy in the administration of the law will always cause one to speak of the prospects of peace in qualified terms. Genuine—aye, and heartfelt—were the encomiums poured by the Chairman at the meeting upon the leal and self-sacrificing work in these recent serious times of the executive officers and the attached workers of all grades; and the thanks were sincere to all who had contributed in any way to the upholding of right. The praise and the thanks were richly deserved.

A New Retort-House at Birmingham.

We must congratulate Mr. C. C. Barber on the paper he prepared for the Midland Junior Gas Engineering Association, and which was read last Saturday. It describes the design and construction of a retort-house at the Adderley Street works of the Birmingham Corporation, the Engineer-in-Chief of which (with Nechells) is Mr. Walter Chaney. It is in every respect a modern equipped house, with all accessories to economical working—such a house as one expects to find built in these days, when favour sides with horizontal retort working. There is always interest in reading such descriptive notices of new retort-houses of this kind, as in the detail one has an indication of the engineer's preferences, and of any special work necessitated by the character of the site. To pick out one of the difficulties peculiar to the site of this house, and which had its influence on the design of the constructional work pertaining to the building and the bench. At one end of the site, an old derelict gasholder tank, built in brick and puddle and 20 feet deep, was discovered; this on its abandonment having been filled with ashes and spent lime. On looking at the plan showing the foundations for the house and bench, it is apparent that this defect in the site must have caused an appreciable difference in the cost of the foundations, which at this part had to be carried to the tank bottom. In considering, therefore, the cost of the house, the additional expense that the extra work

occasioned must not be set against it, but against the economy of the filling-in in a time long since passed. Another interesting feature, illustrating the progress in carbonizing methods, is the productive value of the site in comparison with a former day. For three-quarters of its length the new house occupies the site of an old house that was tenanted by direct-fired and hand-charged settings. Under those conditions this part of the site only produced $\frac{3}{4}$ million cubic feet of gas. The new house is an extension on the old by one-fourth of the length of the latter; and this extension gives, under the new carbonization and working methods, a house capable of turning out $1\frac{3}{4}$ million cubic feet of gas per day. The economies of progress are illustrated here.

Power on Gas-Works.

In regard to the concluding part of Mr. Barber's paper, where it is shown how cheaply electricity for motive power can be generated by a private gas-engine-driven plant, for such a varying load as the requirements of a gas-works provide for the generating plant 0.35d. per unit for gas is an attractive figure. It would be of considerable interest if someone would, with an electricity plant such as that at Adderley Street, enter into the whole question of expense from the capital outlay to the running costs in comparison with other forms of power. The particulars collected should be of value not only for gas-works purposes, but, in a measure, as a guide in the competition for power business. Of course, for outside competition purposes, the figures would only have an approximate value, seeing that a retort-house electricity generating plant is running (practically continuously if the house is a large one) night and day, and that is not a condition that applies to many industries requiring power. On the other hand, the private generating plant in a factory does not incur the distribution expenses and losses that are a charge on the output of a central station. In this power question for gas-works, what with gas, steam, electricity, hydraulic power, and compressed air variously in service on them, there ought to be the material for much instructive research and communication either through our columns or in the form of a paper to one of the technical organizations. There are difficulties we know in the way of making such research, as the niceties of economy in respect of power are not studied on some gas-works as they are in other manufactories where fuel costs money, and is not, as is so frequently the case in a gas-works—at any rate, for boiler purposes—almost a waste product. In some works, too, situated by a river or having their own well, water is not an expensive item. Another difficulty in the way of thorough investigation is that in not many gas-works are there found provided the means for gauging power economy, and keeping control over it.

A Lecture on Photometry.

In almost as many weeks, the London and Southern District Junior Gas Association have had four fixtures—two of them being visits to works, one a paper, and the remaining one a lecture. The latter took place on Friday evening; and it says a good deal for the enthusiasm of the members that, in spite of these numerous Association engagements, they turned up in such satisfactory numbers. After all, however, it is perhaps not surprising, for the lecture was on an all-important subject, and by a gentleman who is able to speak with authority on the subject. The former was entitled "Light—And Some Reflections," and the latter was named Mr. Jacques Abady. From the full report of the lecture which appears (together with the subsequent discussion) in another part of to-day's number, it will be seen that Mr. Abady gave his audience a treat; and it may be added that they showed themselves thoroughly appreciative of the privilege that had been accorded to them. On the subject-matter of the lecture, we may possibly have something to say on a future occasion; but it can meanwhile be remarked that, as would have been expected, the question of photometry was dealt with in an intensely practical manner. Mr. Abady's text was the avoidance of empiricism; and he explained to the members that it was possible to carry out tests by means of a portable photometer without anything whatever that was empirical entering into the matter. With regard to some of the instruments which are at times used (and Mr. Abady said that those who advise these photometers are nearly all connected with the electrical industry), the lecturer gave his hearers some very plain truths; and altogether the members of the Association who were present spent a thoroughly enjoyable and at the same time, it may be said, a highly instructive evening.

The Growth of Officialism.

Some remarkable figures respecting the growth of officialism and the increase of its cost in a municipal borough conducted on quite moderate lines are published by a Torquay newspaper. Torquay is among the youngest of the boroughs; its Charter of Incorporation having been granted in 1892. In the year immediately following this important event in the history of the town, the municipal authority had in its service 26 officials, who were paid salaries amounting to a total of £2815 per annum. A few years later, there was an outcry to extend the boundaries of the borough; and the neighbouring districts of St. Mary Church, Babbacombe, and Cockington were added—the contention being, as is usual in such cases, that economy as well as efficiency would be promoted by governing the whole area from one common centre. How far these anticipations of better and cheaper service have been fulfilled, we are not told; but the amalgamation of the neighbouring local authorities with the borough has not had the effect of causing a reduction in the number of officials. On the contrary, instead of the 38 who were serving the Corporation in 1901-2, there are now 51; and the pay has risen from £4917 to £6760 per annum, with a promise of future increments which will bring the total to £6917. Thus the number of officials has practically doubled since the town was incorporated; and the salaries paid to them have grown by no less than 145 per cent. It is pointed out that these increases in number and pay are quite independent of the small army of school teachers who in the meantime have become municipal servants, and whose salaries are also advancing at a rapid rate. The experience of Torquay in the matter is not by any means unique; but the figures convey a lesson at a time when increasing efforts are being made to bring everything and everybody under bureaucratic rule.

The Eight-Hour Day in France.

An article in the current number of "Le Gaz" is devoted to a consideration of the possible consequences of the adoption of the eight-hour day in France, and particularly the effect on gas undertakings. The writer considers that the passing of such a law by the French Chambers would result in a rise in the price of the products of the industries with which gas-works are in touch; and, seeing that gas companies work under concessions which fix the charge to be made for gas, this would necessitate an advance in the price of residuals, which would in all likelihood not afford adequate compensation. Moreover, they have to keep up the supply of gas, and the additional labour required would probably cause an increase of 20 to 22 per cent. in the amount of wages paid over a year. This, it is thought, would give the death-blow to many works. Having stated the difficulties, the writer proceeds to consider the means of removing them. In his opinion, the only way of minimizing as far as possible the adverse pecuniary effect of the proposed law is to substitute piecework for wages, and, in conjunction with the change, to give premiums varying in value for the quantity of gas produced. At the same time he thinks that it would be advisable, wherever practicable, to replace labour by machinery.

Speculations to be Avoided.

In the "JOURNAL" for July 13 last, under the head of "A Resuscitated Company: Men, Objects, and Promises," we dealt with the revival of one of Eaton's schemes, bearing the revised title of the Patent Block Tar, Motor Oil, and Asphalte Company, a concern which in its various guises has received attention at our hands from time to time. The prospectus issued in July, like its predecessor, fell on rocky ground; and there was precious little response to it in the way of hard cash—not sufficient, we should say, to pay the costs of issue, let alone the office expenses, and the compensation that was no doubt looked for to the owners of names that it was hoped would be magnetic—such as Sir C. B. H. Soame, Bart., H. W. L. Way, John Maclean, and S. J. Acland, "M.I.G.E." The hopes of Eaton in these men must have fallen low. But another effort is being made to secure more cash. Our estimate of the concern and of those who are trying to engineer it has not changed; and so our advice is to give it a very wide berth. In the process there is no 150 or any other percentage of dividend worth having by investors; and if the public are foolish enough to part with their money, it will be found that the concern will go precisely the way of others that have come from the same hatching-place. The other group of promoters are now also busy trying to scrape in money in connection with the Bude Gas

Company and the South Lincolnshire Water Company. The Directors of the latter Company are, though the prospectus is dated Dec. 6, offering six months' interest at the rate of 5 per cent. per annum to be paid to purchasers on Dec. 31. The temptation is not so potent as it used to be. It is now familiar to investors. However, the public do not show much confidence in these concerns; and we are not sorry.

Natural Gas in Western Canada.—A Canadian correspondent writes to "The Times" as follows: "Few are aware that in Southern Alberta a vast underground supply of natural gas has been tapped, and is being turned to great advantage by the people. At Medicine Hat, where the Crow's Nest branch to Lethbridge and beyond leaves the main line of the Canadian Pacific Railway, the city owns three wells, about 1000 feet deep, two producing about 1 million cubic feet of gas, and the third 3 million cubic feet daily. The Canadian Pacific Railway Company has its own well, with a daily output of 1,225,000 cubic feet. At Dunsmore, in the same neighbourhood, there is a well, 1285 feet deep, producing 1,600,000 cubic feet of gas a day; and at Suffield a well 1180 feet deep has a daily output of 65,000 cubic feet. Near the city of Calgary, 180 miles west of Medicine Hat, on the main line of the Canadian Pacific Railway, on an island in the Bow River, is a well 1886 feet deep, yielding 8,365,000 cubic feet a day."

Buying Coal on its Calorific Value.—At the close of a paper presented by Mr. S. A. Taylor at the last meeting of the American Mining Congress, he expressed the following opinions: "That while the B.Th.U. method of purchasing coal, so far as the purchaser is concerned, may temporarily prove a good thing, it will in the end result in his paying much more for his coal. That, so far as it affects the conservation of fuel, it will prove a failure. That it is quite possible to so study the method and conditions under which fuel may be used as to effect a very great deal more economy to the purchaser, and at the same time not destroy the stability of the business of the producer of coal, which is a condition much to be desired—as a matter of fact, it is a necessity—and something which will not obtain should the B.Th.U. method of purchasing fuel come into general practice. That where this is used, the agreement should state specifically the method of sampling the coal for testing; the method of determining the B.Th.U., preferably with the bomb calorimeter; and the person who would make the tests. Also, in case of dispute, to have an arbitrator, agreeable to all parties in any way interested, named in the contract."

Use of Tar on Roads.—In an article, on the development of modern road surfaces, in the "Journal of the Franklin Institute" for October, Mr. W. H. Fulweiler divides the methods of applying tar into three general heads: (1) Brushing with a hot coating of coal tar, and dusting it lightly with sand, which is in general use in France. (2) Painting the surface by machine, and dusting with sand, which is in general use in England. (3) Coating the surface with a fairly heavy layer of hot tar or tar compounds, and then covering with a light coat of screening—the surface being finally rolled. According to an abstract in "Nature," the latter is the general system adopted in America, and seems to be better adapted to the rougher surface of American roads. A refined grade of tar, considerably heavier than that employed in France or England, is used, having more body and greater binding properties, and the coating applied is about twice as heavy. A light coating of clean gravel or fine stone chips is then put on instead of sand, and rolled; thus renewing the wearing surface, and filling the voids better than can be done by the use of sand. The treatment produces deeper penetration and more lasting effect, and succeeds best on macadam roads. It is practically mud-proof, absolutely free from road dust, apparently proof against heavy motor traffic, and most satisfactory for American conditions. The cost is higher than the French and English methods.

Gas-Producer Tests.—In the review of the technical and mechanical progress made in the gas industry during the past twelve months which Mr. Irvin Butterworth laid before the American Gas Institute at their last meeting, from which extracts were given in the "JOURNAL" last week, he referred to some tests of gas-producers carried out by Professor R. H. Fernald, and dealt with in a recent bulletin of the United States Geological Survey. The investigations were undertaken as a result of the great inaccuracies which he said were apt to creep into tests of short duration, due principally to the practical impossibility of bringing the fuel bed to the same condition at the end of the test as at the beginning. The conclusions drawn by him are summarized as follows: "That throughout a test the fuel bed should be maintained in uniform condition, with regard to both the character of the fire and the thickness of the bed, but that, failing in this, special care should be exercised to see that the fuel bed is in the same condition and of the same thickness at the close of a complete test, or at the end of a test period, as at the beginning; that a test should never be started when the producer has been standing idle for some time with banked fires, as the fuel bed will not be in the average condition under which it will be required to work during the test; that if, as the appointed hour for closing the test approaches, the fuel bed is not in proper condition, the time of closing the test should be postponed until the bed naturally assumes the proper thickness and character. No forcing of conditions should be allowed simply to bring the test to an end at a previously determined hour."

ASSOCIATION OF WATER ENGINEERS.

The Fourteenth Winter Meeting of the Association was held last Friday and Saturday, at the apartments of the Geological Society, Burlington House, W., under the presidency of Mr. ROBERT ASKWITH, M.Inst.C.E., of the Weardale and Consett Water Company. There was a good attendance of members.

Confirmation of Minutes.

The SECRETARY (Mr. Percy Griffith) read the minutes of the annual meeting held at Durham on June 10 to 12; and these were confirmed.

Papers and Discussions.

The PRESIDENT said he was sorry to have to announce the postponement of Mr. G. N. Yourdi's paper on "Reservoir Outlets." Mr. Yourdi had been unwell, and so was unable to complete the paper; but he had promised to have it ready for the summer meeting. The members would regret that a paper of so much promise should not be read that day. But the pleasure was only deferred.

The papers were taken in the following order:

Friday.—"Public Water Supply for Fire Extinguishing," by Mr. C. W. S. OLDHAM, of Ipswich. "Evaporation from Water Surfaces," by Mr. SIDNEY R. LOWCOCK, M.Inst.C.E.

Saturday.—"A Sterile Boring in the Inferior Oolite (Somersetshire)," by Mr. WILLIAM PHELPS. "Ferro-Concrete as Applied to Water-Works Construction," by Mr. HARRY W. TAYLOR, Assoc.M.Inst.C.E.

Appointment of Scrutineers.

On the nomination of the PRESIDENT, Mr. James Dewhirst and Mr. A. J. Price were appointed Scrutineers of the balloting-papers for the Council and officers for the ensuing year, as well as for new members.

Election of Office-Bearers and New Members.

At the close of the discussion on the paper by Mr. Phelps on Saturday morning, the PRESIDENT announced that the result of the examination by the Scrutineers of the balloting-papers had resulted in the election of the following gentlemen to office in the ensuing year:

President.—Mr. William Henry Humphreys, of York.

Vice-Presidents.—Mr. Edward Sandeman, of the Derwent Valley Water-Works, and Mr. J. Spiers Pickering, of Cheltenham.

Ordinary Members of Council.—Mr. Easton Devonshire, of London; Mr. George Greenslade, of South Hants; Mr. Frederick Griffith, of Leicester; Mr. H. Ashton Hill, of the South Staffordshire Water-Works Company; Mr. William Matthews, of Westminster; Mr. Thomas Molyneux, of Stockport; Mr. C. Clemesha Smith, of Wakefield; Mr. R. H. Wyrill, of Swansea; Mr. J. J. Lackland, of St. Helens; and Mr. Frederick W. McCullough, of Belfast.

Honorary Secretary and Treasurer.—Mr. W. G. Peirce, of Richmond.

It was also announced that the following new members and associate-members had been added to the roll:

Members.—Mr. K. P. Hawksley, of Westminster; Mr. C. B. Newton, of Hull; Mr. J. S. Sharland, of Geelong, Australia; and Mr. J. H. Willoughby, of Santos, Brazil.

Associate-Members.—Mr. W. R. Jenkins, of Cardiff; Mr. J. O. Jones, of Jersey; Mr. H. C. Rimell, of Cardiff; Mr. J. C. A. Roseveare, of the Derwent Valley Water-Works; Mr. J. W. Wilkinson, of the Derwent Valley Water-Works; and Mr. Alfred Peirce, of Richmond.

Mr. W. H. HUMPHREYS (York), in acknowledging his election to the office of President, said that nothing would be lacking on his part to make his year of office a success. His Chairman had been good enough to come to the meeting that morning; and perhaps he would like to say a few words.

Invitation to York.

Sir JOSEPH SYKES RYMER remarked that it was a great pleasure to him to be present at the meeting on the occasion of the election of the Engineer of the York Water-Works Company to be the President of the Association. Those who were connected with the York Company took it as a compliment that the members of the Association should consider that one of the Company's officials should be of that standing which qualified him to take such a position as President; but they felt sure the members had not made a mistake in the confidence they had placed in Mr. Humphreys. It would be a great pleasure for his (Sir Joseph's) colleagues and himself to meet the members at York in the summer, and to show them what they were

doing there. They claimed to be second to none at York in their water-works machinery—engines, boilers, and so forth, and especially in the filtering of the water. But they were always willing to learn; and they tried to improve. They were quite conscious they had not reached perfection; but if the members went to York, and could show them anything whereby the Company could advance, they would be only too delighted. He should like to add a word of congratulation to the members of the Association on the vocation in life that they had chosen. He hoped they were all properly remunerated by their various companies and authorities. [Laughter.] Independent of that, however, water engineers had the satisfaction of knowing that they were doing a great amount of good. There was no more interesting or useful vocation than to endeavour to send out to the communities a wholesome and satisfactory supply of water. He trusted the new President and all the members would have a happy and profitable year.

The PRESIDENT, in acknowledging the kind remarks of Sir Joseph, thanked him and his colleagues heartily for the invitation to visit York next summer. The Association were glad indeed to accept it. Sir Joseph would find water engineers were always willing to give good advice. They were not a shy or bashful body. If they saw anything that they thought was wrong, they would not hesitate to say so.

Control of Accounts of Municipal Authorities.

There was a discussion on this subject; and unanimously the following resolution was passed: "That the Association of Water Engineers approves, and endorses, the action of the Committee of Municipal Trading Departments in their opposition to the proposed centralization of the control of their accounts."

Votes of Thanks.

Proposed by the PRESIDENT, and seconded by Mr. W. MILLHOUSE, a hearty vote of thanks was passed to the President and Council of the Geological Society for the use of their rooms for the meeting.

Mr. WILLIAM MATTHEWS (London) moved a vote of thanks to the authors of the several papers. The papers had been exceedingly interesting and entirely useful, as had also been the discussions.

Mr. FREDERICK GRIFFITH (Leicester), in seconding, said he regarded the papers as being above the average, and so had been the discussions.

The motion was unanimously carried.

On the proposition of Mr. H. ASHTON HILL, seconded by Mr. C. SAINTY, a cordial vote of thanks was passed to the Scrutineers.

This completed the business before the meeting.

PERSONAL.

Mr. E. W. BOOTH has resigned his position as engineering assistant in the Water Department of the Bolton Corporation, and the Committee have decided to advertise for a successor.

Mr. W. S. M'GREGOR, representing Messrs. Biggs, Wall, and Co., has accepted for the third time the position of Chief Engineer of the Imperial Ottoman Gas-Works, Constantinople, and will shortly leave England to take up his new duties.

At the meeting of the Paignton Urban District Council last Thursday, the Water Committee reported that four candidates for the office of Water Engineer appeared before them, and they recommended the appointment of Mr. J. C. HAWKINS, of the Water Engineer's office, Cardiff, as Chief Water Engineer to the Council, at a salary of £200 per annum, rising by annual increments to £250 per annum. The recommendation was approved.

We learn that Mr. G. P. POOLE has resigned the position of Manager of the Madeley (Salop) Gas-Works, in which he succeeded his father, who had filled it for upwards of thirty years. In the early days of his professional career, Mr. Poole was Manager of the Broseley Gas-Works; but after three years he left to take a similar appointment with the Sutton and Hooton Gas Company, with whom he remained more than twenty years. He left their service to enter that of the Madeley Company, and is now leaving it on account ill-health.

Mr. FRANK H. ROBINSON, the Engineering Assistant to Mr. J. G. Newbigging, M.Inst.C.E., of Manchester, was elected an Associate Member at last Tuesday's meeting of the Institution of Civil Engineers. Mr. Robinson was educated at the Manchester Grammar School, and, after three years' training with Messrs. Thomas Newbigging and Son, has been for the past 6½ years with the Manchester Corporation—now at the Gaythorn Gas-Works. Mr. Robinson's paper, on the "Design and Construction of a Large Gasholder Tank at Manchester," appeared in the "JOURNAL" as recently as the 30th ult.

OBITUARY.

DR. LUDWIG MOND.

WE regret to record the death, at the age of 70, of Dr. Ludwig Mond, which occurred at his London residence in Avenue Road, Regent's Park, early last Saturday morning, after a protracted illness. The deceased was the Managing-Director of Messrs. Brunner, Mond, and Co., Limited, and had occupied several important positions in the scientific world; being chiefly known for his great achievements in chemical research. He was born at Cassel in 1839, and was educated at the Polytechnic in his native town; afterwards proceeding to Marburg University, where he studied chemistry under Hermann Kolbe. Subsequently he went to Heidelberg, to complete his studies in Bunsen's laboratory.

After having held several chemical appointments in Germany, he came to England in 1862 with the object of introducing his process for the recovery of sulphur from alkali waste. For a short time he was associated with Mr. John Hutchinson, of Widnes; and while at these works he perfected his process. In 1864, he returned to the Continent to undertake the erection and management of a Leblanc Alkali Works at Utrecht. About three years later he settled in England, and subsequently became a naturalized British subject. In the course of his travels, Dr. Mond became acquainted with M. Ernest Solvay, of Brussels, the inventor of the Solvay process; and, having acquired the English patent rights, he established in 1873, with Mr. J. T. Brunner (now Sir John Brunner) as a partner, the firm of Messrs. Brunner, Mond, and Co., which was converted into a limited company in 1881. The works which they erected at Winnington and elsewhere are now the largest alkali works in the world, and employ something like 4000 men.

Another question to which Dr. Mond applied himself was that of the economical utilization of fuel; and the outcome of his work on this subject, which began about 1879, was the invention of the system of producing power gas known by his name. The development of this system, and the steps taken to supply the resulting gas on a large commercial scale in South Staffordshire, will be fresh in the recollection of our readers.

Always interested in the advancement of science, to further this object, Dr. Mond founded and endowed in 1896 the Davy-Faraday Research Laboratory at the Royal Institution. In addition to this, he contributed to the progress of science in this country; the principal institutions to which his generosity was chiefly directed being the Royal Society (of which he became a Fellow in 1891), the Royal Institution, the Universities of Cambridge, Liverpool, and Manchester, the University College, London, and the Lister Institute of Preventive Medicine. In recognition of his many services to science and industry, he received several honours and honorary appointments. He was Grand Cordon of the Crown of Italy, and a member of the Accademia dei Lincei; and he received honorary degrees from Padua and Heidelberg, and from the Victoria and Oxford Universities. He was President of the Society of Chemical Industry in 1889, and of the Chemical Section of the British Association at its Liverpool meeting in 1896. He was chosen President of the Chemical Society this year; but for reasons of health he was unable to serve.

Dr. Mond leaves two sons—Robert (the elder), the Hon. Secretary of the Davy-Faraday Research Laboratory; and Alfred, who represents Chester in the Radical interest in Parliament.

The death is announced of Mr. GEORGE SWAINSON, who retired from the position of Borough Treasurer of Bolton early in the present year, after occupying it for 33 years. Mr. Swainson was elected first President of the Institute of Municipal Treasurers.

Mr. THOMAS WRIGLEY, the Chief Committee Clerk to the Manchester Corporation, died at Rhyl on Friday last, at the age of 62. Mr. Wrigley had a serious breakdown in health in the summer, and had been absent from duty for some three months. He served under 26 different Mayors and Lord Mayors.

Mr. ALFRED WALKER, who died last week in his seventy-second year, was for some time Chairman of the Huddersfield Gas Committee; but his most notable service was as Chairman of the Water-Works Committee—a position that he held from 1900 until September, 1908. During the municipal years 1878-9 and 1879-80, he was Mayor of the borough.

The death took place at Knowle, Warwickshire, on Wednesday, of Mr. EDWARD TANGYE, one of the five brothers who built up the engineering business of Tangyes Limited, at Cornwall Works, Birmingham. Mr. Tangye, who was in his 78th year, in his early days took an active share in the mechanical department of the business; but his health gave way, and he went to live in Cornwall. A few years ago he returned to the Midlands, and took up his residence at Knowle. He leaves a widow and family.

The Late Mr. Barber's Position.—The "Birmingham Mail" says: We understand that it is doubtful if the Birmingham Gas Committee will take any steps before Christmas to fill the vacant secretaryship at the Gas Department created by the death of Mr. G. Hampton Barber.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 772.)

THE Stock Exchange had its ups and downs last week. At the start, everything was going quite well. The rising tide in the choicest departments was still running strongly. Consols and their gilt-edged associates were buoyant; Railways made a broad advance; and the Foreign Market was strong. The cheerfulness was widespread enough to include many of the more speculative lines. But before long the big rise had its inevitable sequel and reaction. Monday was perhaps the best day (the demand for investment not having worn itself out); and Consols advancing a little more. On Tuesday, the Railway Market was very busy, and prices were full of rise. Consols, however, paused at their zenith, and then fell back a little in the face of realizations to secure profits. Wednesday was much the same. The general tone was good, and Railways were still a centre of attraction; but Consols kept on giving way. Business in general became quieter on Thursday; and the profit-snatching operations reached the Railway Market. On Friday, markets were inactive and irregular. Government securities and the Railway Market were weaker; but the Foreign, American, and South African were stronger. Saturday was quiet and dullish, and pretty well every department was rather weaker if it moved at all. In the Money Market, there was a plentiful supply on easy terms. On Thursday (as had been generally forecast), the Bank of England rate was lowered to $4\frac{1}{2}$ per cent. Before the close of the week, market rates hardened. Business in the Gas Market was not up to the average in point of activity. Some issues which are usually in evidence were not touched at all, and the leading lines were rather devoid of animation. One or two issues, generally quiescent, woke up a bit; but they could not restore an equilibrium. However, the tone was quite firm and steady; and all changes of quotation—albeit few in number—were in the upward direction. In Gaslight and Coke issues, the ordinary plodded along quietly without any change; all transactions being within the range of 102 $\frac{3}{4}$ and 103 $\frac{1}{2}$. In the secured issues, the maximum made 87 $\frac{1}{2}$ and 88 $\frac{1}{2}$, and the preference 104. There were many dealings in the debenture at from 82 to 83 $\frac{1}{2}$. South Metropolitan was quiet and unchanged at from 119 $\frac{1}{4}$ to 120 $\frac{1}{4}$; and the debenture realized 82 and 82 $\frac{1}{2}$. In Commercial, the 3 $\frac{1}{2}$ per cent. made from 103 free to 104, and the debenture 81. Among the Suburban and Provincial group, Alliance and Dublin was dealt in at 17 $\frac{1}{2}$, Brentford old at 253, ditto new at 192, Brighton ordinary at 151 $\frac{1}{2}$, British at 43 $\frac{3}{4}$, Hastings 3 $\frac{1}{2}$ per cent. at 93, Lea Bridge at 120 $\frac{1}{2}$, South Suburban at 119 $\frac{1}{2}$ free, Wandsworth "B" at 139 $\frac{1}{4}$ free, and West Ham preference at 127 $\frac{3}{4}$. In the Continental companies, Imperial made from 176 $\frac{1}{2}$ to 177, ditto debenture 94 $\frac{1}{2}$, Union 98, ditto preference 140 $\frac{1}{2}$ (both *cum div.*), European 24 $\frac{3}{4}$ and 24 $\frac{3}{4}$, and ditto part-paid from 18 $\frac{3}{4}$ to 18 $\frac{1}{2}$. Among the undertakings of the remoter world, River Plate changed hands at from 16 $\frac{1}{4}$ to 16 $\frac{1}{2}$.

ELECTRICITY SUPPLY MEMORANDA.

To Terrorize Householders—A Stale Dish Re-served—Doctors Differ—Want of Knowledge—Dr. Haldane's Experiments in Closed Rooms—Judgment of a Competent Committee—Sundry Points.

THE purveyors of electricity in London have so much difficulty in obtaining additional domestic consumers, that they are seeing just now if they cannot capture some by striking terror into their hearts by telling them all the most horrible things possible about the unhygienic properties of gas, and the nicest things possible about the sanitary qualities of the electric light. They are disseminating the information through the "Electrical Bulletin;" and from the energetic Editor, Mr. Spencer Hawes, we have received, with his compliments, a copy, presumably to let us know how cleverly the editorial work of the "Bulletin" is conducted. But on this occasion we regret to see the work was too much for even the versatile Mr. Hawes; so he had to take Dr. J. N. Goldsmith as a collaborator. Between them they have prepared a wonderful *réchauffé* dish for the consumption of householders of London. It is mostly very stale stuff that they have re-served; and not in a single place can we find that they have added to the stock of knowledge through their combined mental effort. They have drawn largely from good, but academical, Dr. Haldane, and dipped deeply into the Home Office reports referring to factories and workshops, as though (how very hard put to it they are!) the conditions in workshops and factories—where gas is, in all too many cases, from an objection to departing from custom, allowed to flare away from flat-flame burners, and is used in any crude fashion for heating tools, and so forth, and wherein producer or suction gas is now frequently employed—at all represents the conditions obtaining in the home. If the electricians are so hard pressed that they have to attempt to frighten people away from gas to electric lighting, do let them go about the business, if they can do so, in an honest manner, and not stoop to crass deception. Then, again, like a couple of mischievous boys, Mr. Spencer Hawes and his helpmate Dr. Goldsmith have set Professor Vivian B. Lewes and Dr. Rideal in opposition. That is unkind; but we cannot see one single respect in which the compilers have supplied the material that proves that either Professor

Lewes or Dr. Rideal is wrong in his assertions. They quote Dr. Parkes, Dr. Haldane, Dr. Newsholme, the Medical Officer of the London County Council; but there is no difficulty in quoting to the contrary authorities still greater in the scientific world than these. But we cannot hope in the space of these notes to deal entirely with matter that occupies sixteen columns in the "Bulletin," or to produce all the rebutting evidence. The ground has been traversed time and again in these columns. Facts remain facts; and all the appeals to Dr. Haldane and to the Home Office report on Factories and Workshops will not upset those facts. One fact is that in the past twenty years the consumption of gas in Great Britain has more than doubled; and Mr. Hawes and Dr. Goldsmith fail to produce one iota of evidence that, in consequence of this doubling of use, the general health of the community has degenerated or that the mortality has increased. It is good to apply practical tests of this kind to the superstitions of a by-gone day, to which superstitions the electrical folk are in their extremity clinging with a tenacity that is both amusing and instructive to their competitors. It is to say the least interesting in this connection to see the reliance placed on the Home Office reports in regard to factories and workshops. We rather thought the electrical industry had had enough of the Home Office and their regulations applying to the use of electricity in workshops and factories. It was not long since they were talking, with remarkable fecundity, of red-tapism and official fads; but now they find in the same quarter friends in their need.

We have said that much of what is presented in this "Electrical Bulletin" is stale and little original. The quotations that preface the article by the joint authors bear that characteristic. One of them is from a paper by Sir Aston Webb, in which he says that "carefully regulated incandescent electric lighting is the best, and greatly simplifies the ventilation. Gas is better avoided." Men, of course, have a perfect right to change their opinions, when they find that the former ones were erroneous. At the meeting of the Royal Institute of British Architects on May 17 last, Sir Aston Webb was a speaker. He stated that, having recently, owing to illness, been compelled to have a fire in his bedroom, he was convinced that a gas-fire was preferable to a coal fire. On the same occasion, Dr. H. A. Des Vœux also mentioned that "he is a strong believer in gas for heating houses, and especially for bedrooms. There are now 500,000 gas-stoves in London; and if gas were deleterious to health as some people thought, they would have heard of its effects before this." Again, as was stated a fortnight since in the "JOURNAL," during the past two years upwards of 1000 gas-fires have been fixed for members of the medical profession in London. We should like to know from Dr. Goldsmith whether the medical men represented by these 1000 gas-fires are inferior to him in judgment. The question is a delicate one; and perhaps as to what Dr. Goldsmith thinks, his modesty will not permit him to give expression.

The authors devote about four columns to Professor Lewes and Dr. Rideal, on the question of bacteria cremation by gas; but it is clear that here and in other places personal knowledge does not assist the criticism by Mr. Hawes and Dr. Goldsmith. We will leave the bacteria, with a recommendation to them if they desire prolonged life to get into places electrically lighted, only shunning those, which are few and far between, where the mercury-vapour quartz-tube is in use. To get into the ultra-violet rays of this light means certain death. Then the attention of London householders is called to the "destructiveness of sulphur acids"—their "propensity for tarnishing and destroying household equipments, decorations, and ornaments." Mr. Spencer Hawes and Dr. Goldsmith have a peculiar affection for Dr. Haldane. They will therefore be displeased to learn that this particular bulwark of theirs, in his evidence before Lord Rayleigh's Committee on Gas Testing in the Metropolis in 1904, said: "The sulphuric acid is, I think, mostly due to the general London air; it is only partly due to the gas. I should attribute *most of it* to the sulphuric acid present in the outside air from the combustion of coal," which (we may add) is largely contributed to by the electricity stations of London. Following up this, the joint authors refer to "some startling results that were brought before the Pharmaceutical Society at Edinburgh lately;" one of the startling results being the destruction of the leather cover of the seat of a chair that had been standing near a large gas-fire. We refer the authors to our "Memoranda" in the "JOURNAL" for Jan. 12 last for a criticism of this startling result; and on the subject of carbon dioxide and organic impurities in air, there is an article in our issue for Feb. 9 (p. 360) that may be of interest to them, and supplement their present knowledge.

The matter of sulphur compounds is next taken up; and the surprising thing is that Mr. Hawes and Dr. Goldsmith selected Dr. Haldane to support them in this connection. In treating of this aspect of the subject, the joint authors set off by disclosing their personal ignorance. They say: "The sulphur in the gas, after the partial purification which it undergoes in the gas-works, exists chiefly as carbon bisulphide, with a small proportion of *sulphuretted hydrogen* and organic sulphur compounds. These sulphur compounds are inflammable, and yield a mixture of sulphurous and sulphuric acids when the gas is burned in a flat-flame burner, while they appear to be completely oxidized to sulphuric acid in the flame of an incandescent burner." We would suggest that this weighty statement should be reconsidered by the authors, and revised in at least one essential particular—that as to the *sulphuretted hydrogen*—as it may cause ridicule among people who receive the "Bulletin" and who happen to know

more about the matter than these dabblers in the chemistry of gas and gas lighting. Probably they have got a little mixed over a statement in an article which has been of enormous value to them, that "the sulphur contained in *crude unpurified* lighting gas is present chiefly as sulphuretted hydrogen; about one-tenth being present in other forms, chiefly as carbon bisulphide." They take tightly hold of the coat tails of Dr. Haldane, and quote from articles by him in the "Journal of Hygiene" on "The Air of Factories and Workshops" and "The Relation of Sulphur in Lighting Gas to Air Vitiating." We have gone far since Dr. Haldane published those articles in 1902 and 1903; and in the succeeding year—1904—we learned a great deal about the unsound foundation on which the learned Doctor's opinions are based. Dr. Haldane is one of those scientific men who occasionally are most unscientific in their methods of procedure. The authors themselves ought to have seen that Dr. Haldane's conclusions were egregiously unjust and unacceptable from the very fact that they themselves quote: "In his experiments, gas was burned in a *closed* room; and the degree of contamination of the air was ascertained by carbonic acid estimations." Gas is not, as a rule, burned in "closed" rooms (such as those in which Dr. Haldane conducted his experiments at the Physiological Laboratories at Oxford) in dwelling-houses, without the ordinary means of ventilation. Dr. Shirley Foster Murphy, questioned by Lord Rayleigh, threw some light upon the character of Dr. Haldane's experiments, in giving evidence before the Board of Trade Committee on Testing Gas in 1904. Dr. Haldane had submitted his evidence before Dr. Murphy was called; and the latter had, in the meantime, been to Oxford to witness a repetition of the experiments. In Dr. Haldane's first experiments, he used a room of only 900 cubic feet capacity (*with the register of the fireplace closed*) for the sulphur experiments; and the second room had a capacity of 5500 cubic feet, with *no* fireplace, and half-a-dozen flat-flame burners fixed in it, each passing 10 cubic feet per hour! The character of the experiments witnessed by Dr. Murphy in other two rooms, is explained by an editorial comment in the "JOURNAL" at the time; and this may be quoted:

These observers took a couple of rooms of a capacity of some 6000 cubic feet; *the windows and doors were kept closed, and there was no fireplace in the rooms.* Can this be called an ordinary dwelling-room? Then in each of these shut-up rooms, they flared away gas at the rate of 11·8 cubic feet an hour, which Dr. Murphy said was equal to about the use in these apartments of three flat-flame gas-burners. Why did they not try one incandescent burner? The gas burnt in one of the rooms, they packed with bisulphide of carbon until the sulphur in the gas reached about 36 grains. Then these two scientific men, another Doctor, and three ladies alternately entered the two rooms [half-a-dozen persons altogether]—all, on Dr. Murphy's admission, knowing more or less that one room was undergoing a somewhat different treatment from the other. They found what they sought. That they did so is not marvellous, when one considers the conditions of the rooms, and the method of treating and using the gas. And this passes in places for scientific research! We earnestly protest against its injustice, and hope—though the hope we fear is a vain one—that the gas industry will be delivered from all such unfairness in the future. A more practical test than the experiments applied to the gas by these doctors is found in the reply of Dr. Murphy, that he had never heard of people complain of the gas supply who were working in towns where the sulphur impurities are left in the gas; and again, answering another question, he stated that he did not think that, if the sulphur compounds other than sulphuretted hydrogen were left in the gas, there would be any specific damage to health.

On the same point, Dr. Haldane said: "It is unpleasant when you get a perceptible quantity of oxidized sulphur in the air; but I do not know anything to lead me to suppose that it is actually injurious to health." Mention is made in the quotation from our editorial columns of five years ago of the fact that bisulphide of carbon was put into the gas by Dr. Haldane; and, in his evidence, Dr. Murphy stated that he could not say whether there would be any difference between the burning of pure bisulphide of carbon mixed with gas and the sulphur compounds there would be in ordinary gas. These are the experiments, in *closed* rooms, upon which Mr. Hawes and Dr. Goldsmith place so much reliance; and we ask them whether they honestly believe them to be fair tests, and whether they would accept them as such on behalf of electric lighting. If not, then let them say so in the next issue of the "Electrical Bulletin." They might also at the same time point out that Dr. Haldane was effectually disposed of by the Board of Trade Committee's report in 1904—the Committee consisting of Lord Rayleigh, Sir W. Abney, Dr. R. Farquharson, Mr. William King, and Mr. J. Fletcher Moulton, K.C. Consider those names, and then this statement in their report:

It is not disputed that only a small percentage of the gas undertakings in the United Kingdom (whether in the hands of Companies or Local Authorities) are required to take these sulphur products out of the gas they supply. Nevertheless, it does not appear that any complaints are made by the inhabitants of other districts on the ground that the gas unpurified causes injury to health, or is more destructive to articles such as leather, &c., than it is supposed to be in London. In the face of this striking fact, the Committee are of opinion that those who contend for the maintenance of the clauses relating to sulphur compounds (other than sulphuretted hydrogen) have not sufficiently shown that their abolition in the case of the London Companies would be detrimental to the public.

Are Mr. Hawes and Dr. Goldsmith prepared to dispute the competence of Lord Rayleigh and the other members of the Committee to form a correct judgment in this matter?

We do not know that there is any value in further traversing

an article from the pen of a pair of writers who have obviously no personal knowledge of these matters, and who rely so confidently upon the results of experiments of the character exposed here. But two or three points more may receive passing remark. In the section of the article on "Scientific Ventilation," we do not see anything about the complaints as to the conditions of the electrically lighted Law Courts and the new Central Criminal Court, nor do we observe any reference to the statements in the last report on Factories and Workshops as to the great improvement effected in the lighting of such places where incandescent gas-burners are employed. Nor do the authors quote Dr. Haldane's statement, referring to a table in the paper on the "Air of Factories and Workshops:" "The table shows clearly the great advantages of incandescent mantles. Their much more general employment in factories and workshops is very desirable with a view to avoiding excessive vitiation of the air, and at the same time obtaining a good and perfectly steady light." As to "Poisonous Emanations of Partially Burnt Gas," we should like the learned Mr. Hawes and Dr. Goldsmith to explain what they mean by this statement: "With varying gas pressures and inverted gas-burners, especially when they are not nicely adjusted, considerable quantities of partially consumed gas may easily escape into the rooms." How, and from where? What, too, is meant by this gas being "*heavily charged* with carbon monoxide." Let us have an illustration in figures. Then, as to the "Potentialities of Gas Leakage," interior gas-pipes ought not to be allowed to leak; it is the fault of the consumer if they do. As to the "Lancet" and its traditional efforts in arousing terror in the public mind, we may refer the authors to a couple of leaderettes in our issue for Aug. 18, 1908, the first of which is headed "The 'Lancet' finds a Mare's Nest."

The section of the "Bulletin" containing the old, old electrical arguments as to the relative cost of electricity and gas must also be passed over, in view of the length to which this article has already extended. All the mildewed arguments are brought forward once more by Mr. Hawes; and their repetition indicates the poverty of the electrical land. Figures are given to show where in cases money has been saved by displacing gas by electricity. We have not sufficient space to quote the thousands of cases that gas undertakings could furnish us with of savings effected by the eviction of electricity and restoring gas, which figures would be anything but "farcical." The "Wasteful Bye-Pass," "Mantle Renewals and Burner Repairs," are dealt with in the approved electrical fashion; and a paragraph appears headed, "A Great Public Institution favours Gas"—viz., the Metropolitan Asylums Board. The Editor has quite—of course, inadvertently—overlooked the report of a Committee of the Local Government Board in which it was stated that there is no justification for adopting electricity where gas at present exists.

New Gas for Balloons.

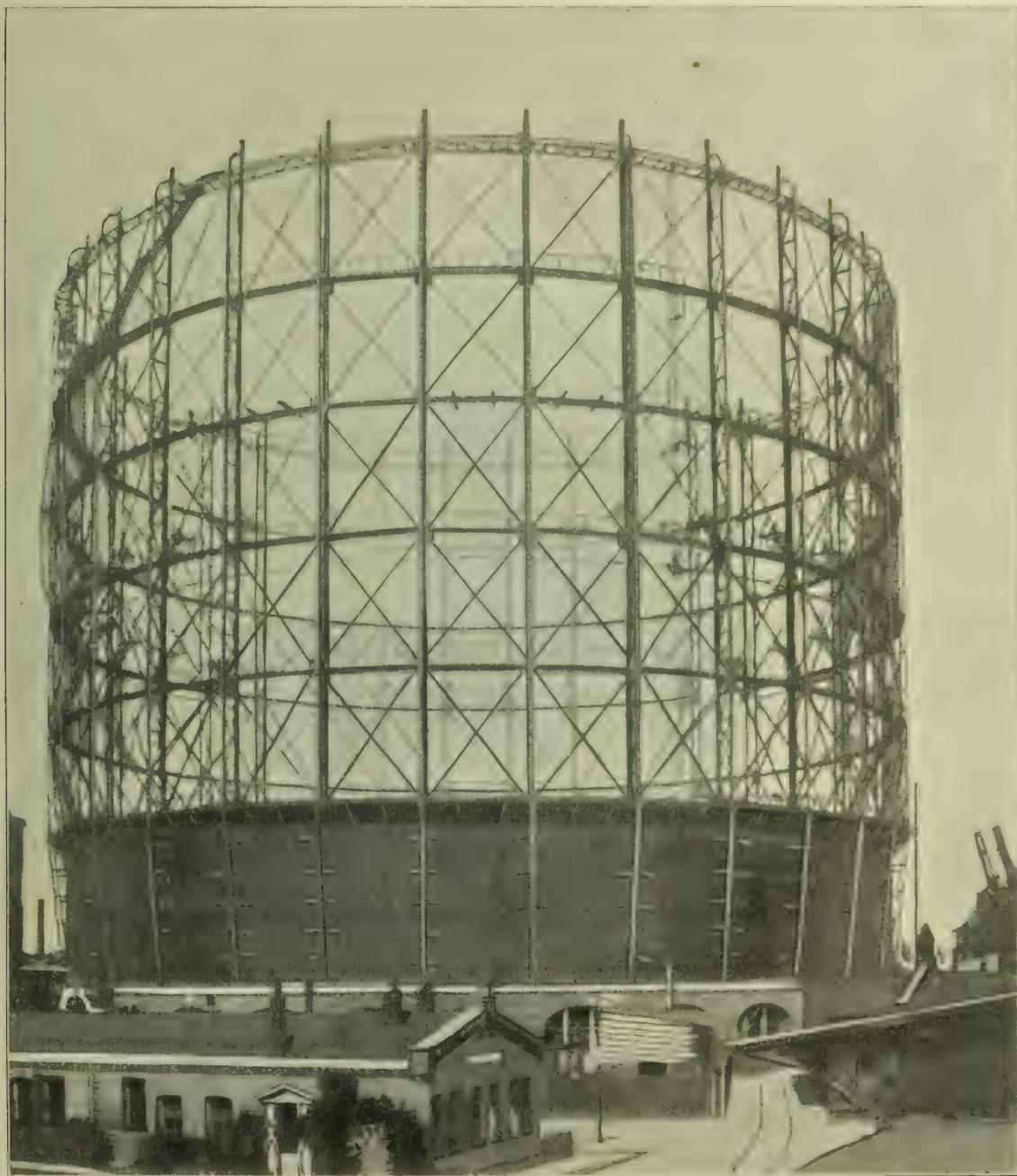
According to information from Berlin contained in the Engineering Supplement to "The Times" last Wednesday, Dr. W. von Oechelhaeuser, the General Manager of the German Continental Gas Company, has been carrying out some experiments with the object of producing a new kind of gas suitable for balloons. According to our contemporary, they show "that the decomposition of ordinary coal gas in vertical retorts yields in normal operation a balloon gas of a specific gravity of about 0·225; so that to one cubic metre would correspond a lifting power of about 1 kilo. According to the statutes and regulations of the International Association of Aeronauts, the lift of one cubic metre of lighting gas has up to the present been calculated at 0·700 kilo. and that of hydrogen gas at 1·050 kilos. Hence, on the basis of these figures, the lifting power of the new balloon gas would be to that of hydrogen as 1 : 1·050, and by its assistance a balloon of a capacity of 1000 cubic metres would be able to lift 300 kilos. more than one of the same capacity filled with coal gas; or, alternatively, the size of a balloon with the same lifting power could be reduced by 30 per cent. This balloon gas contains upwards of 80 per cent. of hydrogen; while the content of methane is reduced to 5 or 7 per cent. The gas has only a very slight smell, and contains neither benzol nor any other heavy hydrocarbons capable of attacking the balloon cover." Dr. Oechelhaeuser is at present engaged making experiments to ascertain whether the process is adaptable to horizontal retorts.

New Method of Preserving Wood.—Some recent experiments by two Swedish engineers, MM. Heidenstam and Friedemann, on the preservation of timber have resulted in the introduction on a commercial scale of a new chemical preservative. The substance is known as cresol-calcium, and is produced by the action of cresol ($\text{HO} \cdot \text{CH}_3 \cdot \text{C}_6\text{H}_4$) on slaked lime. A solution of the resulting compound having a 10 to 15 per cent. composition is used for impregnation, which is carried out in exactly the same manner and with the same apparatus as is employed for creosoting, with the exception that with the new material the temperature of 70° to 80° C. required for the creosote process is not necessary. The advantages claimed for the method are its cheapness, the cleanliness of the treated material, and its inflammability. In addition, a feature of the process is said to be the ease with which the right amount of preservative fluid can be given to the wood.

THE CATASTROPHE AT THE HAMBURG GAS-WORKS.

THE catastrophe which occurred at the Grasbrook Gas-Works of the City of Hamburg on Tuesday afternoon last is reported to have been the heaviest which has befallen the city since the sinking of the steam-boat *Primus* there. The Grasbrook works have, as "JOURNAL" readers are aware, been recently undergoing extensive enlargement; and conspicuous among the new work was the gasholder of 200,000 cubic metres (7,060,000 cubic feet) capacity, which is the largest gasholder on the Continent of Europe, and undoubtedly the largest in the world constructed with an annular tank and with the contained cellar utilized for general purposes. The accounts which have so far come to hand of the accident are by no means clear in regard to

the causes and details of the occurrence; the eye-witnesses and reporters having been naturally chiefly impressed with the magnitude of the disaster and the consequences of it. The daily Press, both in England and Germany, has generally referred to the catastrophe as an "explosion;" but it is evident from the more trustworthy accounts that, if any explosion actually occurred, it was a secondary and minor incident of the mishap. With these prefatory remarks, we may proceed at once to give an account of the accident, prepared from the reports of eye-witnesses and of Press representatives as published mainly in the "Hamburger Nachrichten." At the close, some particulars will be given of the type of construction of the tank and gasholder.



THE HAMBURG GASHOLDER BEFORE THE ACCIDENT.

It must be realized in the first place that the accident has involved not merely the destruction of the largest gasholder on the Continent, but also so much of the surrounding buildings and plant that the Grasbrook Gas-Works are, for the time being, reduced almost to inactivity as a gas manufacturing station. The City of Hamburg is therefore suffering at present from a very inadequate supply of gas, and, except where there is electric lighting, the streets are only partially illuminated at night. A large number of lives—thirty, at least—have been lost through the catastrophe; and the number of severely injured amounts to from forty to fifty. Up to the time of the reports so far to hand leaving Hamburg, it had been impossible to ascertain definitely how many had been killed and injured by the accident, as the search of the *débris* is attended with much difficulty and danger; while many of the more severely injured who are now in the hospital may yet succumb to their injuries. In addition to the thirty deaths

definitely known to have taken place up to Wednesday evening, the authorities estimated then that at least sixteen persons (few if any of whom could be alive) remained buried in the *débris*. Funds have been opened in Hamburg to relieve the families of those killed and incapacitated by the disaster.

The new gasholder, which was constructed in four lifts conjointly by the firms of F. A. Neuman, of Eschweiler, and the Berlin-Anhalt Engineering Company ("Bamag"), was taken over by the management of the gas-works on its completion on Nov. 6 last. It was filled for the first time with gas about ten days before the accident happened; and on the afternoon of the occurrence it was about half full, and therefore contained at the time about $3\frac{1}{2}$ million cubic feet of gas. About a quarter past three in the afternoon of Tuesday last, many of the workmen engaged on the buildings round about the gasholder observed a sudden lifting of the bell, or of the uppermost lift of the bell, followed by an

equally sudden fall, and that by another lift. Foreboding no good therefrom, many of them took to flight, climbing or jumping down from the roof framings on which they were engaged.

The holder meanwhile sank once more, and a quantity of the water in the cups was forced out. At the same time, from beneath the holder and above the concrete ring, a large flame issued on the side that was nearest the town. At the moment also, enormous tongues of flame sprang out from the vault of the under-structure of the tank, destroying everything round about which was combustible or susceptible of injury by fire. The whole sub-structure of the gasholder, which consisted of strong iron girders with radial ribs and lateral ties, covered with masonry (cement concrete), became penetrated, and everything contained in the vault, including the canteen and kitchens, was at once buried in its ruins. Above it, the large volume of about $3\frac{1}{2}$ million cubic feet of gas streamed out, burning into the open, illuminating everything to a great distance with its glare, and producing enormous clouds of smoke. In the immediate vicinity, the "explosion" gave the impression of a small earthquake; but there was no violent concussion, as the outflowing burning gas was not mixed with air. The enormous tongues of hot flame that roared forth from the arch of the sub-structure stretched across the whole length and breadth of the space intervening between the retort-house and the new coal-stores to the buildings on the opposite side. In the vault beneath the gasholder every living thing was naturally killed in a moment—crushed or roasted to death.

Some only of the workmen engaged on the framing of the coal-store in course of erection, and the men working in the retort-house on the opposite side, were able to be rescued. Some were driven down by the advancing flames, and others jumped down in order to escape them; so that many of these fell victims to the disaster, or were more or less severely burned. The flames also raged terribly on the side where the retort-house was in course of construction, and in the gangway between the two gasholders, in which men had likewise been at work. The window panes, and in many cases the window framings, also of the vault were shattered by the force of the "exploding" gas, as well as windows of the retort-houses facing the gasholder. The tongues of flame rushed forth for a short time only. Nevertheless, they set fire to all the combustible woodwork in the vicinity. The roof of the gasholder house near by, in which was the old gasholder containing about 40,000 cubic metres (1,400,000 cubic feet), being largely of wood, was fired by the flames; and ultimately this holder also was completely burnt out. It appears that only one section of the fire brigade was able to get to work on the burning holder. This section played on to it from the Elbe—from the direction of which the wind was blowing. The Chief of the Brigade, however, permitted the roof of the house of the old gasholder to blaze unchecked, as he feared injury to his staff from the explosion which was momentarily expected to occur in this holder. He was convinced that the extinction of the fire in this quarter could only be seriously taken in hand after the holder, with its $1\frac{1}{2}$ million cubic feet of gas, had burst.

The hose was got in readiness against the time when the Chief of the Brigade should give the word for its employment on the burning gasholder house. Meantime, the roof of the building continued to burn; while the onlookers exchanged views as to what would happen when the holder itself burst. The technical men were of opinion that the contents would burn away with a large flame without extreme violence. Other people, however, anticipated that there would be an explosion; and that the gasholder would be blown into the air. The Chief of the Fire Brigade, in order to guard against all possible contingencies, gave orders at 4.30 p.m. for the circle from which people were excluded to be enlarged, though the order was scarcely necessary. Then the roof of the gasholder house collapsed; and the populace retired still farther in order to be safe from the explosion which was then momentarily expected. The police had, consequently, no work to do in keeping neighbouring streets clear, and were merely engaged in advising the officials at the river and wharf side buildings—only about 100 yards distant from the burning gasholder—to take to flight. Nevertheless, the impending disaster did not occur until about 4.45 p.m., when darkness had already set in. There was then a sudden mighty roar; and an immense blood-red sheaf of flame shot upwards to a height of about 500 feet, and spread tremendous heat to a great distance. A wide area was lighted up as if by daylight. Scarcely, however, had the magnificence of the scene been realized before the great blaze began to pale, and in a few seconds it was over. Some $1\frac{1}{2}$ million cubic feet of gas had been burnt in that brief space of time. A great cloud of smoke issued from the yawning cavity of the unroofed gasholder. Then the fire brigade got to work on it, and soon overcame the danger of further spread of the fire.

It was now possible to gauge in some measure the extent of the disaster. The make of gas from the retort-houses, the settings in which had escaped injury, was diverted immediately after the collapse of the first gasholder. From one account, it would appear that the lids of the retorts were opened, and the gas was allowed to burn away at the mouthpieces. Another account says that the burning gas from the stacks of the retort-houses brightly illuminated the whole works. In front of the large gasholder, the *débris* of the accident was comparatively small; but the scaffolding, &c., of the buildings in course of erection was heavily charred. It had been attacked by the tongues of flame issuing from the under-structure of the new holder. The vault of the latter was filled with iron girders, planks, brickwork, and cement piled up in

absolute chaos. The gasholder, by its collapse and the pressure of the burning gas, had split up the roof of the vault. The lofty guide-framing of this holder, as seen by the light of the flames from the neighbouring holder, appeared comparatively little injured; but the walls of the house of the old holder projected skywards in a state of ruin. On the side adjoining the street there was an enormous gap, diminishing below to a crack, caused by the pressure of the liberated gases. This old gasholder is totally destroyed, and will have to be entirely re-built. The fire brigade continued its work until about 9.45 p.m., when it was considered safe to withdraw all but six of the firemen. Thousands of people, however, remained in the neighbourhood of the works until far into the night.

THE EXTENSIONS AT THE GRASBROOK WORKS.

It may be useful to give a brief account of the gas-works which supply the City of Hamburg, and in particular of the Grasbrook Gas-Works and the extensions which have been in progress there since 1907.

There are three gas-works at the present time in Hamburg, of which the Grasbrook works, situated between the Strand and the Magdeburg wharves, is the oldest. For many years, it was the only works in Hamburg. Its position on the tide-way of the River Elbe renders it accessible to steamers; so that the coal is landed on the works and bye-products are removed without intermediate transport. In other respects its situation is good, in that it is in the centre of the district which it supplies, and the mains connecting it to the distributing system are of a short and simple character. Thus the Grasbrook works is at the present time the central and most important factor in the gas supply of the city. The district supplied directly from it comprises the whole of the inner town, including St. Pauli and parts of St. Georg and the suburb of Eimsbüttel. The next most important works is the Barmbeck works, which for the time being has the largest productive capacity and supplies directly the districts on the right bank of the Alster, and Barmbeck, Eilbeck, Hohenfelde, Borgfelde, and Hamm. The third city gas-works is situated in the Ausschläger Elbdeich, and directly supplies the districts of Billwärder, Ausschlager, and Hammerbrook, as well as a portion of the inner town and of St. Georg. The distributing system directly connected with each of the three works is, however, joined up, so that all the works are in close co-operation, and one can supplement the supply to the district of another and equalize the load on any particular works. The regulation of the gas pressure throughout the whole district is controlled from the Grasbrook works, which thus form the central works of the undertaking. The maximum day's make of gas in the year 1894 amounted to 199,100 cubic metres (= about 7,030,000 cubic feet), and in the year 1906 to 362,400 cubic metres (= about 12,800,000 cubic feet). At the present time, the Grasbrook Gas-Works can make about 5,450,000 cubic feet in twenty-four hours and the Barmbeck works 6,000,000 cubic feet.

The Committee of the Corporation which has control of the gas and electricity supply undertakings for several years past had had in mind the establishment of a new works on the upper stream of the Alster. But while this project was under consideration, extensive changes took place in methods of gas manufacture; and before proceeding to recommend the Municipality to erect this fourth works, the Committee decided to reconstruct the existing works in a manner which would effect a large increase of their output. Even when the third of the existing gas-works was erected, it was found that improvements in the plant of the other works could be introduced. These consisted mainly in the adoption of machinery to displace manual labour as far as possible. Charging and drawing machinery was tried first experimentally at the Grasbrook works; and one of the three retort-houses there was then equipped with it. In 1907, it was decided to adopt stoking machinery at the Barmbeck works also. The existing systems of retort-settings having, however, been to some extent superseded in recent years by new systems, the Committee took the latter into their consideration. The great advantage of these systems is that they admit of the make of gas obtainable on a given area of ground space being very largely increased, while at the same time they afford easier methods of working. The new types of retort-settings were tried experimentally; and, as a result, the Committee recommended that a complete reconstruction of the Grasbrook Gas-Works should be put in hand. The chief feature of this reconstruction was the adoption of new systems of carbonization, which would increase the maximum output of the works from (approximately) 5,450,000 cubic feet to 15,890,000 cubic feet per diem. The erection of a water-gas plant at the Grasbrook works would further increase the productive capacity of the works to a total of 21,200,000 cubic feet per diem. Consequently, this works would be able to meet the increase in the consumption of gas for at least ten years. The Committee have, therefore, now postponed indefinitely the project for the erection of a fourth gas-works. It is ultimately intended to reconstruct in a similar manner the Barmbeck works; but a start was made on the Grasbrook works because, being the oldest of the three, its existing plant was more antiquated than that at the other works.

The Grasbrook Gas-Works has its three retort-houses and a coal-store disposed in the middle of the works. One of the retort-houses had been re-equipped with horizontal retorts and stoking machinery shortly before 1907. The other two retort-houses contained horizontal retorts of an older date without machines

for stoking. The settings would have had to have been replaced in any case within a short time. In the coal-shed between the Nos. 1 and 2 retort-houses a new bench of vertical retort-settings was erected experimentally in 1907, and brought into action shortly afterwards. To the west of these buildings, and adjoining the Harburger Strasse, were two gasholders; the larger being of about 1,765,000 cubic feet capacity, and the smaller of about 512,000 cubic feet capacity. The last-named is old, and would shortly be replaced. There is a third small gasholder of about 160,600 cubic feet capacity on the part of the works adjoining the Elbe, near by which is the coke yard. The purifying and apparatus houses are to the north of the retort-houses. It was decided that the new carbonizing plant should consist of carbonizing chambers of the Munich pattern, set on the slope, and each capable of receiving a charge of $11\frac{1}{2}$ cubic yards of coal. Whereas the old retorts were charged and discharged four times in 24 hours, the charge of coal is left in the chamber settings for 24 hours; so that the number of times of charging and discharging is reduced to one-fourth.

The total cost of the reconstruction was estimated at 14 million marks (£700,000). Of this sum, £100,000 was for the erection of a large new gasholder, £282,000 for the new carbonizing plant, £24,000 for new water-gas plant, £44,000 for new coal-stores, £49,200 for coal and coke handling plant, £110,000 for the construction and equipment of purifying and apparatus houses, £49,500 for the enlargement of the mains laid from the gas-works to the distributing system, and the remainder of the total estimated expenditure was for subsidiary plant and buildings. The expenditure on the Billwärder Gas-Works, which was erected in the years 1900-3, amounted to a total of about £370,000. The Grasbrook works, when the reconstruction is finished according to present plans, will have seven times the productive capacity of the Billwärder works, which at the time of its erection was equipped with the latest available plant and apparatus. The erection of another gas-works of approximately the same capacity as the Grasbrook works would have required a larger expenditure than the reconstruction of the existing works; and, owing to its less favourable position, it would have involved higher working charges. The Senate of the City took the view, however, that it was unnecessary at the moment to carry out the whole of the extensions at the Grasbrook works, involving the expenditure of £700,000. It was decided to vote a sum of £450,000 for the work of reconstruction to be carried out during the years 1908-09. This sum included the expenditure for the erection of the new gasholder (from which the present catastrophe emanated) and of the coal-store, as well as the greater part of the extension of the mains to the distributing system, but only half the contemplated expenditure on new carbonizing plant and a third of the estimated outlay on the water-gas plant.

LATER DETAILS.

Subsequent reports state that on Wednesday morning the scene of the catastrophe presented a most dismal aspect. Beneath the large gasholder lay, in dire confusion, masses of concrete and masonry, iron girders and bars, and charred planks. It was impossible to remove or explore this *débris* to any considerable extent until struts and props had been erected to support the tank and the plates of the bell, and thereby the risk of further loss of life through the falling-in of the superstructure guarded against. This shoring-up of the tank, &c., and the laying of cables to carry electricity for lighting the ruins, claimed first attention on Wednesday; but it was anticipated that some days would elapse before the substructure could be thoroughly explored and examined. Notwithstanding that the retort-settings did not suffer damage, it is expected that it will be six months before the normal supply of gas from the Grasbrook works can be resumed. Consumers are being asked to limit the use of gas as much as possible for this period; and the public lighting will be restricted. The scene of the disaster was visited on Wednesday by the Burgomaster, Dr. Burchard, and by several members of the Senate of the City and of the Lighting Committee, and a large number of police and other officials.

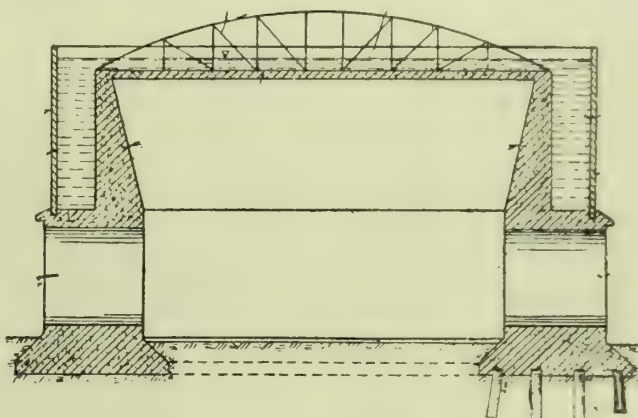
The gas-works' staff estimate that 3,400,000 cubic feet of gas in the new gasholder and 1,400,000 cubic feet in the old gasholder were burnt; but some estimates make the quantity of gas in the new holder at the time of the outbreak rather larger. The dead include workmen in the employ of a number of contracting firms engaged in the reconstruction of the works, and several women employed in the canteen and kitchen.

CONSTRUCTION OF THE NEW GASHOLDER AND TANK.

The new gasholder, of about 7,060,000 cubic feet capacity, in which the disaster had its inception, was erected, as already stated, jointly by the firms of F. A. Neuman, of Eschweiler, and the Berlin-Anhalt Engineering Company, of Moabit, Berlin. The contract appears to have been placed at the beginning of last year; and the autumn of this year was specified as the time for its completion. The contract price was 1,011,500 marks (nearly £50,000). The authorities of the gas-works required the construction to be such that railway lines should run beneath the holder for the passage of waggons; and hence it was necessary that the tank should be of somewhat similar design to that of the gasholder (of half the capacity of that at Hamburg) which was erected some few years ago at the Amsterdam Gas-Works, and of which a full description was given by Heer van Rossum du Chattel at the meeting of the Gas Section of the Engineering Congress at Glasgow in 1901. [See "JOURNAL," Vol. LXXVIII., p. 706.] But, as will appear, some essential differences have

been introduced in the Hamburg holder. The firms concerned in the erection of the latter are second to none in repute among constructing engineers for this type of work in Germany. The Berlin-Anhalt Company ("Bamag") are the constructors of the next largest gasholder in Germany—viz., the new one at the Charlottenburg Gas-Works, of 5,300,000 cubic feet capacity. This firm's share in the construction of the Hamburg gasholder was the bell or holder proper, which is in four lifts; while Messrs. Neuman erected the guide-framing and built the tank. The latter firm have recently also been engaged on the new holder, of about $1\frac{1}{2}$ million cubic feet capacity, having a wrought-iron tank 164 feet in diameter, at the Bremen Gas-Works.

The system of guide-framing adopted in the Hamburg holder is covered by a German patent (No. 152,685) granted to the firm of F. A. Neuman, and dated Dec. 6, 1901. This type of framing, which is intended for holders guided either by radial or tangential rollers, or by both these types of rollers, has columns which are of relatively great depth in the radial direction, and the columns are connected in the following manner. The outer angles of every column are connected by diagonal and horizontal rods to the inner angles of the next column. A panel-work is thus formed, the feature of which is that it lies in the same plane extending between the outer faces of alternate columns, which plane is intersected by the inner face of the intervening column. Whether the rods run exactly in the same plane between alternate columns or whether they are bent slightly where they are attached to the inner face of the intermediate column, must depend on the relations maintained between the depths of the columns, their number, and the circumference of the holder. The framing of the new Hamburg gasholder appears to have consisted of 32 columns; while the diameter of the holder was about 250 feet. An impression of the depth of the columns and the general appearance of the guide-framing may be obtained from the view of the holder on p. 733. The holder is stated to be about 200 feet high; so that the depth of each lift and of the tank would be about 50 feet.

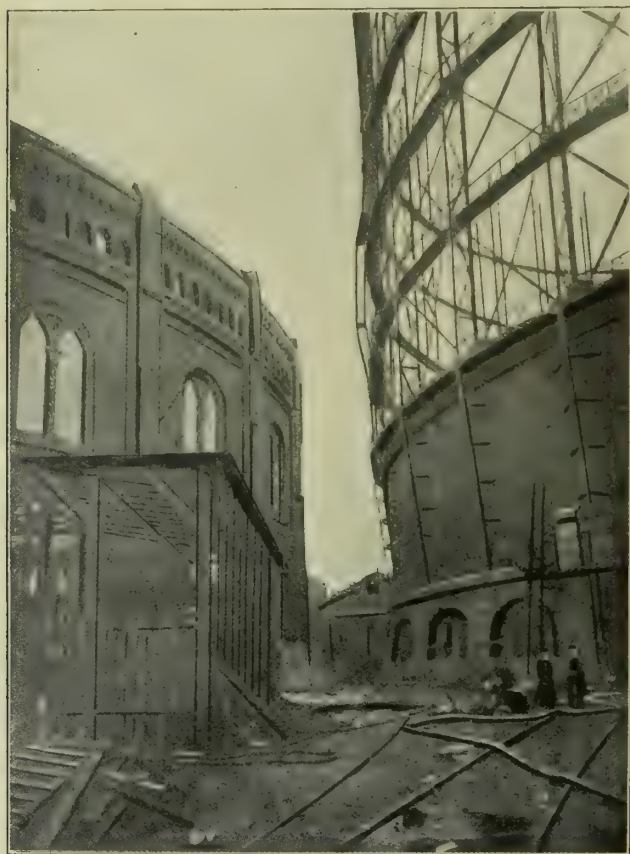


The Scheuss Construction of Gasholder Tank.

The tank was, by the contract, to be constructed according to the design patented by Herr M. Scheuss, of Eschweiler, by which the inner wall of an annular tank is formed of a concrete ring. This type of tank has been adopted by the firm of F. A. Neuman for other gasholders—e.g., one at Chemnitz. Apparently, the design is that covered by the English patent, No. 26,073 of 1904 granted to Herr Scheuss [see "JOURNAL," Vol. LXXXIX., p. 714]. According to this patent, an annular gasholder tank is constructed with the inner wall and horizontal bottom of the ring-tank made of masonry, concrete, or reinforced or armoured concrete, while the outer wall of the ring-tank is of iron or steel. When the masonry or concrete base of the ring rests directly on the ground, the area enclosed by the ring is merely made water-tight, and a layer of water, as sealing liquid, covers it. But, when, as in the case of the Hamburg holder, it is desired to have the interior space available for general storage purposes or for the passage of railway waggons, it is best, according to Herr Scheuss, to elevate the annular tank, in order to afford easy access to the interior, and to admit of daylight gaining admission thereto through windows provided in the substructure. The tank at Hamburg, as our view of the holder shows, was mounted on such a masonry or concrete substructure, having arches and windows for the passage of goods and persons and the admission of daylight to the interior. When this type of construction is adopted, a water-tight ceiling is provided above the interior space within the annular tank a short distance below the water-level in the latter, as shown in the annexed figure illustrating the Scheuss construction of a gasholder tank. The water then extends over the ceiling or roof of the interior chamber and seals the whole gas-tight. The ceiling or roof is carried by a framework of girders, which may be made to serve the dual purpose of carrying the ceiling and of supporting the crown of the holder when the bell is grounded. In the Hamburg gasholder, this ceiling or roof was evidently of cement concrete. The tank differed from that of the Amsterdam gasholder essentially in being constructed, as to its base and inner walls, of concrete, reinforced and supported by steel girders where necessary, instead of being like the Amsterdam tank wholly a steel structure. The interior chamber appears to have been utilized at Hamburg in part at least for a canteen and kitchens; and it was traversed by railway lines.

THE CAUSE OF THE DISASTER.

Reports state that it is as yet impossible to assign any cause for the breakdown of the holder, and that until the official inquiry which is to be held shortly has taken place any explanations that are offered must be pure conjectures. Nevertheless, we quote for what they are worth, some of the explanations hazarded in the "Hamburger Nachrichten." According to one account, the second lift of the gasholder was at the time just clearing the tank; and the third lift was beginning to rise. The cupping of this lift increased the pressure within the holder; and the extra pressure sufficed to blow the water seal in the cup, and the escaping gas was fired. It is suggested that the flames issuing from the stacks of the neighbouring retort-houses may have fired the gas; and once it had been fired, the enormous flames cracked the roof of the chamber or vault of the tank, into which the gas then passed. The flames from the burning gas in the vault streaming forth horizontally from the arches, were responsible for much of the subsequent damage and loss of life. This explanation implies either that the cups were too shallow—which from the repute of the constructors may be ruled-out as inconceivable—or that they leaked badly, or else that the third lift jammed, and so caused the pressure to rise to an abnormal amount, or that there was tilting of the upper lifts. Yet the report which suggests that the increased pressure caused by the third lift blew the seal of the cup, states that the holder had been previously raised to its full height, and tested under air-pressure, and that no fault had been observed in this test.



An Early Photograph of One Part of the Large Holder After the Fire.

[The Old Gasholder House referred to in the Article is shown on the Left-Hand Side.]

Another and later report, however, states that a test of the holder under air-pressure had been carried out a fortnight before the date of the disaster, and that it had revealed unsoundness, so that a second test was considered necessary. Whether this second test with air had been made, is not clear. But the authorities are taken to task for having allowed a gasholder which had proved unsound under the air-test to be filled with gas; and an explanation is demanded of this course of action. Clearly, if the report is true, that gas was put into so large a gasholder while by the air-test it was known to be unsound, a most serious responsibility rests upon those who authorized the filling of the holder with gas. But, it would be unfair to attach much importance to these early explanations—especially as it was announced at the official Lighting Bureau of the City, about the same time, that so far it had been absolutely impossible to assign a cause for the accident. Notwithstanding the foregoing conjectures of carelessness or fault on the part of those responsible for the filling of the holder with gas, the local Press, at the same moment, speaks most confidently of the technical ability of the staff at the gas-works.

THE LARGEST HOLDER.

During the week (writes Mr. F. S. Cripps) all sorts of wild statements have been made as to the size of the Hamburg gas-

holder which "exploded." It has been described in the "Daily Mail," "Mirror," and other papers as the "World's Largest Gasometer." If you can find space for a note controverting this, it would be as well; for there is no reason for be-littling England, and glorifying Germany, even in the matter of gasholders. The "Mirror" stated the holder to be 200,000 metres capacity, or 7,060,000 cubic feet, which is 71 per cent. less than the 12,000,000 cubic feet holder of the South Metropolitan Gas Company, not to mention the 14,000,000 cubic feet holder in New York, which latter I hope, ere long, England will eclipse.

NEW GAS-WORKS PROPOSED FOR TRIESTE.

In the hall of the Society of Engineers of Trieste, the Engineer of the Municipal gas-works, Sig. Sospisio, recently explained his proposals for new works in the city.

He considered the question whether the day would come when the electric light would supplant gas, and therefore whether the construction of a small gas-works to supplement the existing large ones would be sufficient. His opinion was that electricity would never supersede gas in Trieste; and he gave figures to prove his contention. Having established the point as to the necessity of new works, he next considered three sites which were suggested. Each section of the new works should, he said, be able to produce and deal with 20 million cubic metres of gas per annum—say, 706 million cubic feet; and each section could be divided into two equal parts for a make of 10 million cubic metres. The construction of the first section could be commenced, and progress made with the following sections in accordance with the increase in the consumption. Sig. Sospisio next described his ideal system for unloading coal from vessels; and he illustrated the method by which it could be carried by an aerial electrical railway into the stores and thence to the retorts, and the coke subsequently dealt with. Large mains could be saved by the gas being sent to the distributing gasholder stations in the city at high pressure.

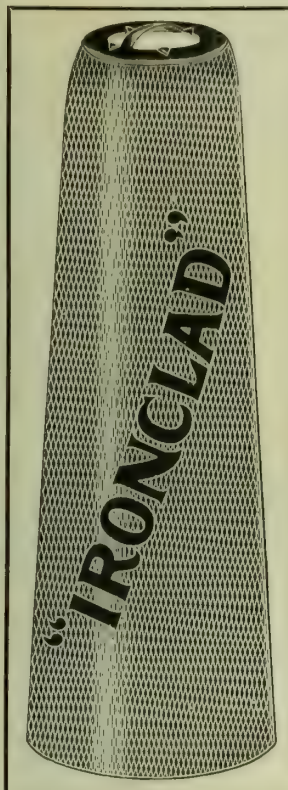
After the explanation of Sig. Sospisio's many designs, Sig. Ing. Pittoni proposed the appointment of a Sub-Committee to study the problem—a proposal that Sig. Sospisio willingly accepted, offering to submit to it all his reports and particulars. The Sub-Committee was thereupon appointed.

FERRO-CONCRETE RESERVOIR AT COWES.

A recent issue of the monthly publication bearing the title of "Ferro-Concrete" contains an illustrated description of a new ferro-concrete covered reservoir for filtered water which has been constructed at Cowes, Isle of Wight. It was formed by dividing and covering over part of an existing storage reservoir; and the covered portion, which has a capacity of $1\frac{1}{2}$ million gallons, is entirely of Hennebique ferro-concrete. The reservoir measures 247 feet long inside, and is divided into two compartments, each 80 feet wide. The mean depth of the reservoir is 16 feet, and the mean depth of water 13 feet. The new division wall consists of vertical panels, 9 inches thick, stiffened by counterforts on both sides, spaced 5 ft. 8 in. apart, centre to centre, and finished with a 9-inch curb flush with the face of the counterforts on the uncovered side of the reservoir. The interior columns, 9 inches square, are disposed in twenty rows, for the most part spaced at intervals of 11 ft. 3 in., centre to centre, each row comprising three columns in the width of 80 feet. With the exception of the outer spans of 22 feet, the main beams measure 19 ft. 4 in. from centre to centre of the columns, and afford support for the secondary beams, which divide the roof into panels measuring 11 ft. 3 in. long by 6 ft. 4 in. wide; the outer panels at each end being 22 feet long. Carried by the main beams, extending from side to side of the reservoir, measuring 7 inches wide by 14 inches deep, the secondary beams are 5 inches wide by 8 inches deep; and the continuous roof slab of ferro-concrete is 4 inches thick. The whole of the works, comprising two sets of Candy filters, pumping machinery, and buildings, were designed for the Cowes Urban District Council by Mr. John W. Webster, their Surveyor and Water Engineer, with the collaboration of Messrs. Mouchel, of Westminster, so far as concerned the details of the ferro-concrete construction, and have cost £5450.

Photography has of late years entered so largely into the domain of journalism, as our pages testify every week, and so many people engaged in the gas industry handle the camera as a recreation, if not for business purposes, that no excuse is needed for calling attention here to the "British Journal Photographic Almanac and Photographer's Daily Companion" for 1910, of which we have just received a copy. It is a bulky volume of rather more than 1300 pages (7 in. by $4\frac{3}{4}$ in.). The contents include lists of photographic societies and bodies; formulæ for the principal processes and those of the chief plate and paper makers; chemical, exposure, and optical tables, and miscellaneous information. The Editor (Mr. G. E. Brown, F.I.C.) has a chapter on "Lens Calculations by Mental Arithmetic;" and he contributes an "Epitome of Progress." The book is published by Greenwood and Co., 24, Wellington Street, Strand, W.C., at the price of 1s., or bound in cloth, gilt lettered, at 1s. 6d. net.

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Fig. 13.

A. Pattern fitted with Two No. 2 Inverted Burners, Flashlight and Wrought Cradle.

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Fig. 10.

H. Pattern fitted with Two No. 2 Inverted Burners, Ball Trap Door and Wrought Cradle.



Fig. 19.

M. Pattern fitted with Two No. 2 Inverted Burners, Flashlight and Cast Base.

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Fig. 20.

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THE LATEST GAS UNDERTAKINGS RETURNS.

Official Figures as to Gas Supply.

As briefly notified in last week's "JOURNAL," the returns relating to the gas undertakings of the United Kingdom for the year to Dec. 31, 1908, in the case of Companies, and to March 31, 1909, for the Local Authorities, were issued on the 6th inst.—having been ordered for printing on the 4th of November only. Those immediately preceding were published even more promptly; having appeared within a fortnight of the order being given. This, it must be acknowledged, is a great improvement on past years. The number of pages occupied by the Gas Companies' returns is the same as before; but there are four additional pages in those of the Local Authorities.

Information is furnished in reference to 790 undertakings this year, compared with 770 before. The new comers among the 499 Companies are Annfield Plain and District, Brockenhurst, Southwell District, Stanford-le-Hope, and Tenterden and District; and, among the Local Authorities, Arlecdon and Frizington, Ballinasloe, Coleraine, Dalton-in-Furness, Dunoon, Ellon, Grangemouth, Largs, Liverpool, Richmond (Yorks), Sandwich, Monifieth, Newmills and Greenholm, Sanquhar, and Wath and Bolton (Gas Board). The capital authorized (including other purposes than gas supply in certain cases) is given as £152,702,081, of which £130,708,693 has been paid up and borrowed. For the Local Authorities, the capital authorized is £45,986,570, and the amount borrowed £41,435,988. In the case of the Companies, the figures are: Amount authorized, £106,715,511, being £85,224,944 share and £21,490,567 loan capital; amount paid up and borrowed, £89,272,705. The receipts are: Companies, £20,013,159; Local Authorities, £10,506,480—making a total of £30,519,639.

The statistics relating to working show that 15,394,307 tons of coal were carbonized; the quantity of gas produced being 189,918,737,000 cubic feet, of which 173,957,395,000 cubic feet were sold. The total make includes 21,628,862,000 cubic feet of water gas and 93,500 cubic feet of acetylene gas. The totals in the preceding returns were: Coals, 15,406,753 tons; gas made, 188,486,693,000 cubic feet; gas sold, 172,889,147,000 cubic feet; water gas made, 20,259,883,000 cubic feet; acetylene gas made, 94,080 cubic feet. At the date to which the latest returns were made up, there were 34,490 miles of mains in use to supply 5,916,120 consumers and 700,696 public lamps. The preceding figures were: Miles of mains, 33,536; gas consumers, 5,665,176; public lamps, 700,264.

With regard to carburetted water gas, the make by the Companies has increased from about 13½ millions in 1904 to 16½ millions at the close of last year; the production by the Local Authorities having in the period from 1904-5 to the close of the year ended March 31 remained practically stationary—the figures being 5,033,643,000 and 5,072,976,000 cubic feet respectively. The returns show that when they were made up it was being supplied by the following Companies and Local Authorities; the maximum proportions of its admixture with coal gas (except where averages are stated) being given in parentheses.

Companies.

Alliance and Dublin (49).	Hartlepool (abt. 20, av. 16).	Romford (35).
Aylesbury (15).	Hastings (39'8½).	Rushden and Higham
Barking (30).	Hornsey (av. 32).	Ferrers (16'89, av. 10'85).
Bath (50).	Horsham (33).	St. Albans (30).
Bexhill (29'43).	Hull—British (32).	Scarborough (26).
Bish. Stortford (40'87).	Hythe and Sandgate (40).	Southampton (34).
Bognor (30).	Ilford (25'8).	Southend (52'3).
Bournemouth (36).	Ilfracombe (10'2).	Southgate & District (61).
Brentford (33).	Ipswich (24).	South Shields (22'97 on
Bridgwater (33½, aver. 13).	Kingston-on-Thames (25).	one day only).
Bridlington (33).	Liverpool (50).	Staines and Egham (25).
Brighton (41'72).	Lea Bridge (44).	Stretford (27'44).
Bromsgrove (30).	Londonderry (15, av. 10).	Swansea (25, av. 20).
Cardiff (20 to 30).	Maidenhead (48).	Swindon United (36).
Chigwell (33).	Maidstone (25).	Taunton (35).
Cleethorpes (26).	Malton (about 27).	Tonbridge (25).
Colchester (27).	Marlborough (30).	Torquay (42'6, av. 32'2).
Commercial (43'23).	Merthyr Tydfil (22½).	Tottenham (1).
Croydon (37'9, av. 29'1).	Mitcham (39).	Truro (40).
Dartford (22).	Newcastle (7'76 one wk.).	Tunbridge Wells (25 to 30)
Dorking (25).	Newport, Mon. (22).	Uxbridge (27).
Durham (20 estimated).	North Middlesex (52'72).	Waltham Abbey (2'4).
Eastbourne (41).	Norwich—British (43'6).	Wandsworth (42'2, aver.
Epsom (31'5).	Nuneaton (9).	28'5).
Falmouth (20).	Plymouth (42).	Watford (33'5).
Folkestone (33½).	Portsea Island (30'9).	West Ham (35'55).
Gaslight and Coke (*).	Prescot (29'28).	Weston-super-Mare (33).
Gosport (33, av. 9'5).	Preston (40'5, av. for one	Wexford (25).
Gravesend (45).	week).	Winchester (39).
Guildford (25 to 33½).	Ramsbottom (25).	Wolverhampton (not
Hampton Court (40).	Reading (39'4).	stated).
Harrow (41 calc. over	Redhill (29).	York (25'08).
one week).	Rochester (33).	

*Of the total quantity of gas sent out by the Company, 11 per cent. was unmixed with water gas. As regards the remainder, 68 per cent. contained a maximum proportion of 29 per cent. of carburetted water gas; 12 per cent., a maximum proportion of 36 per cent.; 12 per cent., a maximum proportion of 39 per cent.; and 8 per cent., a maximum proportion of 40 per cent. † Average for the year, 27'46 per cent. ‡ Maximum daily proportion, 51 per cent.; average, 33 per cent.

Local Authorities.

Accrington (25).	Dundee (25).	Oldbury (26).
Ashford (26'1, av. 16'2).	Edinburgh (4'3).	Oldham (34½).
Barrow - in - Furness	Halifax (25'22 one day	Paisley (1'67 oil gas).
(20'23).	only).	Pontypridd (39'3).
Belfast (52).	Hebden Bridge (25).	Rochdale (29'3).
Birkenhead (33'33).	Leeds (25).	Smethwick (20).
Birmingham (25).	Leigh (15).	Southport (39'98).
Blackburn (19).	Lincoln (33'33*).	Stafford (12).
Burnley (34).	Longton (about 30).	Stockport (25).
Carlisle (28'1).	Loughborough (25).	Stockton-on-Tees (21).
Chorley (25).	Manchester (20'14 on the	Tipton (0'7).
Coventry (29'08).	total output).	Todmorden (18'5).
Devizes (42).	Middlesbrough (no limit).	West Bromwich (29'5).
Devonport (51'6).	Nottingham (6'28).	Wigan (10).

* In the daytime; none at night. † At one station only, and on one day only.

Six new Companies appear in this list: Bromsgrove, Cardiff St. Albans, South Shields, Torquay, and Wolverhampton; and the Bilston and Faversham Companies drop out. No additional Local Authorities furnish returns; and those of Leicester and Nelson drop out.

As in previous returns, particulars are furnished regarding the nature and quantity of materials other than coal used for the manufacture of gas. The extent to which oil, petroleum spirit, carburene, or "other material" is being utilized will be seen from the following list of companies and local authorities who make returns:—

Companies.

Alliance and Dublin.	Gosport.	Quorndon and Mount-
Alton.	Grantham.	Ramsbottom. [sorrel.
Aylesbury.	Gravesend.	Reading.
Barking.	Guildford.	Redhill.
Bath.	Hampton Court.	Rhymney and Aber
Bexhill.	Harrow and Stanmore.	Richmond. [Valleys.
Bishop's Stortford.	Hartlepool.	Rochester.
Bognor.	Hastings.	Romford.
Boston.	Hornsey.	St. Albans.
Bournemouth.	Horsham.	Scarborough.
Brentford.	Hull (British Co.).	Shrewsbury.
Bridgwater.	Huyton and Roby.	Southampton.
Bridlington.	Hythe and Sandgate.	Southend.
Brighton and Hove.	Ilford.	Southgate and District.
Bristol.	Ilfracombe.	South Shields.
Broadstairs.	Ipswich.	Staines and Egham.
Bromsgrove.	Isle of Thanet.	Stirling.
Bude.	Kingston-on-Thames.	Stretford.
Canterbury.	Lea Bridge.	Sutton and Hooton.
Cardiff.	Littleborough.	Swansea.
Chigwell.	Liverpool.	Swindon.
Cleethorpes.	Londonderry.	Taunton.
Coatbridge.	Maidenhead.	Tonbridge.
Colchester.	Maidstone.	Torquay.
Commercial.	Malton.	Tottenham.
Croydon.	Marlborough.	Truro.
Dartford.	Merthyr Tydfil. [don.	Tunbridge Wells.
Derby.	Mitcham and Wimble-	Tynemouth.
Dorking.	Newcastle-upon-Tyne.	Uxbridge. [Cheshunt.
Dover.	Newport (Mon.).	Waltham Abbey and
Durham.	Northfleet.	Wandsworth and Putney.
Eastbourne.	North Middlesex.	Watford.
Epsom and Ewell.	Norwich (British Co.).	West Ham.
Exeter.	Nuneaton.	Weston-super-Mare.
Falmouth.	Plymouth.	Wexford.
Fareham.	Portsea Island.	Winchester.
Folkestone.	Prescot.	York.
Gaslight and Coke.	Preston.	

Local Authorities.

Abergavenny.	Dumfries.	Nottingham.
Accrington.	Dundee.	Oldbury.
Airdrie.	Dunfermline.	Oldham.
Alloa.	Edinburgh and Leith.	Oswaldtwistle.
Alva.	Ellon (oil gas only).	Paisley.
Arbroath.	Glastonbury.	Perth.
Ashburton.	Greenock.	Pontypridd.
Ashford.	Halifax.	Portsoy (acetylene
Ballinasloe.	Hebden Bridge.	gas only).
Barrow-in-Furness.	Helensburgh.	Rochdale.
Belfast.	Heywood.	St. Helens.
Birkenhead.	Hamilton.	Smethwick.
Birmingham.	Ilkeston.	Southport.
Blackburn.	Leeds.	Stafford.
Blackpool.	Leek.	Stratford-on-Avon.
Burnley.	Leigh.	Stockport.
Bury.	Lincoln.	Stockton-on-Tees.
Carlisle.	Llandudno.	Tipton.
Chorley.	Longton.	Todmorden.
Coventry.	Loughborough.	Torquay (St. Mary Ch.).
Darlington.	Manchester.	Walsall.
Dalton-in-Furness.	Market Harborough.	Warrington.
Darwen.	Middlesbrough.	West Bromwich.
Devizes.	Middleton.	Wigan.
Devonport.	Mossley.	

The new names in the above lists are the Boston, Bromsgrove, Bude, Cardiff, Fareham, Hythe and Sandgate, Ilfracombe, Nuneaton, Rhymney and Aber Valleys, St. Albans, South Shields, Stirling, Sutton and Hooton, and Torquay Ferrers Companies; and the Faversham and Rushden and Higham Ferrers Companies drop out. Seven new Local Authorities make returns: Abergavenny, Ballinasloe, Dalton-in-Furness, Ellon, Hamilton, Market Harborough, and Oswaldtwistle. On the other hand, the following names which were in the preceding list do not now appear: Abergavenny, Leicester, Nelson, and Stalybridge.

The Gas Commissioners of Portsoy used 10 tons of carbide of calcium in the manufacture of 93,530 cubic feet of acetylene gas, of which 61,229 cubic feet were employed for private and 23,392

cubic feet for public lighting—together 84,621 cubic feet, at the price of 5s. per 100 cubic feet.

Comparing the figures furnished by the present returns with those contained in similar returns for the previous nine years, it will be seen that the Companies show as follows:—

Year.	Share and Premium Capital Paid Up.	Loan Capital Issued.	Receipts.	Expenditure.
1899.	£57,937,016	£11,451,134	£15,514,700	£11,478,442
1900.	59,638,877	11,775,642	17,638,963	13,864,808
1901.	62,775,845	12,201,533	17,955,187	14,537,797
1902.	64,299,112	12,829,925	17,205,002	13,167,186
1903.	67,417,798	13,451,381	17,756,626	13,214,322
1904.	68,953,306	13,775,734	17,828,872	13,397,727
1905.	70,605,726	14,176,599	17,617,598	13,410,307
1906.	72,008,451	14,467,842	18,166,087	13,671,369
1907.	73,152,891	14,645,271	19,567,336	14,884,982
1908.	74,328,645	14,944,060	20,013,159	15,475,933

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1899.	8,321,187	91,794,898,282	1,817,649	324,166
1900.	8,426,853	94,869,749,232	1,945,825	326,813
1901.	8,580,365	97,386,618,553	2,048,359	326,209
1902.	8,520,004	99,676,048,000	2,197,987	333,308
1903.	8,528,823	101,490,084,000	2,385,348	335,363
1904.	8,673,343	105,311,980,000	2,588,917	343,908
1905.	8,722,145	109,823,682,000	2,813,156	350,113
1906.	8,922,781	114,528,923,000	3,023,619	356,070
1907.	9,240,280	118,699,705,000	3,230,993	362,986
1908.	9,281,738	119,985,109,000*	3,399,193	367,950

* Including 16,555,886,000 cubic feet of water gas. Number of cubic feet sold, 103,316,716,000.

The somewhat similar figures for the Local Authorities are—

Year.	Amount Borrowed, including Annuities (not deducting Repayments).	Receipts.	Expenditure (exclusive of Amount in the next Column).	Interest, &c., Paid.*	Net Profit after Payment of Items in preceding Column.
1899-00.	£29,658,730	£8,048,089	£6,155,725	£1,280,168	£663,189
1900-01.	31,509,701	9,121,418	7,463,693	1,353,259	409,802
1901-02.	34,045,442	9,300,567	7,630,856	1,467,232	414,091
1902-03.	35,738,023	9,554,984	7,215,502	1,584,985	793,764
1903-04.	37,103,279	9,819,685	7,182,008	1,700,405	967,194
1904-05.	38,512,295	9,546,682	7,052,474	1,738,682	790,450
1905-06.	39,401,896	9,636,107	7,085,710	1,799,094	798,210
1906-07.	40,089,167	9,843,243	7,211,987	1,843,122	832,341
1907-08.	40,712,159	10,500,416	7,639,122	1,882,427	827,454
1908-09.	41,435,988	10,506,480	7,998,776	1,905,810	659,445

* These figures include: (1) Interest paid on loans; (2) amount paid for annuities; (3) amount of loans repaid; (4) amount paid for redemption of annuities; (5) amount placed to sinking fund.

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1899-00.	5,289,501	55,360,659,139	1,667,908	257,040
1900-01.	5,479,435	57,138,062,255	1,767,464	278,343
1901-02.	5,522,264	59,300,273,086	1,872,633	287,887
1902-03.	5,589,215	60,902,739,000	1,970,738	294,828
1903-04.	5,673,013	62,717,759,000	1,945,777	301,308
1904-05.	5,622,259	63,335,696,000	2,148,260	310,275
1905-06.	5,758,180	65,081,109,000	2,250,919	315,678
1906-07.	5,923,476	67,312,153,000	2,339,914	321,910
1907-08.	6,166,473	69,786,988,000	2,134,183	327,278
1908-09.	6,112,569	69,933,629,000*	2,516,927	332,746

* Including 5,772,976,000 cubic feet of water gas and 93,530 cubic feet of acetylene gas. Number of cubic feet consumed, 64,640,679,000.

New Gas-Works at Innsbruck.

At the end of the month of October, new gas-works, of a productive capacity of 530,000 cubic feet per diem, were brought into operation at Innsbruck, and have worked quite satisfactorily up to the present time. The principal novel feature of the works is that the whole carbonizing plant consists of horizontal chambers or ovens, 16½ feet in length, erected by the firm of H. Koppers, of Essen. There are no tar or liquor wells, and the products of condensation are collected and stored in iron tanks, standing in the open, which can be heated. The tar and liquor can for the most part be run directly out of these, and only a small amount has to be pumped out. The design and plans of the new works were drawn up by Herr O. Feischer, the Manager of the gas undertaking; and the plant and apparatus were supplied by a number of German and Austrian firms.

Sir William Stephenson, the Lord Mayor of Newcastle, who is Chairman of the Newcastle and Gateshead Gas Company, has, for the tenth consecutive time, been unanimously chosen as Chairman of the Tyne Improvement Commissioners.

FURTHER EXPERIENCES WITH HEAVY CHARGES

By G. M. GILL.

THIS article is intended to deal more fully with some of the points raised in a previous article on the same subject, published in the "JOURNAL" for Oct. 12 (p. 103), and also to reply to the editorial suggestion that some further particulars were desirable. These particulars were omitted, owing to the writer having insufficient data on which to form his conclusions.

MAKE PER MOUTHPIECE.

At first sight, it would seem strange that the adoption of heavy charges should render it possible to increase the quantity of coal carbonized per twenty-four hours; and the writer is aware that certain engineers have not found any increase in this respect to result from the use of heavier charges. Mr. J. Ferguson Bell, in his admirable paper on "Carbonizing" read at the last meeting of the Institution of Gas Engineers, clearly shows that the quantity of coal carbonized is in his case reduced, if anything, rather than increased. The writer cannot quite understand why this should be so, as it appears to him that the larger area of the retort that is filled with coal in the case of the heavy charge should surely make use of the heating surface to much greater advantage. That this should be so would seem to the writer to depend on the law of the radiation of heat, which, as readers of the "JOURNAL" know, is governed by the same law as that of light—i.e., the intensity of heat or light varies inversely as the square of the distance from the source of the heat or light. In the case of a retort charged with coal to the extent of from one-half to two-thirds of the capacity of the retort, there is left a considerable space at the top in which the radiating heat from the upper surface of the retort is fruitlessly expended before reaching the top layer of the charge. This space merely forms an area in which this law is given full play to waste the radiant effect of the heating gases.

In this connection, it is interesting to notice that Mr. Samuel Carpenter, of Dorking, states that, with the circular retort fully charged with coal, he is able to carbonize this quantity in a period of time which is only 15 per cent. greater than when the retort is only filled to the extent of half its capacity. This bears out the writer's experience with filled-up retorts, but to a much greater extent. This extraordinary result is apparently attributed to the uniformity with which the coal is heated, and the way in which the heat is distributed equally on all sides to the centre of the charge. This is a noteworthy fact; and should Mr. Carpenter's experience be borne out by that of others, the circular retort would probably again come into general use, ousting the \square retort from its present popularity.

SIZE OF RETORT.

There are plainly limitations to the size of the retort used with full charges; and the reason for this is clearly shown by some figures, on the penetration of heat, given by Mr. Thomas Glover in his Presidential Address to the Institution of Gas Engineers. It will be remembered that he gives figures to show that carbonization proceeds more rapidly with narrow than with wide ovens. In the case of ovens 12 inches wide, he states that carbonization proceeds at an average rate of 0.500 inch per hour from each side; with ovens 16 inches wide, at the rate of 0.470 inch; with ovens 17 inches wide, at the rate of 0.425 inch; while with ovens 20½ inches wide, carbonization only proceeds at the rate of 0.305 inch per hour from each side. This being so, it is not difficult to understand why coke-ovens compare badly with retorts in respect of output of gas per cubic foot of area.

If the section of a heavy charge be closely observed during the process of carbonization, it will be seen that the outer surface of the coal is comparatively quickly carbonized, while the inner core would appear to need a proportionately large amount of heat to drive off its gaseous contents. As a result of this, it is obvious that, were this core increased in size by reason of the retort being of larger area, this tendency would become greatly accentuated. It would, therefore, seem desirable that the most serviceable size of retort, of whatever shape, should be determined by practical experience.

MAKE PER TON.

With regard to the questions propounded in the Editorial previously referred to, the class of coal in use can best be described as Durham coal of medium quality; several varieties being used. But these same varieties were in use during the period when charges of short duration were in vogue. Further, the effect of heavy charges in increasing the carbonizing capacity of the retorts would undoubtedly apply to all classes of coals. Unfortunately, it is difficult to compare the make of gas per ton obtained with the different duration of charges, as estimates of the amount of coal used in any definite time are largely dependent upon the accuracy with which the coal stocks are calculated. It is always a difficult matter to arrive at the quantity of coal used in any fixed period, except in isolated cases where there is no intermediate stage between the weighing and the use of the coal, or where the storage (after weighing) is of limited extent. For the reason stated, no figures can be given with any confidence in their reliability; but it may safely be asserted that, with heavy charges of ten or twelve hours' duration, it is possible to considerably

increase the make of gas per ton of coal, as compared with the shorter period of six hours. This increase might approximate to about 500 cubic feet per ton of coal.

Some who have experience in this matter might attribute an even greater improvement in this respect, comparing the new with the old method; but universal opinion would seem to agree that the improvement is at any rate substantial. The question naturally arises as to the reason of there being an increase in the amount of gas produced per ton, especially when the appearance of the burnt-off charges under the six-hour system is compared with that of the charges under the longer period.

ILLUMINATING POWER.

The writer's opinion inclines to the belief that the quality, as measured by candle power, is lower when using heavy charges. This is certainly his experience. While working with six and eight hour charges, the average illuminating power of the coal gas was 16.6 candles for a period of eight months during which the six-hour and eight-hour systems were each in force about four months. Since instituting heavy charges, the illuminating power has dropped to an average of 15.5 candles. Before proceeding further, it should be explained that the tests in question were regularly taken every half-hour on a jet photometer, which was carefully adjusted once or twice every day with a table photometer in which the Carpenter burner was used. To supplement these figures, it may be stated that one or two tests have been taken daily on coal gas with the table photometer; and it is interesting to record that the average was 16.6 when working six and eight hour charges, as compared with 15.7 under the longer system. It is not suggested that these figures are in any way conclusive; but they do at least show the tendency which practical experience may be expected to confirm. It may now be asked why should a system of heavy charges and prolonged duration produce a gas of lower illuminating power. The writer has seen it suggested that this is due to the use of an increased vacuum in the retort-house with a corresponding increase of the nitrogen in the gas. This is the gist of a statement made by Dr. Davidson, the Chief Chemist to the Birmingham Gas Department, in a lecture on the "Modern Development of the Gas Industry" published in the "JOURNAL" for Oct. 26, in explaining the "erroneous idea," as Dr. Davidson puts it, that heavy charges give a larger yield of gas per ton of coal. If it be as the learned Doctor enlightens us, a great many are indeed living in a fool's paradise. Does Dr. Davidson suggest that the whole or only part of the increase in the make per ton is due to the increased percentage of nitrogen or other diluents? Those who have tried filled-up charges on a practical scale will certainly rest contented that a system which has met with unanimous favour wherever adopted does not owe its success to the abuse of exhausters. It has already been remarked that with heavy charges the candle power is lower while the make per ton is higher; and the former is doubtless due to the effect of the latter.

EFFECT OF HEAVY CHARGES ON QUANTITY AND QUALITY.

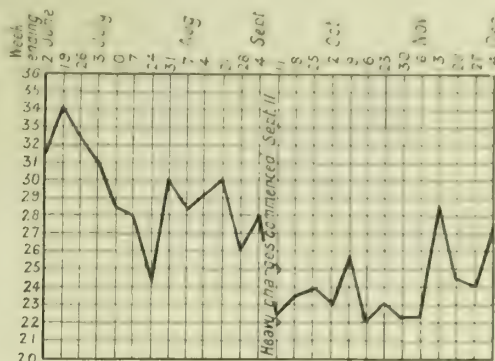
The increased quantity of gas gained by this method would seem to be due to the very thorough carbonization of a large part of the charge, represented by the mass which lies nearest to the retort throughout its entire internal surface. This proportion of the charge would amount to a large fraction (say, fully 75 per cent.) of the whole. The appearance of a charge after some six hours of its carbonization was remarked upon earlier in this article; and it is conceivable that coal, if it is heated for a prolonged period, as is the outer area of a heavy charge, will yield considerably more gas than the 11,000 to 12,000 cubic feet to which we are accustomed in practical working.

With a six-hour charge, none of the coal, or at any rate only a very small portion, would be exposed to prolonged heating, as in this case the coal, lying in a comparatively thin layer, contains no core to which the heat has any difficulty in penetrating, and, consequently, the carbonization takes place more uniformly and rapidly throughout its entire area. It may be questioned whether the extra gas obtained in this manner is worth having; and in this connection it is desirable to ascertain its composition. It would, presumably, consist chiefly of hydrogen, with a small quantity of methane, carbon monoxide, and the usual diluents. Its candle power would undoubtedly be very low—probably not more than two or three candles. Its calorific power, however, would possibly amount to a figure not so far deficient of hydrogen itself—viz., 82.8 calories (gross) per cubic foot.

Bearing upon this point, Mr. Ferguson Bell gives some figures in his paper on "Carbonizing," which help us to appreciate the quality of gas evolved from an apparently spent charge, which would closely resemble the additional gas yielded by a heavy charge. In his Appendix I., he gave the quantity and quality of gas produced each half-hour from a number of retorts charged for eight hours. After the eight hours had elapsed, a few further tests were carried out, which showed that the gas coming away in the succeeding hour averaged $4\frac{1}{2}$ candles and 68 calories (gross), and at the end of the hour was still 2 candles and 52 calories. The writer suggests that it is this quality of gas to which the increased make per ton with heavy charges is due. It is, after all, obvious that, where coal is carbonized in bulk, if the inner core is to be thoroughly carbonized the outer layer must be over-carbonized, with the natural result that the low-grade gas from the over-carbonized coal must mix with, and impoverish to a certain extent, the remaining gas.

SULPHUR COMPOUNDS.

A further advantage in the use of heavy charges lies in the fact that one of the impurities in coal gas, and one which it is desirable should be reduced—namely, the sulphur compounds—shows a distinct tendency to diminish in quantity. This is very clearly shown by the accompanying diagram, giving weekly aver-



Sulphur Compounds (Grains)—Weekly Averages in a Mixed Gas containing a Uniform Percentage of Coal Gas and Carburetted Water Gas.

ages of the sulphur compounds in mixed gas containing an almost uniform quantity of 30 per cent. of carburetted water gas. But for the amount of the latter gas contained in the mixture, the average would, of course, be higher by about 10 grains. According to Professor Lewes, the higher the temperature used in carbonization the greater is the production of sulphur compounds other than sulphuretted hydrogen. With light or heavy charges, the temperature of the retorts is apparently the same; but the amount of sulphur compounds contained in the gas is decidedly lower. So that the reduction in this case must be attributed to some other cause than that of temperature. Probably the sulphur vapour as evolved from the coal does not come into contact with the carbon on the retort to the same extent with heavy as with light charges, by reason of the retort being entirely filled with coal, and so is more inclined to combine with hydrogen to form sulphuretted hydrogen.

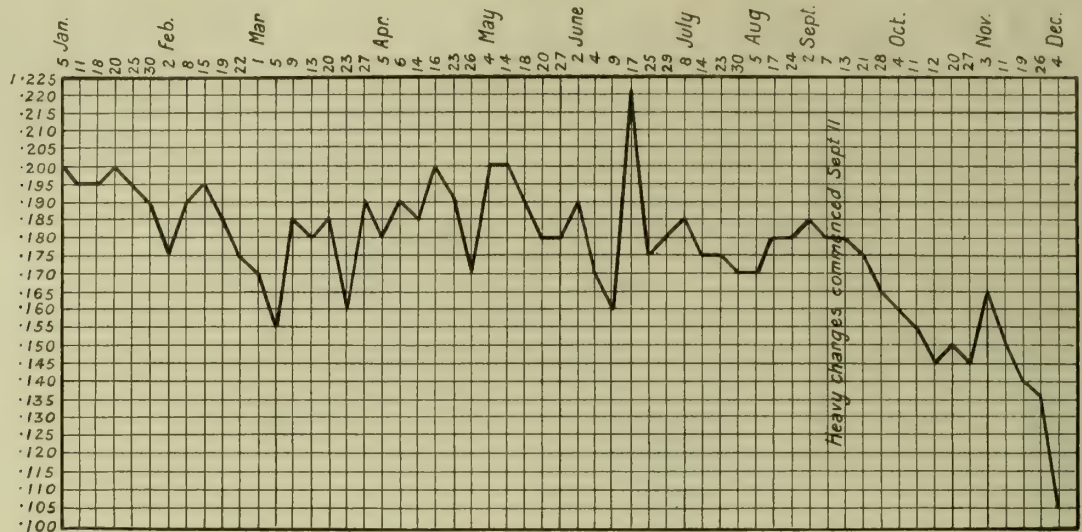
QUANTITY OF AMMONIA.

There is no questioning the fact that the yield of ammonia is considerably augmented by increasing the weight of the charges. This experience appears to be universal among those who have adopted this system. Mr. Ferguson Bell attributes an increase of 17 per cent. in the yield of ammonia to the use of twelve-hour charges as compared with six-hour; but it is noticed from his figures that the bulk of the improvement—namely, 13 per cent.—was experienced in the comparatively small alteration from six-hour to eight-hour charges. The writer would, however, add that he has found considerable improvement in increasing the charges from eight hours to ten-and-a-half hours. The extent of the improvement is somewhat difficult to judge; but it would appear to be of about the same amount as that of Mr. Bell's. From the published figures of a number of gas companies making coal gas only, it may be seen that ammonia yields about 1.87d. per 1000 cubic feet sold; so that, should the adoption of heavy charges result in an increased production to that named by Mr. Bell, the improvement in residual returns will amount to about 0.30d. per 1000 cubic feet sold. This is certainly one of the greatest of the many advantages of heavy charges, as the anticipated improvement, as measured in "£ s. d.," is considerable; the impurity is easily removed, and in most cases without any extra expense, or extension of plant; and the bye-product itself, in the form of sulphate of ammonia, is remuneratively sold.

QUALITY OF TAR.

Not least of the benefits resulting from the carbonization of filled-up retort charges lies in the fluidity of the tar produced. The tar from heavy charges is distinctly thinner than that from light charges; and the advantages accruing thereto render retort-house work much freer from the troubles of stopped pipes and pitched hydraulic mains. None but those who have experienced them can realize the intolerable state into which a retort-house can degenerate when carbonizing a coal whose tar is really thick; and it is a very great boon that a system can be adopted whereby the cause of the trouble—i.e., thick tar—may be removed. From the accompanying diagram,* it may be observed that the introduction of heavy charges immediately resulted in the production of a thinner tar, as represented by tests of the specific gravity of the tar as dispatched from the works in barges. The fluidity of the tar not only greatly facilitates the gas-making operations, resulting in a saving of gas from the ease with which it flows away through ascension pipes and hydraulic mains, but it must also be of materially greater value for distilling purposes. Lunge has stated that "in most cases the specific gravity of tar, after dehydration, is a sufficient guide as to its quality." And, further, he states (mentioning Köhler as his authority) that the specific gravity of tar mainly

* See next page.



Specific Gravity of Coal Gas Tar.
[Each division represents the tar from 1000 tons of coal.]

depends upon the percentage of free carbon, as shown in the following table:

Origin of Tar.	Specific Gravity.	Free Carbon. Per Cent.
Heidelberg	1'220	23'75
Darmstadt	1'215	20'93
Baden-Baden	1'195	19'92
Bockenheim	1'190	18'24
Frankfort	1'180	15'70
Bamberg	1'175	15'15
Neustadt	1'172	15'07
Cannstadt	1'164	14'05
Rottweil	1'161	14'00
Karlsruhe	1'155	13'50
Ulm	1'150	12'44
Heilbronn	1'150	12'42
Oos	1'145	5'00

In discussing the question of "free carbon" contents, Lunge explains that "the more free carbon, the more viscous the tar, and the more easily will it froth over during distillation. Tars containing less free carbon—that is, of less specific gravity—are richer in benzene and other light hydrocarbons than those containing more free carbon. But this holds good only to a certain limit—say, 15 or 17 per cent. of free carbon. Above this, tars of equal percentage of free carbon may furnish more anthracene or more benzene, &c., according to their origin. But if they contain considerably more carbon than 17 per cent., they are sure to yield less valuable products of all kinds and more pitch." And, again, he states that tar containing much free carbon is not very saleable, owing to the difficulty of distilling it down to hard pitch, and so injuring the stills. It may, therefore, be safely asserted that the tar produced in working heavy charges is, by reason of its undoubted lower specific gravity, more valuable and saleable.

Mr. Ferguson Bell, further, shows that the production of tar per ton of coal is increased from the respectable yield of 10'64 gallons with six-hour charges to 12'84 gallons with twelve-hour charges—equivalent to an increase of over 20 per cent. The writer has no figures of value with which to endorse those of Mr. Bell; but he has reason to believe, from his own observations, that a material increase in the yield of tar will result from the adoption of fully-charged retorts. It would seem as though all the advantages of low-temperature carbonization in the matter of yield of tar and ammonia are gained with heavy charges, but without the counter-acting disadvantage of a low yield of gas per ton.

NAPHTHALENE.

The writer has been disappointed to find that the amount of naphthalene contained in the gas has not, as was anticipated, been reduced by working fully-charged retorts. There would appear to be no difference comparing small with large charges. Others have found an improvement in this respect; but the writer still finds that the coal gas contains an average of some 21 grains of naphthalene per 100 cubic feet at the inlet of the extractor. The bulk is, however, easily removed by the simple medium of washing with carburetted water-gas tar.

GROWTH OF CARBON.

In the writer's previous article, already referred to, it is stated that the use of full charges should tend to prevent the adhesion of scurf by scraping it off when the charge is expelled, but that this point was not as yet demonstrated. His further experience shows that this anticipation is not likely to be realized, as the small space in the retort above the charge of coal scurfs over very rapidly, and has to be frequently chipped away if the retort is to be fully charged. Probably the amount of scurf actually made is not so great with heavy charges as with light ones; but its production is chiefly confined to the top of the retort.

SIZE OF MOUTHPIECE.

There is one point in connection with the construction of retort settings intended to be worked with heavy charges which should be mentioned, and that is the size of the mouthpiece. The writer has no hesitation in asserting that the iron mouthpiece should be larger than the retort, as the latter wears away slightly at the point where it is bolted to the mouthpiece, leaving a ridge which greatly tends to prevent the easy discharge of the coke. In cases where a charge is jammed during removal, it can usually be traced to part of the mouthpiece projecting at this point. This at least is the experience of the writer. By allowing (say) ¼-inch all round, there would be no danger of jamming due to this cause.

In conclusion, the writer wishes to make it clear that many of the points raised in this article are to an extent matters of surmise, which may, or may not, be confirmed by more extended experience. Again, further experience in practical working will probably disclose improved methods of gaining the utmost advantage from this new system of carbonization.

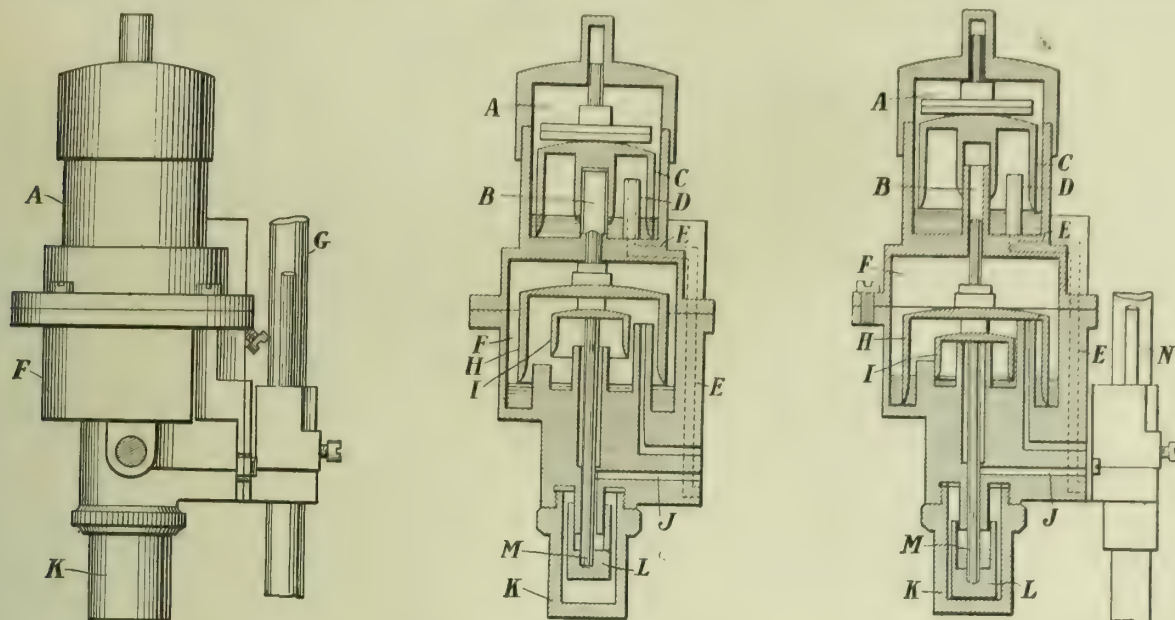
AUTOMATIC LIGHTING OF PUBLIC LAMPS.

THE attention that has recently been given to this subject seems to show that the ideal apparatus has not yet been introduced. There are various types—such as the pressure wave system, the clockwork system, and combinations of both of these; and one would expect that the prime factor in any system would be certainty in action. In this respect, perhaps, the clockwork system has some advantage over other systems in vogue; but its initial cost is so much greater than the pressure wave device that attention has naturally been given to improving it, or overcoming defects that have shown themselves in pressure wave devices.

One of the primary disadvantages of the pressure wave device is that the same pressure is employed to light up as to extinguish. As the pressure wave under various conditions of distribution may at times be interfered with, and its full effect not reach the ultimate destination intended, failure to light all the lamps inevitably occurs. A repetition of the pressure wave from the centre of supply might have the effect of lighting the lamps that have not previously been lighted; but it would just as certainly extinguish those that had been lighted. Thus while the pressure wave system has been applied to small districts, and on areas where the pressure is known to be uniform and the conditions well understood, it has not yet been applied indiscriminately with districts subjected to varying conditions.

To overcome the manifest defects in the pressure wave type of apparatus at present on the market, the device introduced and patented by Messrs. Rosie and M'Kelvie, of Edinburgh, and of which to-day we give some particulars, is certainly one to be carefully studied. It possesses many important features of a novel character, and is capable of being manipulated like the ordinary pressure wave devices. It is, however, claimed to be much more positive in action, for the reason that a different (and greater) pressure is employed to extinguish the lamps than is employed to light them. Consequently, the pressure wave sent forward to light up can be repeated as many times as may be thought necessary without in any way affecting the lamps that were lit by the first impression. On the other hand, to extinguish the lamps, a pressure superior to the maximum required for lighting must be employed. There is no practical disadvantage in increasing the pressure wave—particularly during the early hours of the morning, when the minimum consumption takes place.

The apparatus is already on trial in Edinburgh and some other



Scottish towns, and no doubt more will be heard of its utility in the near future.

In the "JOURNAL" for April 13 last, some particulars were given of the arrangement described in Messrs. Rosie and M'Kelvie's patent specification, No. 5793, dated March 16, 1908; and below are some extracts from their later specification—No. 4283, dated Feb. 22, 1909.

In generally referring to their proposals, the patentees say: "Hitherto it has been usual to effect the automatic cutting off of the supply of gas to the gas-burner by decreasing the pressure in the mains, and so that a dome or domes of a gasholder or diaphragm, and any other similar appliance, actuated by increased pressure of gas, falls when the supporting pressure is reduced, and either effects the closing of a mercurial or liquid seal or other valve, whereby the supply to the burner is cut off. One of the objections to this class of apparatus is that the domes, diaphragm, or the like, require to be of sufficient weight to fall by gravitation and overcome the density of their seal. Therefore a fairly high pressure is required to initially lift the dome or the like; so much so that a very little working surplus pressure is left from the available pressure."

The improved method of automatically lighting and extinguishing gas lights now to be described consists in equalizing the pressure of gas on the inside and outside of the operated domes, so as to put them in a state of equilibrium, whereby they fall by gravity and effect the cutting-off of the supply of gas to the burner. Also the gas used to equalize the pressure is momentarily exhausted from the upper portion of the dome chamber and causes a jet of gas from a pilot tube to impinge upon spongy platinum, so as to effect the lighting of the burner. Alternatively, the lengthened jet of the pilot light may be utilized as a flash light to a burner, or across the top of an incandescent mantle.

An important feature in the arrangement is that for both the operations of extinguishing and lighting of gases, frequent waves of pressure can be used without throwing the appliances out of "tune." That is to say, if certain of the lamps do not light for some particular reason in one of the districts when the first wave of pressure is applied, the wave of increased pressure is applied as often as may be necessary without extinguishing the lamps already lighted, until all the gases are lighted. In former apparatus, in which the gas acts on a bell which determines by a raising action the supply of gas to the burner, the gas cannot be increased in pressure so as to cause the lighting without throwing the whole system out of "tune;" and if the gas pressure be reduced to put in order one district of lights, the lights of the other district are extinguished by reason of the operative bell of the appliance falling and cutting off the supply of gas to the burner.

The illustrations show an elevation of the appliance, and longitudinal sections in the operative and inoperative positions.

The chamber A (the "auxiliary chamber") has within it a central stand-pipe B, which is covered by an inverted cup preferably formed along with the bell C. Also within the chamber is a pipe D, also enclosed within the bell C. This pipe has a port or passage communicating with the gas supply pipe E, as shown in dotted lines in the sections.

The central stand pipe B communicates with the chamber F; and the bell C of the auxiliary chamber is so weighted that it takes more pressure of gas to lift it than it does to lift the bell which supplies the gas to the burner-pipe G.

Within the chamber F is a bell H, having a rising and falling action and having within it an inverted cup I. Within the chamber is also a central stand pipe having a port communicating with the gas supply pipe E through the medium of the port J; and to the one side of the stand pipe is a pipe with the port communicating with the burner-pipe G. At the bottom of the chamber F is another chamber K employed for the purpose of effecting the lighting and extinguishing of the pilot light, as will be described later.

The action of the appliance is as follows: Gas enters by the pipe E and passes to the port J; thence up the stand pipe, and impinges upon the confined internal area of the bell H. The gas lifts the inverted cup and bell sufficiently far to clear their liquid seal, and allow the gas to escape to within the interior of the enlarged area of the bell H. The gas passes therefrom down to the burner-pipe G. The same pressure of gas passes to within the interior of the bell C—that is to say, the gas

passes from the supply pipe E to the interior of the bell C; but it does not actuate it, because it is weighted so that it takes more pressure to lift it than it does the bell and cup of the chamber F.

The apparatus for actuating the pilot light consists of the cup L (with a liquid seal) suspended from the inverted cup I by means of a rod. The lower or body portion is formed with a downwardly depending tube M, and there is sufficient room for the gas to pass from the port J into the chamber K—that is to say, when the appliance is in the inoperative position—and to the pilot light by means of a port to one side of the depending pipe M. When in the inoperative position, the light at the burner is extinguished, and the pilot light is lighted—the gas passing to the pilot tube N.

Let it be assumed that the burners are lighted, and the apparatus in the operative position shown, and that the lights are required to be extinguished. Or (say) in the first instance, there is a district in which the lights have not been lighted. But in another district the lights are lighted. The wave of pressure may be conducted to the interior of the bell H in the chamber F, and the increased pressure allowed to pass to the burner-pipe G without affecting the working of the auxiliary apparatus in the chamber A—that is to say, the auxiliary bell C allows of a considerable margin over and above what it takes to operate the bell H, before the bell C is actuated.

When it is desired to extinguish the lights, the pressure of gas is increased in the pipe E sufficiently to lift the bell C of the auxiliary chamber A. The gas to effect this lifts the bell in the upper inverted cup so that it can pass down to the chamber F, and so that this extra pressure of gas is exerted on the outside surface of the bell H. Similarly, as the pressure of gas is increased and passes to the interior of the bell C it also passes to the interior of the bell H of the chamber F. Thus the pressure is the same at the outside and inside of the bell, and the bell is put in a state of equilibrium. Further, by force of gravity the bell H falls and cuts off the supply of gas.

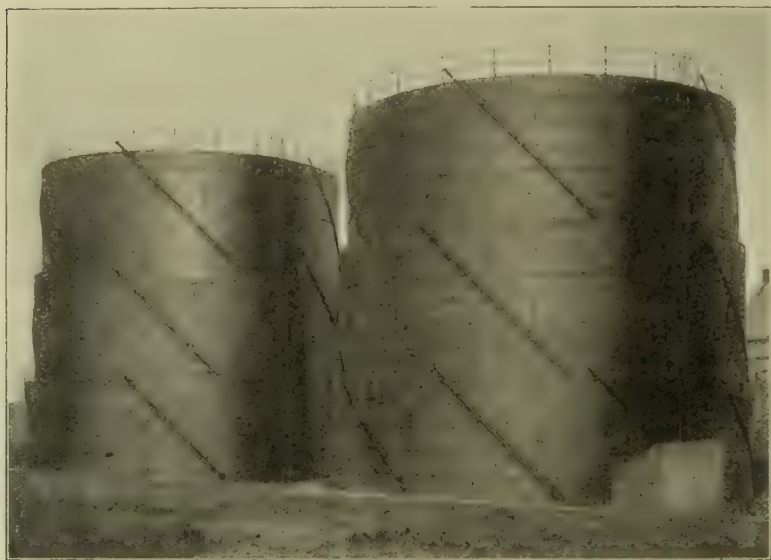
Water Companies and the Income-Tax Question.

Our readers are aware that the subject of the proper allowance to be made for depreciation of plant for income-tax purposes is receiving attention by the Gas Companies' Protection Association as well as by others concerned in the administration of gas companies' undertakings. We learn from Mr. R. L. S. Badham, the Secretary of the Provincial Water Companies' Association, that the question has on several occasions been very fully discussed by the Committee, and that they have had interviews with the authorities at Somerset House with reference to the circular sent by the Board of Inland Revenue to the Surveyors of Taxes, setting forth that no depreciation should be allowed in any circumstances in respect of any portion of water undertakings. It appears, however, that the circular is not being strictly acted upon, as Mr. Badham has heard from several members of the Association that similar allowances to those granted in the past had been sanctioned for the present year. The Committee are not unanimous as to whether the old system of allowance or that proposed by the circular—viz., "that all expenditure on repairs and renewals is to be charged and allowed as working expenses as and when incurred"—is the more advantageous; and, judging from the course recently taken by the Surveyors, it would seem as if the companies could practically take their choice as to which system they would come under. The matter is to be further considered at the next meeting of the Committee.

The Calcutta Lighting Contract.—It may be remembered that at the recent meeting of the Oriental Gas Company various inquiries were made in regard to the possibility of the new contract for the lighting of Calcutta which had been entered into between the Company and the Corporation being ratified by the Bengal Government. We learn from the Secretary (Mr. H. J. Luff) that the Directors have received intelligence that it has now been sanctioned.

SPIRAL-GUIDED HOLDERS AT NORTH ORMESBY AND GUISBOROUGH.

THE Guisborough Gas Company, Limited, during the present year decided to pull out their existing single-lift gasholder, which was 36 feet in diameter by 15 feet deep, and to replace it with a three-lift spiral-guided gasholder. This was arranged with an inner-lift of 32 feet, a middle lift of 34 feet, and an outer lift of 36 feet; all three lifts being 15 feet deep—making the total height from the bottom curb to the top of the dome of holder 44 feet, after deducting the cups.



The Spiral Guided Gasholders at North Ormesby.



The Three-Lift Spiral Guided Gasholder at Guisborough.

The contract was placed with Messrs. Robert Dempster and Sons, of Elland; and the accompanying view shows the tower-like proportions of the structure, which, in spite of its height as compared with its diameter, is, we are assured, more than amply strong to withstand any storm.

This gasholder was erected as the outcome of the Directors of

the Guisborough Company seeing at the North Ormesby Gas-Works, two similar holders, both of which were erected by the same firm, and of which we also give an illustration. The holder on the right-hand side has a diameter of 48 ft. 6 in., and a total height of 48 ft. 5 in.; that on the left-hand side is 48 ft. 6 in. in diameter, with a height of 49 ft. 2 in. to the top of the dome.

PHYSICAL SOCIETY'S EXHIBITION.

As briefly mentioned in the "JOURNAL" last week, the Physical Society of London arranged to hold to-day their fifth annual exhibition of apparatus, at the Imperial College of Science and Technology, South Kensington. We have been furnished with brief descriptions of the exhibits, and take from them the following particulars of those in which our readers are most interested.

The Cambridge Scientific Instrument Company, Limited, had on view Féry radiation and spiral pyrometers, each in use in connection with a Méker furnace. The former is a great improvement upon the instrument shown last year; among the advantages secured being robustness, a more open scale, and independence of accurate levelling. The spiral pyrometer is a radiation pyrometer, and a modification of the one just mentioned. The instrument is completely self-contained, very simple and easy to use, but less accurate than the other. Both the Féry pyrometer and the Méker burner have been described in our columns. The Company also showed a pocket gas-pressure gauge and a leakage indicator. The former is a compact and sensitive dry gauge; its action depending on the movement of an aneroid chamber which controls the pointer. The standard range is zero to 8 inches of water pressure; but it is also made with a range up to 60 inches for high-pressure gas. The leakage indicator is an ingenious application of the principle of the diffusion of gases. An elastic metal chamber is closed by a porous tile. When it is brought into an atmosphere charged with gas, the gaseous atoms diffuse through the tile with greater rapidity than the enclosed air passes out. The pressure in the chamber is thus temporarily increased, causing expansion, which is communicated by mechanism to a dial pointer. It is stated that surprisingly minute leaks of gas may be detected in this way.

Messrs. Everett, Edgcumbe, and Co., Limited, had on view a photometer bench for laboratory and central station use. This apparatus comprises a 10-foot metal bench with travelling carriages, &c., and is provided with a special Everett-Edgcumbe direct-reading adjustable screen photometer head, which can be used either as a "flicker" or as a comparison photometer. A further advantage claimed for it is that it enables the final, or, if preferred, the entire, balance of illumination to be made on the head itself, without it being necessary to move either of the lamps. The complete equipment includes a rotating lamp-holder for the measurement of mean horizontal candle power. The firm also

exhibited a universal pattern Trotter illumination photometer for indoor and outdoor work, and an application of it for daylight use made by Mr. Trotter in 1895. The daylight attachment consists merely of a tube, 10 inches high, placed over the horizontal perforated screen of the photometer, and having a side tube for inspection and stops for controlling the illumination of the screen. The unit of illumination is accordingly what would be received from an unobstructed hemisphere of sky.

Messrs. J. J. Griffin and Sons, Limited, showed, among other things, a radiator devised by Mr. R. H. Smith for measuring the heat radiated from a fire or stove; and a temperature recorder connected to a quartz glass platinum resistance thermometer.

Messrs. Elliott Bros. showed the latest form of Harrison photometer, with an attachment enabling it to indicate the total horizontal illumination; also the Harrison and Slaughter maximum demand indicator, and the Wimperis accelerometer and gradient measurer for the use of engineers.

Royal Institution Lectures.—Among the lectures arranged for delivery at the Royal Institution before Easter are three by Professor Silvanus P. Thompson, on "Illumination, Natural and Artificial;" and six by Professor Sir J. J. Thomson, on "Electric Waves and the Electro-Magnetic Theory of Light."

Royal Sanitary Institute Congress and Health Exhibition.—In connection with the Twenty-fifth Congress of the Royal Sanitary Institute, a Health Exhibition is to be held in the Royal Pavilion, Brighton, next September, full particulars as to which, together with forms of application for space, can be obtained at the offices of the Institute—Parkes Museum, No. 90, Buckingham Palace Road, London, S.W. The exhibition will comprise four divisions, and six classes. In Division C, Class III.—"Heating, Lighting, and Ventilating"—embraces heating apparatus; cooking apparatus; smoke-preventing appliances; lighting, including electric lighting; ventilating gas-burners; and ventilators. In the same division, Class II.—"Water Supply and Sewerage"—includes apparatus for water supply; filtering, softening, and purifying of water; water-waste preventers; and flushing and watering. Silver and bronze medals will be awarded at the discretion of the Judges; and a complete classified and illustrated list of exhibits, to which awards have been given by the Institute, is published by the Institute. A special medal will be awarded for household sanitary appliances in case of pre-eminent merit, which will be called the "Rogers Field Medal."

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

A Meeting of the Association was held last Friday evening at the Cripplegate Institute, Golden Lane, E.C.—the PRESIDENT (Mr. W. J. Liberty) in the chair. There was a good attendance of about sixty members, to hear a lecture by Mr. JACQUES ABADY, on "Light—And Some Reflections." On taking the chair,

The PRESIDENT said he had much pleasure in introducing to the members a gentleman whose name was very well known in the gas industry, and who had kindly consented to give them a lecture. Without further remark, he would call upon Mr. Abady.

LIGHT—AND SOME REFLECTIONS.

Mr. ABADY, who was received with applause, said he was very much obliged to the members for inviting him to come there that evening. It gave him great pleasure to be with them; and he was more grateful still that, having invited him, they had come themselves to hear the lecture. He fully realized that many of them came from a long distance; and, considering the condition of the weather, this showed great enthusiasm for the cause. However, they had come to listen to him speak on a subject about which probably many of them knew more than he did. He felt a certain amount of hesitancy in talking to them about light, because he realized quite well that he was in the presence of men who possessed what was better than any amount of theory—that was, practical experience in all matters relating to the production and distribution of light. In fact, he imagined that many of them wished that they could keep away from light sometimes.

AVOID EMPIRICISM.

The particular aspect he wished to speak about that night was empiricism, which he thought he might define as the "state of being empirical." The dictionary said that anything which was empirical was something which depended upon observation alone—without due regard to science and theory. Photometry, which he was going to speak to them about—or the measurement of light, which was the same thing—was a subject into which so many attempts were made to introduce empiricism, that he wanted to point out to them how foreign the introduction of any such empiricism was in their daily practice. Although they might not have observed it, in pursuance of their calling as producers of gas they really avoided anything in the nature of empiricism.

If they took construction, for instance, dimensions were founded upon something they could measure. He believed that there was a standard foot in Trafalgar Square; but any way there was one in the Standards Department. And although pitching upon the foot as a standard might have been quite an empirical thing, still having once got a foot, they could always verify measurements. Again, with constructional work, stresses and strains and any sort of dimensions or qualities were all dependent upon laws the certainty of which they knew—the immutable law of the lever, for instance. They knew perfectly well what this was, and that it was present in pretty well all mechanical movements. And in making any calculations, they knew that they were founding these calculations on something that was definite, and something to which they could with an amount of confidence refer back. They had not to take anybody else's word; they could determine it for themselves. As to temperatures, they used thermometers which they could verify at either freezing or boiling point. They had something definite there; and they knew their temperatures were definite. Exactly the same with the atmosphere. There was nothing empirical about that. They weighed the atmosphere with the barometer. Just the same when they applied temperature and atmospheric pressure to gas volume, they used these definite measurements. There was nothing empirical there.

So it was with the photometer standard. When they got to the test-burner, he did not know about that. There was something empirical in the value assigned to the 5 cubic feet of gas. When they called it 10, 15, or 16 candles, they knew it depended upon the particular burner used; and it might depend also on the gas examiner. But they all knew that the standard by which it was measured was very definite. They knew that the 10-candle pentane standard was referable to a standard sperm candle made in a particular way. So that right through the operations they were accustomed to carry out daily, or more or less often, there was nothing whatever of empiricism.

He was speaking to an audience who very modestly dubbed themselves an Association of Juniors. He must take it that they were juniors, and act accordingly. If one was struck with the truth of a thing, he must impress it upon others—especially juniors; so that when the time came for them to do work in a particular direction, they might know where they were.

THE LAW OF PHOTOMETRY.

Now he would go a little further, and deal with photometry. The fundamental law of photometry was the law of distances. That was, the amount of light falling directly on a surface was inversely proportional to the square of the distance from the source to the surface. There was nothing empirical about that. It must be so. There was another law which was applied in photometry; and although it might be true to a certain extent, he thought—and those who knew his opinions about photometry knew that he thought, and always had thought—that it should be

avoided. He was talking about the cosine law, which was that the amount of illumination received on a surface obliquely was proportional to the cosine of the angle which the light rays made between the normal and the surface which received the light—in other words, the amount of light falling obliquely was proportional to the cosine. He accepted this as true; and it was true with very great limitations.

PRESENT-DAY LIGHTING CONDITIONS.

The particular reason, he thought, why it was necessary that there should be great accuracy with respect to photometrical operations nowadays would be apparent to those present. First of all, they were not living in the palmy days of the flat-flame burner, when there practically was no light. Their conception of light to-day, compared with what their conception was in the days of the flat-flame burner, was quite different. Had they been in that room 25 or 30 years ago, they would have had to put up with very much less illumination. What the eye was accustomed to, the eye wanted; and consequently people who produced gas, and people who produced electricity, were vying with one another to "go one better." The practical point which concerned gas men was that there was now competition for private lighting, the lighting of large interiors, and for street lighting; and in very many cases the whole battle ranged round what was the total illuminating power that was going to be provided, and what was the illuminating power going to be in the areas or streets that were to be lighted.

On the point of the public getting accustomed to a better light, he might relate a little incident which occurred recently in connection with the Westminster City Council. He was Chairman of the Works Committee of the Council; and his attention was drawn to a paragraph in a paper which recorded the verdict of a Coroner's Jury in an inquest which was held on the body of a gentleman who was run over in Hanover Square. The Jury expressed the opinion—of course, they did not know anything about it, but some doctor went into the witness-box and expressed his opinion, and so they expressed theirs—that the square was not properly lighted. Well, he found that in Hanover Square there were six arc lamps, at 40 volts each, consuming 10 amperes; and at the particular point where this unfortunate man was run over and killed, there was a refuge with an ordinary gas-standard with three incandescent burners. He was just underneath this, and the arc lamps could not have been more than 30 or 40 feet away; and yet the Jury said the square was not properly lighted.

The explanation was very simple. They had probably seen the orgy of lighting in Oxford Street, which simply consisted of filling the firmament with electric flame arcs. The Westminster Council had adopted a similar system along Regent Street; and the explanation of why Hanover Square was said to be poorly lighted was that, when people came from the glare of Regent Street into the square, it seemed to them there was really no lighting there at all. Take away the brilliant light from Regent Street; and no one could say from any point of view that the Hanover Square area was not properly lighted. So they would see the importance of the point he wished to make in connection with the competition there was between different kinds of lighting at the present day. This rendered it necessary that everybody should be absolutely certain of his ground, whether engaged in trying to knock electric lighting out of the streets, or *vice versa*.

ILLUMINATING POWER AND LIGHTING EFFECT.

In this regard, there were two points from which they wanted to view light. One was the point of view of the illuminating power of the source; the other was that they needed to get at the illumination or lighting effect. The reason why they required to know the illumination of the source of light was quite obvious. Probably most of his audience would have, in the course of their daily duties, all sorts of lamps and burners of every type brought to them along with allegations that nothing could be found to compare with their very small appetites for gas, and that nothing else gave such a good light for so small a gas consumption; and they had to test the duty, to verify or otherwise the statements made. To do this, they needed to accurately measure the illumination, so as to ascertain the candle power; and, of course, they could arrive at the duty by ordinary measurement. In the old days, when they had small units, it was not so necessary as it was now to take measurements of angles. If they simply put up the burner and measured its light in the horizontal direction, it would then have sufficed. But to-day it would not be sufficient; because, quite apart from the question of measuring the illuminating power of a lamp in order to verify the makers' statements, they might easily be called upon to find out the distribution of the illumination of a particular lamp. They might want to be able to plot-out a system of lighting; and if they did not know in which direction a particular lamp threw its light, they would not be able to accurately plot it out.

Therefore, they needed accurate knowledge of the illumination of a source of light. The other point, of course, was "illuminating effect;" and he thought there was a good deal of confusion as to what illuminating effect was. Illuminating effect was supposed to be the light on any particular spot chosen, irrespective of the source whence it came. But they would see that it was practically impossible to measure illuminating effect if they accepted this definition. They could take a photometer and point it at a particular lamp and get the illuminating power by any reasonable means, because they could measure the distance, and so on. And

if they took the illuminating power, and divided it by the square of the distance, they got the illuminating effect in foot-candles—or they thought they did. It appeared to him the illuminating effect was not the light on a certain spot irrespective of where it was received; it was the light that was reflected from a certain object, and it seemed to him the material on which the light was reflected very seriously affected the illuminating effect. They could not reckon the illuminating effect as being the power of the source divided by the square of the distance. It was the light reflected from the particular material on which it fell. They could not measure the light falling on the source, but only the light reflected from the receiving surface, if the receiving surface was capable of reflection. An electrician would tell them that, if they wished to test illuminating effect, it did not matter about the source. What they wanted to do was to take the number of foot-candles with a photometer like a camera. He (the lecturer) said that what they had to do was to measure the light reflected from the receiving surface. This was the only test of the comparative advantage of a scheme of lighting. This being so, the members would quite see that the true illuminating effect depended upon the surface itself as well as upon the power of the source of light. When they wanted to get comparative tests of the true illuminating effect, it seemed to him perfectly obvious that they must always measure the illuminating effect in terms of the light falling on a standard surface remaining always the same. Take, for instance, Whitehall. There, though the lights might be the same on a wet and a dry night, they would get an absolutely different reading, because the dry, clean surface would reflect more light than the wet. This was another proposition they wanted thoroughly to grasp and to fully understand.

TESTING AT ANGLES.

Well, then, there was the question of testing at angles, which was another thing that they wanted to be able to understand. Those were the two points—the question of how to test at angles, and the question of the true measurement of proper illuminating effect. He was going to deal with the matter from a laboratory point of view, and also from a street point of view; and he had brought a photometer for the design of which he was responsible. He had not done this for the purpose of advertising the photometer, but to illustrate his points. There was no patent about it, except the "Flicker" disc box; and if anyone could design a photometer with avoidance of empiricism like that, it was just what he himself said should be done. There were enough difficulties connected with the question of measuring illumination—particularly true illuminating effect—without bringing in the difficulties and doubts that they would do if they introduced anything empirical.

In testing at angles, it meant that they were testing the light falling upon the disc box at a particular angle; and the angle expressed always meant the angle of depression from the horizontal. Before they could talk of the light being at a particular angle from the disc box, they had to put the light and the disc box in a certain position. Consequently, as a means of comparison they could not move the disc box unless they moved the light as well, so as to preserve the same angle in reference to the disc box. In testing at angles, they could not get their reading for equality by merely moving the disc box; and so it was necessary to find another method.

There were several ways in which it could be done. It was obviously possible to move the standard of light; but if one had a 10-candle pentane standard, he should not himself call it the most portable thing on earth, without any change taking place in the light. It was pretty clear, therefore, that this was a method which was not desirable.

Then they could get another form of standard which could be moved; and the thing that would at once suggest itself to his audience was an electric standard lamp. He used such a lamp a good deal himself; and there were many advantages and disadvantages connected with it. If an electric standard lamp was used, what had to be done was to verify it by an original standard of light, and then to take a measurement either of the current or the voltage of the lamp. The latter operation should be carried out from time to time. If it was found that the lamp gave (say) 16 candles at 201.5 volts, it was necessary to make certain that the voltage was kept at this figure; and to do this, it was requisite to introduce a resistance—so that then they had two pieces of apparatus. And they could not be certain that the same voltage would always produce the same candle power, because the efficiency of the lamp varied. This was another factor which should always be checked before and after a test. The thing was that they could use an electric lamp the value of which was known, or could be ascertained by comparison with the standard, and move that up and down the bar.

Supposing they wanted to measure at angles, and preferred not to introduce anything with a filament into a gas-works, they could use what in his opinion was the most admirable form of secondary standard they could have; and that was an argand burner with a screen in front of it with adjustable shutters. Supposing that the standard light was masked, and the lamp was at any particular angle, they would simply open or close the shutter in front of the gas-burner, and stop it at the point when they had opened the screen to such an extent that the light falling from it was equal to the light falling on to the disc box from the lamp being tested. The only thing that could alter would be the illuminating power of the burner; and that would have to alter in about two minutes,

which was all the time it took to make the test. They were taking a little piece out of the flame which was liable to very trifling change. Consequently, this was a double standard method which he had found extremely accurate.

There was another way of applying this double standard, and that was by having the burner close to the disc box, coupling them together, and making the reading in exactly the same way, by opening or closing the shutters. Then they could move both burner and disc box along until they had equality with the Harcourt pentane lamp. After that, all it was necessary to do was to divide this latter distance into the distance between the lamp tested and the disc box, and square the product and multiply by the power of the standard of light, which, if a Harcourt lamp was used, would be 10. He had tested as high as 1500 or 1600 candles. One observer after another—Mr. Simmance, Mr. Grimwood, and Mr. Foreman—had taken readings; and they had all agreed within one or two candles. Of course, one had to be particularly careful in the measurement of the distance; but this method of testing at angles appeared to him to be very simple, and one of the best that could be used.

Though some years ago he had a settled view that no test was good unless it was a spherical measurement, he had since come to the opinion that all one wanted was the lower hemispherical measurement and the distribution curve. With ordinary usage, they could photometer a lamp at all angles inside an hour-and-a-half easily—probably quicker. Supposing one wanted to test the illuminating power of a lamp in different directions in a street, it was not easy always to measure the distance; and, of course, they would know what to do there. They had simply to imagine a triangle, and solve it. If the base measurement was available, multiplication by the secant would give the distance from lamp to photometer; if the perpendicular measurement, employment of the co-secant would give the distance. He thought it was best to get a standard distance they could be certain of, and perhaps the perpendicular or the height of lamp-column from ground to centre of flame was the better. He had endeavoured to describe some practical and direct reading methods of testing lights in a laboratory at all angles; and the preceding few lines applied to measuring the distance between the light and the photometer either in a laboratory or in the street. In street testing, however, there were other difficulties which he would now endeavour to describe and show them how they could be circumvented; but whether they took tests in a street or a laboratory, they got the illuminating power by a direct reading. They could plot out the illumination at any point by getting the light in each direction, or they could get the mean hemispherical intensity by the usual factors.

STREET TESTING.

Now, in a laboratory, they had their original standard light—flame or otherwise, and had plenty of room and facility for making the comparisons. But when one wanted to test the illumination in a street, it was a rather different position. There were several alternatives. First, one could vary the distance of the standard of light; but the difficulty of this as applied to the photometer in the street, was that one was limited by space, because it might be desired to test a very high power lamp or one of very low value. Therefore the range of light and distance with a moving electric lamp had to be very big; and this would affect the portability of the instrument.

Another alternative was the Talbot law utilized in the form of a rotating sector. One disc was superimposed upon another which could be opened or closed so as to make an open sector bigger or smaller. The amount of light received would be proportional to the open part of the disc compared with the area of the sector. It was necessary to have some mechanism for spinning, and by which the opening could be made larger or smaller while it was spinning. This required a considerable amount of ingenuity; and in street testing he thought it was not quite practicable. Besides, it was an added objection that there was a good deal of empiricism in it. One had to graduate the openings and to find values for them; and it rather fell to the ground for this reason.

Another method which was largely used was the inclination of the surface upon which either the standard light or the light to be measured fell. This was what was called a cosine photometer. The idea was, he thought, exploded among all people who knew anything practical about the subject. Lambert's cosine law, which really applied, as was shown, to light received upon a surface, would hold good for light which was reflected, if it were perfectly diffused reflection; but one could not get a surface that did give perfectly diffused reflection. Besides the fact that one did not get perfectly diffused reflection, there was the question of the point at which one looked at the receiving surface. If they took a piece of cardboard, and held it in the light, they would see that, according to the point of viewing, the light altered. Consequently, the contention that one could make a photometer by letting the light tested fall on one side of the disc or photometer head, and allowing the standard of light to be reflected from a cardboard or paper screen, which was inclined until there appeared to be equality, and then saying that the light was proportional to the cosine of the angle of inclination of the cardboard screen, was really absurd. Mr. Trotter, who was first responsible for this extraordinary application or misapplication of Lambert's law, had recently stated that a perfect diffusing surface was unnecessary, because all instruments had to be graduated by experiment, and the moving screen need not obey the cosine law at all.

They therefore came back to their old friend empiricism; and he would leave the so-called "cosine" photometers at that.

Mr. Gaster, who championed the cause of "scientific illumination," delivered a series of Cantor Lectures at the Society of Arts, and described without comment or criticism two perfectly preposterous photometers. Those who advised these photometers were nearly all connected with the electrical industry. It was time that somebody should speak strongly, when such photometers as these were calmly brought forward in a series of learned lectures by a gentleman who studied the science of illumination and edited a paper on the subject. The lecturer then proceeded to criticize the two photometers shown on page 858 of the "Journal of the Society of Arts" for Sept. 3, 1909.

A DIRECT READING ILLUMINATION PHOTOMETER.

He would like to show them that it was not impossible to make a portable photometer in which there was absolutely nothing empirical; and he had brought such an instrument for them to see. It was a new thing, and it was not one with which he was perfectly satisfied; but he wanted to explain how it was possible to make tests without anything empirical entering into the calculation. First, it was necessary to recollect that when one was testing at a particular angle, the disc box could not be moved. There must be some means of varying the illumination on the other side of the disc. The method adopted in this arrangement was an exceedingly simple one. It consisted of a sphere, illuminated on its interior surface by a small glow lamp. It would be obvious that any given portion of the interior surface had an illumination equal to any other similar portion, which was what one would expect from the law of inverse squares, and had been confirmed by experiment. The standard of light was 15 millimetres square of this illuminated surface; and by a mechanical micrometer movement, scaled into 300 equal parts upon a drum, the said 15 mm. of illuminated surface could be gradually reduced until the portion exposed balanced the light to be tested. If, with the scale indicating at 100, they ascertained the voltage necessary to equal a candle held at 1 foot from the photometer, it would be obvious that (this voltage being maintained and observed by a rheostat and ammeter) the scale reading upon the drum, when making tests in the streets, would be in terms of a foot-candle. For instance, 90 would mean 0.9 foot-candle; 210 would mean 2.1 foot-candles. Bearing in mind what had been stated with reference to illuminating effect necessitating a standard reflecting surface, what was done to prepare the photometer for taking illumination readings was to place it 1 foot from the reflecting surface or screen used in the actual measurements, and find the voltage required with (say) a scale reading of 100 to equal a candle held at 1 foot from the reflecting surface, and maintain the voltage as before described. It would thus be seen that here was a method of taking accurate readings of the power of sources of light and also similarly accurate readings of foot-candle illumination without anything empirical entering into consideration.

A day or two ago, he made a test, and got a reading of 0.62 foot-candle measuring directly and calculating; and the reading the other way was 0.615. That was taking into consideration experimental errors. This showed that one could handle the photometer pretty accurately.

The President had probably had experience in taking foot-candle readings. Measuring in foot-candle upon a reflecting surface was not a simple thing, because the foot-candle illumination was so small; but what one had to do was to cover the head entirely and look out of blackness at the photometer. The eye soon got accustomed to the small illumination, and could measure very slight differences with great accuracy.

CONCLUSION.

He had endeavoured to show them that the increasingly important question of street measurement of light could be carried out by methods as exact and as referable to definite standards as were the laboratory examinations to which they were all fairly well accustomed.

If the President thought the members of the Association would be sufficiently interested in the subject-matter of the lecture, he would send round (through the Secretary) an accurate transcript of what he had been endeavouring to say.

QUESTIONS AND ANSWERS.

The PRESIDENT having invited questions,

Mr. J. G. CLARK said it had given him very great pleasure to listen to Mr. Abady; and one or two points had occurred to him during the lecture. He was very pleased to hear that Mr. Abady was in favour of the lower hemispherical value rather than the total spherical value. But he would like to state that even the hemispherical value was of very little use without the complete distribution curve in the lower hemisphere. The various forms of integrating photometers which had been proposed were, he considered, quite unsuitable for the discrimination of various sources of light. The ingenious "Flicker" photometer, which was associated with the name of Mr. Abady and Mr. Simmance, provided for the measurement of the flux of light in the various directions so that a complete polar curve might be plotted; and, if necessary, the hemispherical value might be easily deduced therefrom. With these data, together with the energy consumption, one had a very complete knowledge of the photometric value of a source of light. Another interesting point was in regard to the secondary standard of light which Mr. Abady had described.

This consisted of an argand flame having in front a screen with shutters the opening of which could be varied at will. This in a way resembled the Methven screen. It had always been an interesting point with him whether, in using such a standard, one should regard the centre of the flame or the plane of the screen as the centre of the source. It seemed to him that neither would be correct, but that the centre of the standard would always be somewhere between the centre of the flame and the centre of the screen—the actual position varying with the distance from the disc or "Flicker" head. He said that Mr. Abady mentioned the importance of a standard surface for illumination measurements. This was, of course, necessary, and was provided for in illumination photometers. Mr. Abady himself used a sheet of drawing paper, the quality of which was defined. It was, he thought, Mr. Trotter who, in explaining that what they called illumination did not have any reference to the nature of the surface, stated, as an illustration, that the rainfall had no reference to the nature of the ground upon which it fell.

Mr. ABADY said that what he intended to convey was that the effect of the illumination on any spot did considerably depend upon the surface. When they were measuring illuminating effect, it was not the amount of the "golden rain," but the amount of light reflected; and this did depend upon the surface.

Mr. CLARK: And also the amount of light falling on the surface.

Mr. ABADY said they wanted to measure both. Naturally the amount of light falling on a surface depended upon the power of the light; but the amount reflected from the surface depended upon the nature of the surface as well. With reference to the centring of the secondary standard, when it was used in the proper way, coupled to the disc box as here described, it did not matter where it was. They plumbed, as a matter of fact, from the centre of the flame, when they wanted to plumb at all. The Methven screen was plumbed from the silver slot.

Mr. J. S. DOW said he was the bearer of a message from Mr. Gaster, the Hon. Secretary of the Illuminating Engineering Society, who had been kindly invited by the Chairman, but was unavoidably detained by a previous engagement. He had listened with great interest to Mr. Abady's lucid exposition of photometrical principles, and heartily endorsed his remarks on the need for exact photometrical measurement, especially in these days when so many different systems of illumination were available. Much confusion was not infrequently caused by the fact that the conditions under which different illuminants were tested were not strictly comparable. Mr. Abady had also suggested that flame-standards such as the pentane standard, and electric glow-lamp standards, had both their respective spheres of utility. It was gratifying to observe how the gas industry were coming to take advantage of electrical apparatus for their own purposes; and Mr. Abady had shown characteristic enterprise both in adopting an electrical secondary standard for use with his interesting photometer, and in applying the diaphragm method in such an ingenious way. It was, of course, now well known that the inverse square law and the cosine law were only accurately true within certain limits. He thought, however, that this did not justify Mr. Abady's sweeping condemnation of all forms of illumination photometers utilizing the latter principle. Such instruments had been developed in Germany and the United States, as well as in this country, and useful work had been done with them. Moreover, the intention of such instruments was essentially different from that of Mr. Abady. They were intended mainly as a means of readily determining the illumination at a given spot in buildings, &c. For such a purpose, lightness and portability were essential, even though these qualities could only be secured by sacrificing the high degree of accuracy aimed at in the laboratory. Mr. Abady had referred to a lecture by Mr. Gaster before the Royal Society of Arts, in which some instruments were briefly described. It was only fair to mention that Mr. Abady had been invited to exhibit his photometer on this occasion, but omitted to do so. In conclusion, he would like to correct one remark of the lecturer's which might convey a false impression as to the aims of the Illuminating Engineering Society. In the official report of the Council, presented at the Inaugural Meeting on Nov. 22, it was expressly stated that "membership of the Society does not qualify anyone to be recognized as an illuminating engineer." For the present, the Society merely wished to provide an impartial platform for the impartial discussion of all problems in illumination, and, he might add, all types of photometers.

Mr. ABADY, replying to remarks and questions put by several members, said the intensity of the light from an electric lamp did not diminish in proportion to a drop in voltage. He did not want to say that empirically graduated photometers could not be used at all. All he said was that there were a sufficient number of errors—personal errors—and difficulties connected with photometry, to make it undesirable that anything should be introduced which one could not actually measure. He thought he had made his point exceedingly well, as he had got from Mr. Dow an admission that the photometers he had criticized were not intended to be really accurate photometers. He must strongly object to such instruments. He contended that no photometrical information was better than inaccurate photometrical information. He suggested very strongly that it was totally misleading for anybody to construct a photometer and use his name to get that photometer employed, if he knew that it was not accurate. It was all very well for Mr. Dow to say that the use of the photometers which he (Mr. Abady) had criticized was only for approximate information; but he (Mr. Abady) objected to their being described

in Cantor Lectures without this qualification, and they all knew that engineers and surveyors made reports to their committees based on tests made by such instruments, which it was known perfectly well were not accurate. Though he was speaking to a Gas Association, he was not in the slightest degree prejudiced. He simply stood as a perfectly impartial person, who took a great interest in the subject of lighting. It did not make any difference to him, from a business point of view, whether gas or electricity flourished best. Coming to the personal point, he had declined, and he always would decline, to put his instruments side by side with the apparatus for approximate measurements which were improperly described as photometers. If the word photometer did not mean "an accurate light measurer," it meant nothing at all.

Mr. D. W. WINSLOW (Lea Bridge) remarked that they often heard of the 3000-candle power arc electric lamp, and the cheapness of it. Looking at these lamps from an ordinary standpoint, one would not credit them with their candle power. Had this anything to do with the light coming from a point? And was the light value from a 3000-candle arc lamp the same as that from a 3000-candle gas-lamp? In the latter case, they had a series of incandescent mantles which presented a considerable area of light. Did the photometer register against the gas, and in favour of the electric arc because of the fact that the latter was more or less a point?

Mr. ABADY replied that he did not think the comparative efficiency could be referred to in this way. It depended a great deal on the colour of the light—the actinic quality of the light rays. They would find that an incandescent gas mantle could be seen better on a foggy day; but he did not know that anybody had ever stopped to consider whether he got a better result from a particular arc than from a particular set of mantles, due to the fact that one was a point and the other a group of bodies. If the light was there, it was there. He did not think there was anything in this point.

Mr. CLARK, referring to the remarks as to the different photometric value of small and brilliant, compared with large and less brilliant sources of light, said this brought them to the interesting phenomena of shadows, as compared with the intrinsic brilliancy of the source. It was easily demonstrable by graphics that the source having the highest intrinsic brilliancy for a given flux would give the darkest shadows, if an object of any kind be placed in the path of the rays. Take, for instance, a gas mantle having a flux of 500 candles, such a mantle might have a visible area of (say) 10 square inches, and in an arc lamp of the same power the crater of the carbon would be but a fraction of a square inch. The shadows due to the arc would be much more acute than with the gas mantle. He concluded by asking Mr. Abady to emphasize the importance of the complete distribution curve. The mere measurement of the hemispherical intensity was not of so much importance.

Mr. ABADY said they required to utilize the sources of illumination in such a manner as to throw the light equally along the pavement in all directions; and they could only arrive at this experimentally by getting a distribution curve—that was, the illuminating power of the lamp in the different directions—and then apply this to actual conditions. One light might be intrinsically better than another on the mean hemispherical intensity; but, taken all round, it might (on account of an unsuitable distribution curve) not be so good for illumination purposes, which was really what they needed. It was therefore necessary to measure the light at several different angles, tedious though this might be.

Mr. CLARK proposed a very hearty vote of thanks to Mr. Abady for his lecture. He said it was a subject in which he was interested; and it would be well for all of them to make it a subject for study, as it would, he believed, be of even more importance in the future than in the past. One thing which he thought pointed a moral to the lecture was that the subject of lighting divided itself into two sections. First, they had to produce their light; and, secondly, they had to distribute it. Light might, from this point of view, be regarded as their raw material, to be distributed as direct, reflected, and refracted radiation. In this development, the photometer would play an important part. He thought that they would all agree that Mr. Abady had combined pertinent argument with mild humour, in a way to make his lecture exceedingly interesting. Mr. Abady, he knew, was a very busy man; and for this reason they should appreciate all the more his kindness in being with them that evening.

Mr. J. HEWETT seconded the proposal.

The PRESIDENT said it was quite true that what the eye got accustomed to the people wanted. They were getting accustomed to large sources of light; and they would have them. But there was something else to think of. It was necessary to lead, or endeavour to lead, people in this matter. It would not do to put big lamps just anywhere, and say they were going to light the street. The matter must be considered in an intelligent and scientific way; and to do this it was necessary to measure the light, and consider how it could be distributed to the best possible advantage in the area to be illuminated. For this purpose, the best photometer should be secured and carefully worked.

The vote was carried with applause; and Mr. ABADY briefly acknowledged it.

The PRESIDENT announced, before the meeting separated, that it had been decided to have a dinner on Saturday, March 5; a

number of members having already signified their wish that such a function should take place.

Mr. CLARK, writing on Saturday, says: "In further reference to my remarks last evening, regarding the relation of shadows to intrinsic brilliancy of the light source (not total flux), I might have mentioned that this has a very important bearing upon some suggestions I have come across at various times as to how the 'man in the street' may himself discriminate between illuminants by observing the definition of his own shadow. After what I stated last evening, it will be quite evident that such a method is wholly fallacious where any difference in the area of the light source exists. The suggestion is, no doubt, founded upon the old form of shadow photometer, which, for the reasons stated, is quite inaccurate. Such a method would do to compare lights having equal or nearly equal luminous areas; but there it must cease, and I trust we, as a Junior Gas Association, will remember this important limitation."

MIDLAND JUNIOR GAS ASSOCIATION.

Last Saturday afternoon there was a meeting of the Midland Junior Gas Engineering Association, at the City of Birmingham Technical School—the PRESIDENT (Mr. A. O. Jones, of West Bromwich) being in the chair.

THE LATE MR. G. HAMPTON BARBER.

The minutes of the previous meeting having been read by the Hon. Secretary (Mr. Harold E. Temple) and confirmed,

The PRESIDENT remarked that their meeting that day was overshadowed by a loss which not only meant the bereavement of one of their members, but which might have an important influence on the future administration and prosperity of the Birmingham Gas Department. He need not say that he referred to the death of Mr. G. Hampton Barber, the late Secretary and Manager of the Department. He had not himself had the pleasure of his acquaintance; but in the opinion of those best able to judge, he was considered to be a most capable and efficient administrator, and he had heard it said that he was a most sagacious buyer. These were both qualities which were of the utmost importance in connection with the management of an undertaking which dealt with large quantities of finished and raw material. Mr. Barber had great power in the management of the undertaking; and it was a power which in less scrupulous hands might have led to the engineering side being neglected, and consequently to the efficiency being brought down. But happily he had a proper notion of the importance of the engineering side of the concern; and for this reason they were losing in him, not only one of the most respected honorary members of the Association, but also a sincere friend. Before sitting down, he might mention that, with the concurrence of the Committee, he sent a letter of condolence with the family in their bereavement; and he also asked Mr. Temple to purchase a wreath, and forward it in the name of the Association. He was sure that in doing this he had carried out the wishes of the members in the matter.

DESIGN AND CONSTRUCTION OF A NEW RETORT-HOUSE AT THE ADDERLEY STREET GAS-WORKS, BIRMINGHAM.

The PRESIDENT said that, as they would have seen from the agenda and the advance prints sent out, Mr. C. Carrington Barber was to have read a paper that afternoon describing a new retort-house at Adderley Street. They would, however, quite understand that, in the sad circumstances, he was unable to be present. The Hon. Secretary had kindly undertaken to read the paper for him; and he would now call upon him to do so.

The paper, accompanied by drawings and photographs, and followed by a report of the long and most interesting discussion to which it gave rise, will be found on the facing page. Mr. Barber's reply is, of course, still to come; but we shall hope soon to be in a position to publish it.

At the conclusion of the discussion, a hearty vote of thanks was, on the proposition of the PRESIDENT, seconded by Mr. A. HANCOX (Great Malvern), accorded to Mr. Barber for having written the paper and to Mr. Temple for having read it.

In the report of the proceedings at the meeting of the Société Technique in June last, which appeared in the "JOURNAL" at the time, it was mentioned that prizes were awarded for certain of the papers read at the meeting in Paris in 1908. These awards were made on a report by M. Bouvier on the best papers submitted on the occasion referred to. It will, of course, form part of the "Transactions" for the present year; but it has been printed separately, and the author has sent a copy. The prize winners were MM. Charles D'Aubenton-Carafa, Echinard, Guillet, Du Pasquier, Defoy, Camille Roche, and F. Chevalet, the chief points of whose papers are dealt with in the report. Valuable communications were also presented by MM. Th. Vautier and Marquisan—the former on the proceedings at the sittings of the International Committee on Photometry at Zurich in 1907, and the latter on "New Methods and Appliances for the Distillation of Coal for the Production of Illuminating Gas"—and they are epitomized by M. Bouvier. But, being members of the Committee of the Society, the authors could not be recipients of awards.

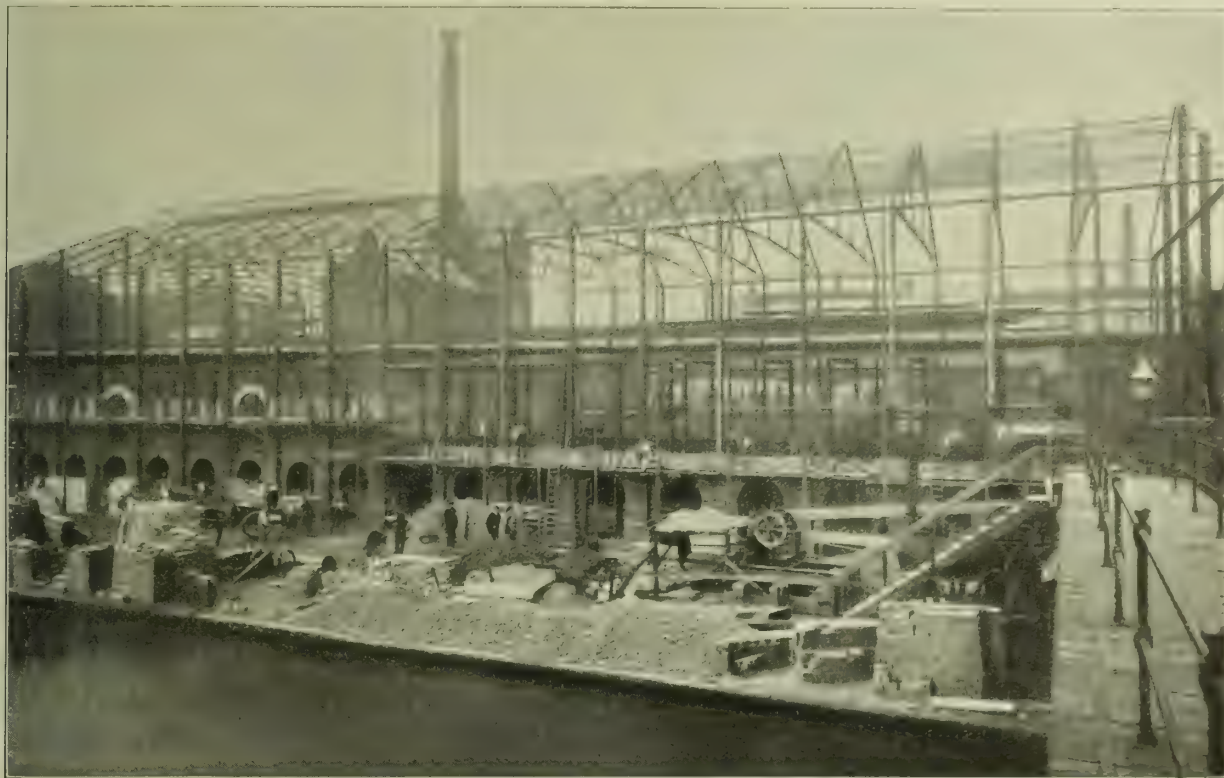
DESIGN AND CONSTRUCTION OF A NEW RETORT-HOUSE AT THE ADDERLEY STREET GAS-WORKS OF THE BIRMINGHAM CORPORATION.

By C. CARRINGTON BARBER.

[A Paper read before the Midland Junior Gas Engineering Association, Dec. 11.]

These works were formerly the property of the Birmingham and Staffordshire Gaslight and Coke Company, and were erected about the year 1844. They were acquired by the Corporation in 1875, and had a productive capacity of coal gas of about 3 million cubic feet per diem. The carbonizing plant consisted of four

retort-houses, direct fired and hand charged, each capable of producing about 750,000 cubic feet per diem. At the present time, there is only one of the original retort-houses in existence; and before long even that relic of old methods must come into disuse and give way to modern improvements.



Exterior (During Construction) of No. 2 Retort-House.

The new retort-house erected at these works—the subject of this paper—consists of sixteen beds of horizontals, each bed containing six retorts, 20 feet long, charged and discharged simultaneously by means of a Fiddes-Aldridge machine.

We commenced clearing the site for the new house in November last; and though somewhat delayed by frost and rainy weather,

this work was completed and the foundations were laid so as to permit the Contractors (Gibbons Bros., Limited, of Dudley) to commence their work of erecting the house and constructing the retort-benches early in February.

The ground for three-fourths of the length of the retort-house was the site of one of the old retort-houses; and on this portion



View of East Side of No. 2 Retort-House.

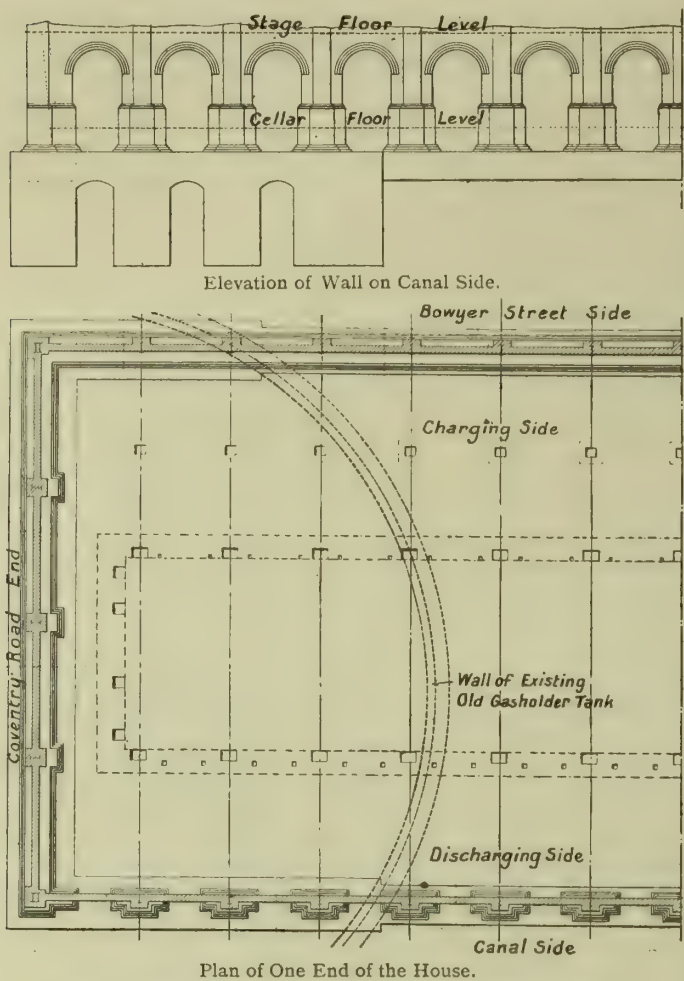


Fig. 1.—Foundations for the Retort-House and Retort-Bench.

little difficulty was experienced in finding suitable ground on which to lay the concrete foundations. But when excavating the ground for the remaining length of the house, we encountered an old brick and puddle gasholder tank about 20 feet deep that had been filled up with ashes and spent lime, a portion of which had to be removed. This done we then bored through the bed of the tank to ascertain

the nature of the ground on which it stood; and this was found to be good, clean dry sand. It was thereupon decided that it was only necessary to carry the foundations for this portion of the house down to the bottom of the tank. The external dimensions of the retort-house are 184 ft. 2 in. long by 58 ft. 2 in. wide; and the retort benches cover a floor space of 161 ft. by 20 ft. The height of the house from cellar-floor level to eaves is 38 feet, and the height of the roof from the eaves is 15 ft. 1½ in.

The foundations of both building and benches were laid by the Corporation, and are formed of concrete consisting of one part of blue lias lime three parts of ballast, two parts of broken brick, and one part of clean sharp sand, excepting under each of the buckstaves, where about one cubic yard of cement concrete was placed. The concrete foundations of the walls forming three sides of the house are 3 feet thick; but at the end of the house, over the gasholder tank, the concrete was taken to the bottom of the tank.

The width of the foundations varied according to the thickness of the walls required at their base. That on the west side was 4 ft. 9 in. wide; that on the east side 4 feet; under the north gable end 5 ft. 6 in.; while the width of the concrete arches formed to carry the south gable end of the building was 7 feet. The concrete foundations for the benches are 3 feet thick, except where the bench comes over the tank before mentioned; and at this point the concrete is carried from the bottom of the tank and arched.

The house is a steel frame erection, with 9-inch brickwork panels above the stage-floor level; the piers being 1 ft. 6 in. thick and 1 ft. 10½ in. wide (fig. 1). The frame of the house is built of rolled steel joists. There are 46 vertical stanchions—20 down each of the sides, and 3 along each end. The four corner or principal stanchions are composed of two 12 in. by 3½ in. steel channels, riveted together, fitted with base plates, cover plates, and head plates. The remaining stanchions are formed of 12 in. by 6 in. rolled steel joists; the whole of the stanchions being tied together by means of 12 in. by 3½ in. steel channels and 8 in. by 5 in. rolled steel joist ties placed horizontally.

The roof is of steel, and consists of 18 principals with the necessary wind-ties and purlins. Each of the principals is built up as follows: The main rafters consist of two 4 in. by 3 in. by ⅞ in. angles placed back to back, riveted together; and they are 32 ft. 11 in. long. The long struts are of 3½ in. by 3½ in. by ⅜ in. mild steel angles, 9 ft. 4 in. long. The main ties are of 4½ in. by ⅞ in. mild steel flats. The tension ties are made of 3 in. by ⅜ in. mild steel flats, 11 ft. 6 in. long, and 3½ in. by ⅞ in. mild steel flats, 14 ft. 1 in. long. The shoes are made of two 12 in. by ½ in. mild steel flats, riveted together, with distance-pieces inserted between them. The wind-ties are 3 in. by 3 in. steel angles; and the ends are boxed to form cleats, each of the ties being secured to the top rafters by two ¾-inch bolts. They are arranged in two sets on each side of the roof, starting from the gable ends, striking upwards

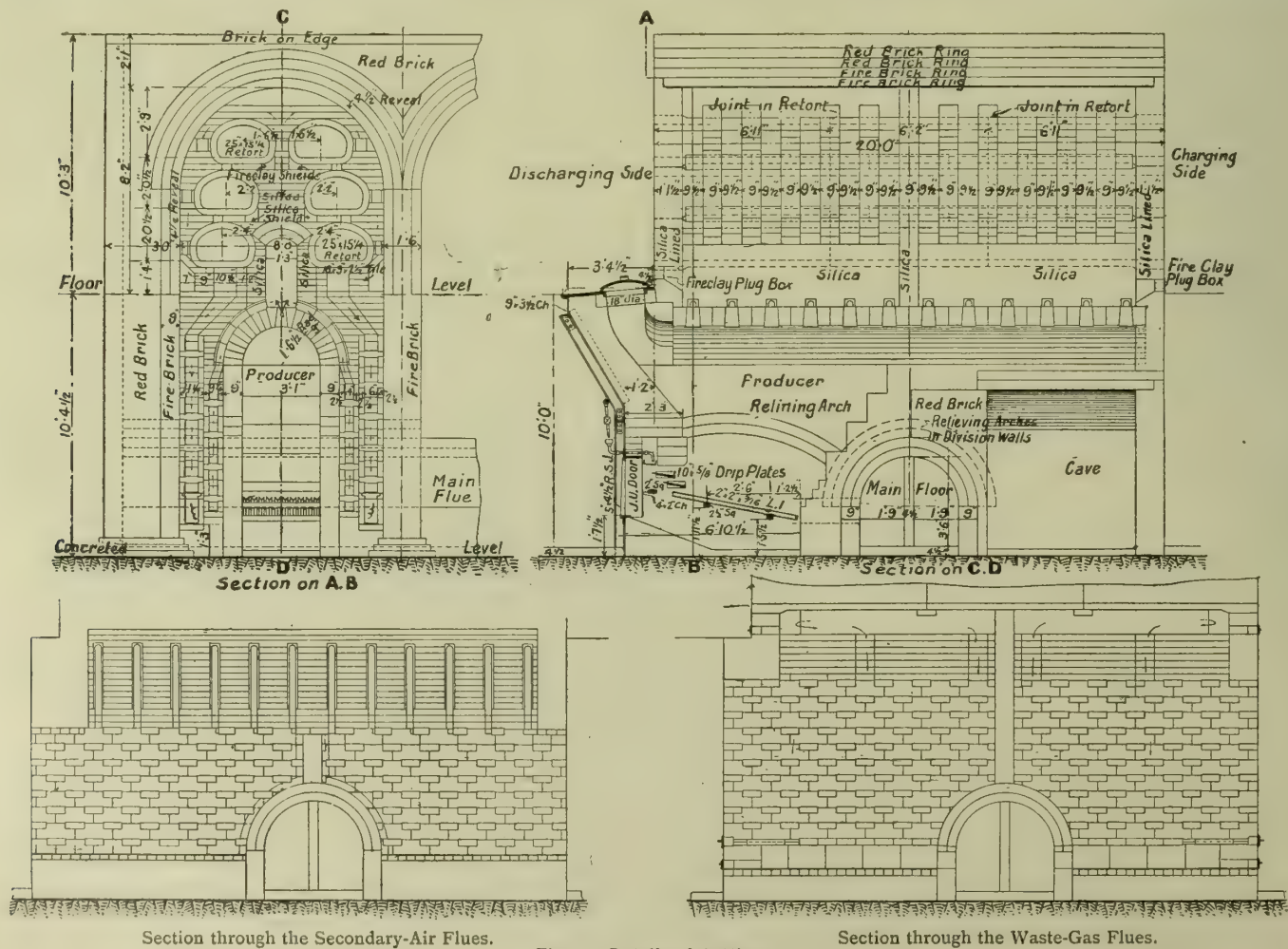


Fig. 2.—Details of Settings.

to the apex, and meeting on the wall-plates at the centre of the house. The roof is covered with 24 in. by 12 in. Bangor slates. A louvre runs along the whole length of the house over an aperture 5 ft. 6 in. wide; the louvre being 6 ft. 3 in. wide and 2 ft. 8 in. high above the apex of the roof. The louvre standards are of cast iron; the rafters of $3\frac{1}{2}$ in. by $3\frac{1}{2}$ in. by $\frac{1}{2}$ in. mild steel tees.

The charging and discharging floors are formed of $\frac{1}{4}$ -inch steel troughing, filled in with concrete and paved with blue bricks. The steel troughing is supported on 16 in. by 6 in. rolled steel joists on the charging side, and 12 in. by 6 in. rolled steel joists on the discharging side; the joists supporting the floors being 9 ft. 6 in. apart, supported by brackets fixed on to the main stanchions and to the buckstaves. The charging floor between the wall and the bench is 21 ft. 7 in. wide; and the discharging floor is 15 ft. 1 in. wide. Rails are fastened to the floor joists on the charging side for the Fiddes-Aldridge machine to travel upon. A space of about 1 inch is left between the sides of the floor and the house-walls to allow for expansion. Extra support is given to the floor on the charging side by placing steel vertical supports 12 in. by 6 in. midway between the wall of the house and the retort-bench. The floor joists are held in position on the brackets above mentioned by $\frac{3}{4}$ -inch bolts passed through slotted holes, so as to allow for ex-

pansion and contraction and thus prevent the pushing of the main stanchions and walls of the house out of perpendicular.

It was stipulated in the contract that the cast-iron to be used was to be of such quality that bars 3 ft. 6 in. long, having a section of 2 in. by 1 in. would stand a load of 26 cwt. in the centre of a 3 feet span before fracture. All mild steel had under test to show a tenacity of not less than 26 tons or more than 32 tons per square inch, with an elongation of not less than 20 per cent. on a length of 8 inches or more than 40 per cent. reduction of area at fracture; and, further, strips of any of the steel used, whether for plates, bars, angles, tees, or channels, were required to bend cold, without previous annealing, over a diameter equal to twice their thickness, till the opposite sides were parallel without showing any signs of cracking.

The retort-house has a productive capacity of $1\frac{1}{2}$ million cubic feet of gas per diem. There are two retort-benches in line, each containing eight beds of six retorts 25 in. by 15 $\frac{1}{4}$ in. \square section, and 20 feet long. The retorts are heated by Gibbons and Masters' patent "A.B.C." regenerative furnaces. The waste gases and secondary air are baffled by means of Gibbons and Masters' patent "A.B.C." tiles. These tiles are 2 $\frac{1}{2}$ inches thick, and are placed back to back, and so arranged that the joints are

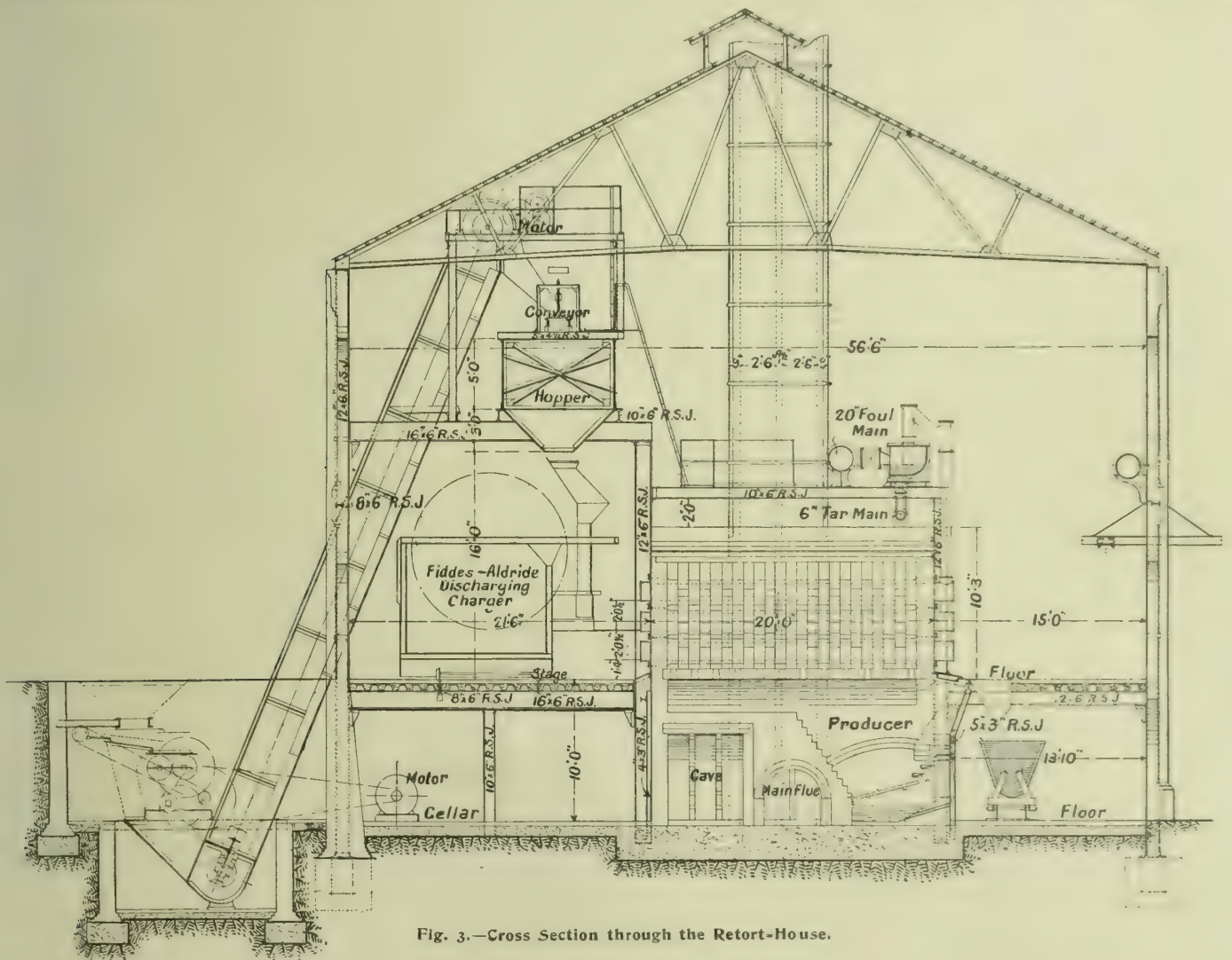


Fig. 3.—Cross Section through the Retort-House.

all broken to prevent, as far as possible, short-circuiting between the waste and secondary air flues. The intention of the panelling is to assist the transmission of heat from the waste-gas flues to the secondary air flues; and there is a nib on each of the baffle-tiles to keep the panel-tiles in position.

The main flue is divided by means of a $4\frac{1}{2}$ -inch mid-feather, so that the pull on both sides of the settings may be easily controlled. There is a separate stack to each bench, built-in with the end wall; and the mid-feather in the main flue is continued to the top of the stack. The heating of the retorts is under complete control; each bed being regulated by a set of four dampers. A 9-inch wall divides the setting above the producer arch. The nostrils in the producer arch, twelve in number, are placed equidistant. The combustion chamber is built with Yorkshire silica bricks; and the silica work is continued to within 3 inches of the top retorts. The main arches are semi-circular, constructed of two courses of $4\frac{1}{2}$ -inch fire-bricks, and two courses of $4\frac{1}{2}$ -inch common brick. The haunches of the arches are filled in with common brick; the whole being capped with 6 $\frac{1}{2}$ inches of common brickwork.

There is one ascension-pipe, 8 inches diameter, to each retort; and all the ascension-pipes are placed on the discharging side. The hydraulic main is Π shaped, 2 ft. 6 in. wide on the top side. It is divided into sections, one for each bed, and is supported on

cast-iron saddles resting on rolled steel joists, connected to the buckstaves. There is a tar-tower to each bench, connected with the hydraulic main by means of a 6-inch pipe. A 10-inch Cort's weir-valve is fixed to each section of the hydraulic main, so that in the event of the latter getting out of level, or the tar-main becoming blocked, the seals on any section can be regulated independently of the tar-tower. The foul main, 20 inches in diameter, is of wrought steel, $\frac{1}{8}$ -inch thick, made in sections flanged and bolted together; its total length being 370 feet over all. A 10-inch retort-house governor made by Messrs. Parkinson and Cowan, Limited, is fixed on the hydraulic main about 6 feet beyond the end of the retort-benches; and from this point, to assist the cooling of the gas, the foul main is returned the whole length of the building, supported by brackets bolted on to the main stanchions of the retort-house. The foul main over the top of the benches is also supported on cast-iron saddles resting on joists fastened to the buckstaves.

The coal-handling plant consists of coal-breaker, twin elevators, a push-plate conveyor, and a hopper running the whole length of the house for feeding the charging machine. The coal-breaker is placed in a pit 14 ft. 8 in. by 15 ft. 1 $\frac{1}{2}$ in. and 20 ft. 6 in. deep. The foundation of the pit is a concrete bed 18 inches thick; the walls of the pit being built of brick 14 $\frac{1}{2}$ inches thick set with cement mortar and backed with cement concrete 2 ft. 9 $\frac{1}{2}$ in. thick at the bottom, and stepped at suitable heights until reduced to a



Charging Stage of No. 2 Retort-House.

thickness of 14 inches at the top. A hopper made of wrought-iron plates to guide the coal on to the breaker is suspended on rolled steel joists placed across the top of the pit at a level which enables the coal to be directly tipped from carts into it.

The coal, after passing through the receiving hopper, feeds on to a jigger-screen placed just above the coal-breaker, and so arranged that only coal of 1 inch cube or over has to pass through the breaker, the small material passing through the screen directly into the elevator-boot. The jigger screen obtains its motion from eccentrics connected with the main shaft of the coal-breaker; the latter being driven by a $12\frac{1}{2}$ H.P. electric motor. The coal-breaker is of the double-crusher type, made by Messrs. W. J. Jenkins and Co., Limited, of Retford, and has a crushing capacity of 25 tons per hour.

The coal, after being crushed, passes on to the elevator, and is lifted up to the conveyor in the retort-house fixed at a height of 34 feet above the cellar-floor level. Each elevator is fitted with 66 buckets each 20 inches wide, and 8 inches deep, and is speeded to lift 25 tons of coal per hour. The buckets are attached to a Gibbons patent steel roller-chain; the elevator being encased in a sheet-iron frame of suitable strength and dimensions. The elevators are belt-driven off an $8\frac{1}{2}$ H.P. motor fixed on a platform at the elevator head; but the starting and stopping gear is operated from the stage-floor level.

The coal-conveyor is of the push-plate type, and 158 ft. $10\frac{1}{2}$ in. long. The framework supporting the conveyor is made of an inverted U shape, and is constructed with 4 in. by $2\frac{1}{2}$ in. tees, strengthened with gusset plates in the corners. Angle shoes are fixed to the corners of the frame, and are bolted to the supporting joists which span the hoppers. The frames are strengthened throughout the length of the conveyor by means of $2\frac{1}{2}$ in. by $\frac{1}{2}$ in. mild steel flats, lattice-braced. The push-plates, fixed $19\frac{3}{4}$ inches apart, are 20 inches wide; and the gauge of the rails on which the conveyor travels is $23\frac{1}{2}$ inches. The conveyor is driven by an 8 H.P. motor fastened to a platform fixed on the top of the hopper at one end of the house. This platform is 5 ft. 5 in. by 3 ft. $2\frac{3}{4}$ in., strengthened by means of four 6 in. by 3 in. channels fastened to the joists across the hopper. The motor runs at a speed of 1000 revolutions per minute, reduced by three sets of wheels, so that the sprocket-wheel driving the conveyor makes $13\frac{1}{4}$ revolutions per minute. The speed at which the conveyor travels is 84 feet per minute.

The coal is passed from the conveyor into the coal-hoppers by means of slide doors 4 ft. 9 in. centres along the whole length of the conveyor. The hopper is 160 feet long and 10 feet wide, and holds about 250 tons of coal. It is carried on 16 in. by 6 in. rolled steel joists, supported on brackets bolted, with slotted holes to allow of expansion, on to the main stanchions and to the buckstaves. The top portion of the hopper is rectangular, and is 4 ft. 6 in. deep. The bottom part is 3 ft. 6 in. deep (fig. 3), and the sides are set at an angle of 42° with the horizontal. At inter-



Discharging Stage of No. 2 Retort-House.

vals of 4 ft. 9 in. throughout its length, the hopper is strengthened by means of a frame constructed of 6 in. by 3 in. by $\frac{3}{8}$ in. tees, and $2\frac{1}{2}$ in. by $\frac{1}{2}$ in. flats fixed diagonally. The 34 openings in the bottom of the hopper (through which the retort-charging machine obtains supplies of coal) are formed with iron castings, machine faced, and fitted with doors operated by patent levers. A checker-plate gangway, supported on brackets fixed to the hopper frame, runs along the whole length of the hopper.

A Fiddes-Aldridge machine is used for simultaneously charging and discharging the retorts; and since these machines have been so frequently and so fully described in the Technical Press, I need only add that the one in use in the retort-house under



View taken from the Top of the Benches - No. 2 Retort-House.

review is under perfect control, easy to work, and its operations are complete in every detail.

Electricity is the motive power employed in working the coal-crusher, coal-elevator, coal-conveyor, and charging machine; the current being generated on the works. For this purpose, a 49 B.H.P. gas-engine has been installed which, at full load, consumes $15\frac{1}{4}$ cubic feet of gas per horse power per hour—a total of 747 cubic feet per hour, costing, with gas at 1s. 6d. per 1000 cubic feet, less 5 per cent., 1s. 0 $\frac{1}{4}$ d. per hour, or 0.26d. per horse power per hour. The engine drives a dynamo which generates 160 amperes at 225 volts, or 36 units of current per hour; and thus at a cost of 1s. 0 $\frac{1}{4}$ d. for gas, electric current is produced at only 0.35d. per unit.

At other works of the Gas Department, either hydraulic power or compressed air is employed to operate the charging and discharging machines—both the systems having proved economical. The use of electricity at Adderley Street will later enable comparisons of cost to be instituted that must prove interesting and instructive; but the point I now wish to make is that in Birmingham motive power can be obtained by means of gas at a cost of 1d. per 3 H.P. per hour.

In conclusion, I have to express my regret that, as the plant has only recently been started-up, and our tests are consequently not yet completed, I am unable to furnish the members either with results of the cost of manufacture, or the cost of working. I may, however, add that, so far as can be seen at present, we shall be getting from Derbyshire coal well over 11,000 cubic feet of 16-candle gas (tested by the No. 1 "London" argand burner) per ton carbonized, with a very satisfactory yield of coke and other residuals for sale, at a carbonizing cost of under 1s. per ton, which would be still further reduced if the charging machine, instead of being only employed on 96 retorts, could have its full complement of 200 retorts to charge and discharge.

I am indebted to Mr. Walter Chaney, the Engineer-in-Charge of the Nchells and Adderley Street works, under whose supervision the erection of the new house has been carried out, for enabling me to furnish the Association with the information contained in this paper.

Discussion.

Mr. W. S. SMART (Saltley) said that, in the first place, he would like to express his sympathy with Mr. Barber in the very sad event that had prevented his attendance at the meeting. The paper which had been read was most interesting; and he thought additional value was added to it by the fact that it was accompanied by very clear detailed working drawings. They were able to follow descriptions of this character very much more closely when drawings were attached to papers. Mr. Barber's contribution came at a very opportune time, as the members had only just visited Coventry, where they saw the Fiddes-Aldridge machine in operation in a retort-house of a somewhat similar type; and they were thus enabled to contrast the two, and see the variations in the designs. He thought retort-houses of this class would be the strongest competitors in future with the more recent methods of carbonization—such as inclined chambers and verticals—in the inevitable struggle for the survival of the fittest, which had always taken place in engineering work. They were told in the paper that the foundations were put in in lime concrete, and in the depth of winter. It seemed to him that it would be a matter of very serious consideration as to whether it would not perhaps be better, or as well, if these foundations were laid in portland cement instead of lime. Lime depended for its setting on the loss of water and the absorption of carbon dioxide from the atmosphere; and in winter lime concrete took a very long while setting. Portland cement, on the other hand, was independent of these considerations, and set very quickly. Of course, there was a great difference in cost; and the practical consideration was, Are you justified in increasing the cost of the retort-house to obtain these advantages? Steel frame buildings, he noticed, had been adopted in this particular case. As far as Birmingham was concerned, steel frame buildings were an innovation. They had, however, several advantages. Generally, brickwork and steelwork were placed with separate contractors; and where there were two or more contractors working together, delays were always inseparable from the job. One contractor was waiting for another; and there were always excuses. On the other hand, with a building like this, a few blocks of concrete were all that was necessary; and the steelwork contractor could practically finish his contract without waiting for anyone else. The duties of the clerk of works were also much simplified. The clerk of works often required to watch the contractors very closely in connection with large and important constructions. One frequently saw foremen erectors, and such-like, fiddling and messing about with a tenpenny-halfpenny spirit level; whereas the correct thing would be for contractors to send an experienced man with a theodolite and dumpy level to line up and level the work. They often required watching in this respect. With regard to cost, however, he supposed a steel frame building would be more expensive than a solid brick building. He thought, if he rightly made it out—of course, it all depended on the number of openings in the brick walls—it would cost approximately £200 more than a solid brick building. He noticed, too, that there were eighteen principals. He took it that these were intermediate ones, and that there would be an additional principal or steel framing of some description at either end. If not, the advantage of getting clear away with the work would be lost, as the workmen would have to wait before they could fix the

purlins on the end bays until the gable walls were all built up. Then he noticed that wind ties were being put in. All the more important engineers used these; but his own opinion was that they were unnecessary in a case like this. Where they had about eighty or ninety purlins on the roof, as here, he thought the addition of a light angle tie was not going to make much difference. Where the purlins were (say) 10 feet apart, or where they had wooden purlins, ties were necessary; but in the present case it did not seem to him that they were. The trough flooring as put in was very good; and, in his opinion, it was one of the best. It was rather expensive; but, still, it made an excellent floor. One of the disadvantages was that it was very awkward for cutting round the U shape for bringing up pipes, or anything like that. But, to his mind, it was much to be preferred to the expanded metal or reinforced concrete which appeared to be so widely adopted at the present time. He saw that tests had been specified for cast iron. Well, his experience of this matter was that they were not often enforced; but if the work was very important, he always thought it was much better to specify that the test bars should be cast and run with the casting. The quality of iron in the foundry cupola (which dealt with relatively small quantities) was constantly changing; and one could not have an inspector at the foundry continuously. It was only by casting the test bars with the casting that one could be sure they correctly indicated the quality of the iron. Steel tests had also been specified; but it simplified matters if in these cases one merely stipulated that the material was to be to British standard, which altogether went into the matter more thoroughly than one could hope to do in a specification such as the one in the paper. This particular specification said all mild steel had under test to show a tenacity of not less than 26 tons or more than 32 tons per square inch, with an elongation of not less than 20 per cent. on a length of 8 inches or more than 40 per cent. reduction of area at fracture. The British standard was 28 tons to 32 tons; and it did not take into account reduction of area of the test bar, while the bending tests also were not so stringent as in this case. With regard to the settings, the drawings showing the section through the waste gas flues and secondary air flues seemed hardly complete in one particular instance. The end walls of the setting from the semi-circular producer arch downwards were omitted; and the baffle-tiles had been carried across the full width of the bed. As shown, they were more or less open to the atmosphere. He presumed, however, there would be blocks or else an end wall to stop up the flues. If there were special blocks fitted in, it seemed there was a lot of space left; and there would be a tendency to draw in air. Then as to the semi-circular main arches of the setting. They were shown to be made of four 4 $\frac{1}{2}$ -inch brick rings; whereas he had been told by experienced retort-setters that it added to the life if the inner ring of the arch was made one brick thick, instead of half a brick. This prevented a tendency to cave in. With regard to the coal-breaker pit, this was given as 20 ft. 6 in. deep, which seemed rather deep for one of this description. The author also said it was 14 ft. 8 in. by 15 ft. 1 $\frac{1}{2}$ in.; and inspection of the drawing seemed to show that it was wider than it was deep. Possibly there was a printer's error here, and it was really about 15 feet deep. Was there any difficulty found with water? In the case of most of the other works of the department, there had been enormous trouble with water in connection with crusher-pits; and he presumed there would be difficulty at Adderley Street. The drawing said "Canal Side of the House;" and if there really was a canal near, trouble might be expected. Generally speaking, it had been found necessary to render the walls of the pits in cement, and to make the bottom in the form of an invert of an arch, so as to prevent the head of water thrusting it up. In the description given of the coal-hopper, it was mentioned that it would hold 250 tons; but from the dimensions given, it seemed to him that this was a very generous estimate. He did not think that 250 tons of coal could, without much trouble, be got into a hopper of this description, 160 feet long, 10 feet wide, and filled by a conveyor only 20 inches wide. There was not much chance of it getting very full. In fact, after making due allowance for the portions left unfilled, due to the angle of repose of the coal, he could not see how it would be possible to get more than (say) about 160 tons in without considerable labour in trimming. Then, again, the paper said there was a single gas-engine. He would like to know whether, as the result of the working of the plant, it had been found necessary (as was often done) to put in a duplicate engine—as was the case with the elevators. In several places, the author said slotted holes had been put in for expansion. His own experience was that they did not take expansion. There was so much grit that the friction between the two surfaces was too great for much sliding action to take place.

Mr. W. H. JOHNS (Saltley) remarked that Mr. Smart had dealt so fully with the engineering part, that there seemed to be very little left for him (the speaker) to talk about. As a gas engineer who had had experience of the working of gas-engines, he had always found it necessary to have a duplicate. There were occasions when one got hot bearings; and lately there had been some trouble with countershafts. There were one or two points in the paper he was not quite clear upon. In the first place, the author said that a 10-inch retort-house governor was employed. Did this deal with the whole of the 1 $\frac{1}{2}$ million cubic feet made per 24 hours? If so, it appeared to be rather small. At Saltley, on one of the sections with a make of 1 $\frac{1}{2}$ million feet a day, they were going to have installed two governors, each

10 inches in diameter—that was, to deal with rather less gas than at Adderley Street, where one was supposed to do the work. If they could do with one governor at Adderley Street, he thought the same provision should be sufficient for Saltley; but he had been given to understand by the makers that it was necessary to have two governors—one to be cleaned out while the other was in action. In retort-houses, they were not working under the best conditions as regarded atmosphere; and the dirt which came in contact with the bell of the governor (unless the governor was enclosed) had been proved to soon eat away the metal. While one governor was under repair, it was, of course, necessary to have a spare one. It was also stated in the paper that the governor was fixed on the hydraulic main about 6 feet beyond the end of the retort-bench. He did not know whether Mr. Barber meant on the foul main; but he (the speaker) was not aware of the hydraulic main overhanging or extending beyond the retort-bench. At any rate, he had never seen one. Mr. Smart had raised the question of the capacity of the hopper. He also wished to refer to this point, but in a rather different connection. The paper gave the capacity of the hopper as 250 tons; and from this it appeared that they had a very good reserve. The coal breakers and elevators were designed for a capacity of 25 tons per hour. They required during the 24 hours, with a make of 11,000 cubic feet of gas per ton, and a production of $1\frac{3}{4}$ million cubic feet, 160 tons of coal. Why was the hopper designed for 250 tons? Owing to the position of the Adderley Street works, it was necessary to cart the coal, and they probably liked a little in hand in the hoppers; so that the difference between 160 tons and 250 tons no doubt was made up of storage for emergencies. He would like to ask whether they found it requisite to employ a night shift there, or whether, in the design of the hoppers, it was not intended to work a day shift only. Because in well under eight hours, with 25 tons per hour, they would be enabled to get up sufficient coal for the 24 hours. There was another point that struck him as being perhaps rather strange. The tendency nowadays was to put in beds of eight or more retorts. Why they should have gone back to six, he did not know. Probably it was on account of the centres of the buckstaves being only 9 ft. 2 in., and 8-inch ascension-pipes being employed there was some difficulty in fitting in the pipes. He would like to know if this was so. In a paper which was recently read by Mr. Bell, of Derby, he believed it was stated that the centres of the buckstaves were 9 ft. 6 in. in a similar installation; and under these conditions, he was able to get eight retorts in a bed. By working eights in the settings, the machines at Adderley Street should have been employed to better advantage. He was under the impression that these machines could work at their maximum capacity 200 retorts; whereas at Adderley Street the maximum amount of work they could be employed on was 96 retorts. The cost of carbonizing for the 96 retorts was given in the paper as about 1s. per ton. This seemed to him a great deal too high; and he would not be satisfied himself, with a new installation, unless he got down to a much smaller figure. But, as he had pointed out, the machines were only doing half-work at the present time; and if they could have had a little more to deal with, a lower figure should have been reached. At Derby, he believed the figure was 6d. per ton, with De Brouwer machinery. He did not know the exact figure at Coventry, where they had Fiddes-Aldridge machinery; but he believed that it was under 1s. per ton. He had not himself had experience with the Fiddes-Aldridge machine on a practical scale, though he had had acquaintance with it on some old settings before it was adopted actually for gas-works use. He referred, of course, to the first machine, which was erected at Bath. They tried it there on some old beds when it was in the experimental stage. What he would like to know was whether the retorts could be filled—of course, leaving space for the swelling of the coal—so well as could be done with the De Brouwer projector. The filling up of the retorts combined with longer periods of carbonization seemed to be the general practice nowadays where over 12,000 cubic feet per ton could be obtained. Why were the De Brouwer machines not put in in this case? Perhaps it was on account of the number of men necessary to work them—two instead of one. But this would be a very small matter. Besides, they had to look at the actual cost of carbonization; and it did not matter whether there were two men or one, if the ultimate result was satisfactory. It seemed to him that, with longer periods of carbonization and filling the retorts completely, better results could be obtained. Of course, these were heavy charges, because the retorts were large; but he did not mean that. What he meant was the filling of the retort as far as possible. It would have been very interesting indeed if Mr. Barber could have given them some idea of the cost of the installation, leaving out the walls and the roof. They might not all be content to put in steel structures with brickwork panelling. Some of them might prefer to build the walls of solid brickwork; and therefore he thought the comparison of the walls and the roof should be left out. He would have liked to have known the cost of the installation, so that it could have been compared with a similar installation of vertical retorts. There was another thing in the paper that was not quite clear to him—that was, the method of removing the coke. Was there any difficulty in quenching the coke in these bogies? No mention was made of the capacity of the bogies; but from what he could see on the drawing, compared with the distance between the coke floor and stage floor level, which was given as 10 feet, the bogies would be

about 5 or 6 feet deep, and 3 or 4 feet wide. The length he was unable to get from the drawing. He should say that there would be a large quantity of coke contained in such a bogie, and that there would be some difficulty in quenching it. Did the author find that there was any deterioration in the coke? To his (the speaker's) mind, it would become slightly burnt before it was removed from the retort-house. There was no mention in the paper of the make of the retorts. He took it that Stourbridge material was employed.

Mr. A. HANCOX (Great Malvern) said Mr. Smart had made some remarks with regard to lime and cement concrete. He (the speaker) thought the extra cost of the cement concrete would be more than repaid by its use. In the first place, it was difficult to get lime concrete to set. Often some months after lime concrete was put in, there was found to be a great deal of moisture in it. For this reason, he thought they would find that with cement concrete the foundation would be much strengthened at the early stage of putting up the building when the weight came upon it. As regarded the cost of steel framing and solid brickwork for retort-houses, he would point out that in the present case had solid walls been put up they would have had to be much thicker; but for steel framework the thickness was ample. With reference to the wind ties, there was an old and a true saying that "Prevention is always better than cure." He thought it was highly advisable in every case that wind ties should be added. Mr. Smart had remarked that the depth of the coal-crusher pit seemed to him excessive; but perhaps they had been guided a great deal by the crusher and elevator. At Malvern they had a deep hole to tip the waggons into. They had a hopper that held 10 tons of coal at one tip; and in that case the hopper hole would run about 23 feet deep to the bottom of the boot. He thought probably they would be guided to some extent by the amount of coal they wanted the hopper to hold, and also by the crusher. He would like to ask Mr. Barber if he did not think it would be better to have a cavity in the main arch between the two rings of $4\frac{1}{2}$ -inch fire-brick and the two rings of red brick. He agreed with Mr. Smart as to the advisability of having one 9-inch ring of fire-brick, instead of two rings of $4\frac{1}{2}$ -inch brick, for the inner ring of the main arch. Also in the combustion chamber he noticed there was a segmental arch, which undoubtedly must throw some side-thrust on to the bottom retorts. He thought in time Mr. Barber would find that this thrust would tend to push the sides of the retorts in and deform them. A semi-circular arch would overcome the difficulty.

Mr. OWEN EVANS (Wrexham) remarked that the paper was particularly interesting to him because they had had a retort-house of this description in use at Wrexham for two years, though they did not carbonize anything like the same amount of coal as in Birmingham. The first point he wished to refer to was the position of the ascension-pipes, which were fitted on the discharging side of the house. At Wrexham, they had them on the charging side, which he thought was the better position, because with this type of machine the discharging stage was a lot hotter than the charging stage, and the coke dropping in front of the ascension-pipes tended to keep them hot. The other side was cooler; and, in addition to this, placing the ascension-pipes there made a better distribution of labour, as the man there did not have so much to do, and was therefore more able to look after the ascension-pipes than the man on the discharging side. He would like to know how many men were employed per shift. He would prefer to use portland cement, which was what they put in at Wrexham. As to the number of retorts in a bed, they had sixes at his works.

Mr. R. WARDELL (Birmingham) said he noticed the 9-inch intermediate walls were not carried up to the main arch. He referred to the portion immediately above the top retorts. From his experience of discharging machines of the push type, this had been found necessary. That was to say, to build a 9 in. by 9 in. pier from the top of the retort to the underside of the main arch—leaving sufficient space for the free passage of the furnace gases. When working on new retorts, there was practically no trouble; but with old retorts that had sagged and lost their shape, charges when pushed out would occasionally buckle and wedge, with the result that, when retorts were not strengthened in the way he had mentioned, they were liable to displacement. Of course, the circuit-breaker on the discharger could be made to blow readily, and so prevent damage being done; but if the precaution he had named was taken, the circuit-breaker could be more heavily weighted. In a large house where one discharger was dealing with (say) 200 or 250 retorts, time was an important matter; and they could ill-afford to lose it through the circuit-breaker blowing freely on an old set of retorts. The Fiddes-Aldridge machine seemed to him to be putting "all one's egg in one basket." In the event of it breaking down, both charging and discharging were dislocated for the time; but with the De Brouwer machinery, if either the charger or the discharger broke down, there still remained one operation that could be gone on with. It was also important to be able to fill the retorts right up, which could undoubtedly be accomplished with the De Brouwer machine. With reference to gearing, it was stated in the paper that "the motor runs at a speed of 1000 revolutions per minute, reduced by three sets of wheels, so that the sprocket-wheel driving the conveyor makes $13\frac{1}{4}$ revolutions per minute." If a motor had been installed in the first place speeded at a lower rate, the initial cost would have been greater; but the continuous loss of friction would have been saved.

Mr. HANCOX said he should like to refer to a remark that had

been made to the effect that two retort-house governors should be installed, so that one could be working while the other was undergoing cleaning. At Malvern, they had had Braddock's retort-house governors for nearly two years. They had two; and they wanted occasionally to be cleaned out. He had periodically changed them over and taken out the bell; but the whole time they had been in, he had not had a handful of tar, or anything more than would run from the outlet at the bottom.

Mr. G. C. PEARSON (Birmingham) remarked that, with regard to the settings, the point that struck him was that there seemed to be no arrangement for distributing the primary air. It all appeared to go in through the clinkering door. It would be much better if there was some arrangement for the distribution of air under the fire-bars. To his mind, there was very little danger of retort-house governors getting out of order or wanting cleaning. They had had one working for two years in connection with the coal-testing plant; and it had not been out of order in any way. They found it necessary to fix an automatic syphon at the bottom to run off the tar that collected there, and also to arrange a run-off to the reservoir. A little tar seemed to adhere to the sides of the governor-valve, and run down to the reservoir, and cause the valve to stick somewhat. The automatic syphon kept everything quite clear. Of course, one always arranged a retort-house governor in such a manner that it could be bye-passed for a short time if necessary.

The PRESIDENT (Mr. A. O. Jones, of West Bromwich) voiced the great regret of the members at Mr. Barber's absence that afternoon, and its cause. He said it was in deference to Mr. Barber's wishes that they had the meeting at all. There was some idea of postponing it until he could be present and reply personally to the discussion; but Mr. Barber seemed to desire that the paper should be read. He would see the report of the discussion, and would no doubt reply to it through the medium of the Technical Press. Turning to the paper, he would like to know why such a small number as six retorts in a bed was adopted. The use of machines on one side of the bench only showed to advantage in the construction of the retort-house. With the arrangements adopted, it seemed possible to reduce the width of the retort-house by about 15 feet, which represented rather a large economy of space in building a new house. In this instance, 170 cubic feet of gas was produced per square foot of area per 24 hours, which was very high. The size of the retorts was 25 in. by 15½ in. by 20 feet long; and from this basis he worked out the size of the charges. Taking 1¼ million cubic feet per 24 hours as the production of the house, and 11,000 cubic feet as the make per ton, it came to nearly 10 tons per setting; and with a make of 11,500 feet, to about 9½ tons per setting. This worked out for eight-hour charges would be about 10½ to 11 cwt.; and for six-hour charges, about 8 to 8½ cwt. This was a very heavy charge; and he did not know how they managed to get it. As to the silica work which was continued to within 3 inches of the top retorts. He supposed that would give it a longer life; and if this was so, why did he not have his retorts made of silica as well? If he took his retorts out, he would have to take his division-walls out to do it; and so there would not be so much economy as by having silica retorts as well.

At a recent meeting of the Paris Academy of Sciences, M. Witz dealt with the subject of the regeneration of the exhaust gases from internal-combustion motors. The author suggests that the exhaust gases, taken from the cylinder without cooling, should be passed over a column of incandescent coke. The gas thus produced, containing carbon monoxide, is washed and re-admitted with pure oxygen to the gas-engine cylinder. It is assumed that the price of the oxygen, prepared from liquid air, is now sufficiently low for use in this manner commercially. The utilization of the heat in the exhaust gases is calculated to give an economy of about 30 per cent.

It has frequently been said that a busy man finds rest not by abstention from work but from change in the character of his occupation. The remark appears to be particularly applicable to Mr. Samuel Wood, whose retirement from the firm of Messrs. Wood, Drew, and Co. was announced in the "JOURNAL" for the 13th of July last. On his release from professional duties, Mr. Wood went to live near Bournemouth; and evidence has just reached us that he is still by no means idle. When busily engaged with accountancy work, he must have found recreation in the study of philology, for he was able, at the weekly meeting of the Exeter Literary Society on the 2nd inst., to discourse for an hour and a quarter, without notes, on "The Growth of the English Language." The thorough knowledge of the subject which Mr. Wood displayed could scarcely, we should imagine, have been acquired in the leisure he has had since his retirement; and therefore we must assume it was the outcome of many hours previous study by way of recreation. He explained how, by philological evolution, from the 800 words which sufficed for the tribes whose representatives came to Europe in past ages from the mysterious depths of Asia, has sprung all the enormous variety of thought and marvellous power of language of the present Indo-European tongues. By the aid of lantern slides, he showed specimens from the old writers, from King Alfred to the Elizabethan Bible, to illustrate the changes which the language underwent from century to century. At the close of the lecture, the Chairman (Mr. W. N. Westlake, of Exeter) proposed a cordial vote of thanks to Mr. Wood.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

Visit to the Alloa Corporation Gas-Works.

Last Saturday afternoon the members of the Eastern District Division of the Scottish Junior Gas Association paid a visit to the gas-works of the Alloa Corporation. The day was pitilessly wet, and in consequence the attendance was disappointingly small—numbering only about twenty. Provost Duncanson, Councillor Mitchell, and Mr. J. W. Napier, the Engineer, received the visitors; and by these gentlemen and Mr. A. Kelloch, the Assistant-Manager, they were shown round.

In the retort-house there is a single bench, containing 14 ovens, in 11 of which there are settings of eights, and in the rest settings of sixes, back to back, and fired on a regenerative system. The charging is done by a De Brouwer machine, which has been in use since the end of 1905. On inquiry, Mr. Napier stated that the first rubber belt upon this machine lasted a year and eleven months, and charged about 25,000 tons of coal. The present belt has been more than a year in use. As was explained at the time the machinery was inaugurated, the two sides of the retort-bench are served by one machine, which is made to travel round the end of the bench. The motive power is electricity, which is generated on the works; Alloa being the first place in Scotland where electricity was employed for driving gas-works machinery. The drawing is done by hand; the coke being raked out into barrows which are wheeled out by men to the yard, and the quenching being done on the way, under a tower. The system of handling the coke is about to be superseded by a more up-to-date one; plant for this purpose, costing about £2000, being all but completed. The drawing will continue to be by hand; but the coke will be received in skips running upon rails in the underground chamber of the regenerative arrangement. The skips will be hoisted to a Telfer railway, which will convey them to a couple of hoppers, each of 10 tons capacity, or to the yard. Before reaching the hoppers, the skips will travel over the flat roof of the engine-house, upon which are placed two cast-iron tanks, 9 feet square and 6 feet deep, into which the skips will be lowered for the quenching of the coke. Below each of the hoppers, screening plant, to be driven by steam, is being fitted up; and a bagging appliance, to be served from either hopper, is provided. The plant is being supplied by Messrs. W. J. Jenkins and Co., Limited, of Retford. For the working of the De Brouwer machine, as well as the coal breaker and elevator, a 25 H.P. "National" gas-engine, coupled direct to a dynamo, has been in use. To work the new plant, an addition has been made to the power plant in the shape of a 40 H.P. gas-engine of the above-named type and a dynamo of 20 kilowatts capacity, which will work two motors, one of 11 H.P. for elevating the coke and the other of 7 H.P. to work the Telfer railway. It should be stated that a Parkinson and Cowan 10-inch retort-house governor was fitted up some time ago, and has proved a highly effective instrument.

Coming to the purifying plant, an Everitt tar-extractor has been in operation for some months, and by its use the naphthalene trouble has been considerably reduced, although not altogether eliminated. The gas is washed by a Livesey washer and a Holmes washer-scrubber, each of a million cubic feet capacity. The exhausters, in duplicate, are Waller's, one being of 30,000 cubic feet capacity, and the other of 40,000. Purifying is effected by oxide only, in four boxes 20 feet square. Only one sieve is employed; the material being filled to the top, a depth of 39 inches. In the purifying process 2 per cent. of air may be introduced, as required. The purification costs last year, for 121 million cubic feet, amounted to £46; being at the rate of 0.09d. per 1000 cubic feet of gas made. The quantity of gas passed through the purifiers before changing has been as high as 134 million cubic feet; and the purifiers have not been changed for fully twelve months. The purifier-house is lighted by electric lamps, which can be lowered into the boxes. An overhead runway extends into the yard, and on it skips containing 10 to 15 cwt. are run by hand.

The gas supply to the town is governed by a Cowan water-loading governor. The night pressure is 4 inches, and the day pressure as high as 3 inches. There are two district governors; one for serving the Clackmannan district, and the other one the Cambus and Tullibody district. The lighting of the works is most effectively done by high-pressure inverted incandescent gas-lamps, similar to those in use in Fleet Street. For their service a very small Keith compressor, working up to 54 inches, is placed in the exhauster-house, and is driven by a belt off the exhauster shaft. Beside it is a switchboard, upon which the lamps in all the different departments about the works can be turned on or off; ignition being effected by an electric spark.

Mention has been made of the out-districts which are supplied with gas. One of these is about three miles to the east, and the other about the same distance to the west of the town. In the one to the east there was great difficulty in maintaining an adequate supply of gas, and after leaving the gas-works a visit was paid to the town station, where the members were shown an arrangement for boosting the gas supply, which has been found to work very satisfactorily. A small Bryan Donkin exhauster, worked by an electric dynamo, is used to compress the gas. The machine is capable of compressing up to about 10 inches. With an inlet pressure of 3½ inches, it is being worked so as to compress up to

6½ inches; and at the entrance to the district the gas is governed down to 4 inches.

In the course of the visit, Mr. Napier explained that in one part of the area of supply great trouble was experienced on account of the cast-iron mains being broken in consequence of underground workings; and that he had, with good effect, laid Mannesmann steel tubes in the district. He had also, he said, on account of the costly street paving which is now the fashion, adopted the practice of laying these tubes for all service-pipes, as they are found to be capable of withstanding more pressure from road-rollers; and as they have a life double that of cast-iron pipes, there is less occasion with them for opening roadways. It should also be mentioned that in a corner of the now all but disused lime-store a bathroom for the workmen has been fitted up in which water is heated by the exhaust steam from the engine that drives the washing and scrubbing plant.

After the inspection, the visitors were entertained at "high tea" in the Royal Oak Hotel.

Provost DUNCANSON, who presided, extended a welcome to the Association. He said the gas undertaking was one of the most valuable they had. The original capital when the Corporation took over the gas-works in 1877 was £25,000; and the capital now at the debit of the gas-works was no more than £32,000. The members would, he thought, agree with him that the works had been conducted in a most economical and efficient way. They had been very well served by their Managers. He need not speak of Mr. Napier, whom they all knew; but his immediate predecessor—Mr. Yuill—was a man of outstanding ability. Mr. Napier, however, did not fall below the standard of Mr. Yuill. He might tell them that any proposition made by their Gas Managers, which was likely to be for the benefit of the undertaking, was adopted without hesitation.

The PRESIDENT (Mr. H. Rule, of Falkirk), on behalf of the Association, expressed their thanks to the Corporation for their kindness, and also their appreciation of the honour done them in having Provost Duncanson and Mr. Mitchell there to welcome them. With regard to the works they had seen, he thought they could say that, though they were not new, their efficiency was almost equal to that of new works; and also that they were being kept up to date, as witness the alterations which were going on in connection with the coke-handling plant, and other minor constructional work. He felt sure the members had received many little "wrinkles" which they might adopt. They were also very much indebted to Mr. Napier for giving them all the information possible about the works.

Mr. MITCHELL said the gas-works at Alloa were a wonderful institution. They came into the hands of the Corporation some thirty years ago, when the annual output was about 20 million cubic feet. The capital value of the undertaking now, after all these years, was only £8700 more. This was very good business indeed. As an industrial concern, there was nothing in Alloa that gave a better return than the gas-works. The visitors might think they were in the midst of the coalfield; but nine-tenths of their whole supply of coal was brought to them by rail. They had always endeavoured to write off their capital. About fifteen years ago they spent £5000 on cookers, and in ten years they wrote all this off. Their sinking fund, and the method they had adopted with it, had been very satisfactory. There was one thing, however, which they had been afflicted with during the last two or three years, and that was the electric light. They had had upon this a deficit of nearly £5000 a year. The Council had now arranged with the Electric Plant Company to break their agreement, pay them an indemnity, and take over the lighting. They had resolved to put down plant of their own, and to supply electric current direct; and he had no doubt that in a few years' time, from their method of writing off value, they would be able not only to show a clear asset, but to make a profit. The output of gas in Alloa—121 million cubic feet—was very large for the population, which numbered only 12,000; but they must remember that they were in a centre of industry, and also that there was a great deal of gas consumed by those who used it for power. They supplied gas for this purpose at 1s. 6d. per 1000 cubic feet, which induced the use of gas, and also helped to keep out suction-gas plant.

Mr. NAPIER expressed his pleasure at having the Association of Junior Gas Managers at Alloa. It was a great benefit indeed to the younger generation of managers to go about visiting works, thereby creating in their minds a wider and a fuller knowledge of their profession. Mr. Mitchell had done well in paying a tribute to the Corporation management of the gas undertaking; but there was one aspect of Town Council management in Alloa as regarded gas affairs of which he wished to speak well. This had reference to the disposal of their profits. Some corporations, more particularly in England, had brought a considerable amount of calumny and guilt upon their heads by using the profits from the gas-works in reducing the rates. He was a strict and strong opponent of taking any profits whatever from the gas department for helping the rates; and the Town Council of Alloa had shown great wisdom in not doing so. If it were wished to confer an advantage, it could very well be done by reducing the rate charged for public streetlighting. In Alloa they had reduced the rate for public lighting by 3d. per 1000 cubic feet. By the method he recommended, there would be the further advantage to the gas undertaking that it would place it in a stronger position, from a

competitive point of view. In Alloa, they had a very large consumption of gas for their population; and it had undoubtedly arisen from the very low price of gas for some years past, and from the advantages they had given in connection with the use of cookers. They had 4300 consumers, and no less than 2300 of them were on their books as having cooking appliances of one kind or another. As regarded power purposes, they had reduced their rate, and had thereby obtained a very considerable increase—from 16 to 20 million cubic feet, or about 16 per cent. of the total. They might be said to have absorbed to a considerable degree the possible consumption of gas; but the Gas Committee were in negotiation with two railway companies with regard to a supply for lighting railway carriages, and they hoped to be able to come to terms with them. The system that would probably be adopted would be that the railway companies would send their tank-waggons to have gas pumped into them, under a pressure of 100 lbs. per square inch. It was exceedingly interesting to know this, because it showed that coal gas was going to have a further use as regarded the lighting of railway trains. He perhaps ought to mention that the annual consumption of gas in Alloa, per ordinary consumer, was 28,600 cubic feet; per slot-meter consumer, 15,600 cubic feet; and per gas-engine, no less than 196,000 cubic feet. Mr. Napier referred to the following table as illustrating the progress of the gas undertaking:—

Capital Expenditure.

Year.	Total Capital Expenditure.	Gas Made.	Capital per Million Cubic Feet of Gas Made.	Capital per 1000 Cubic Feet of Gas Made.	Total Capital Charges (Interest and Sinking Funds).	
					Amount.	Per 1000 Cubic Feet Made.
	£	Cubic Feet.	£ s. d.	s. d.	£ s. d.	
1902	32,241	88,602,200	364 0 0	7 5'33	2073 3 9	5'61
1903	31,966	97,040,400	329 10 0	6 7	2348 9 8	5'79
1904	32,391	96,377,700	336 2 0	6 8'60	2510 11 7	6'24
1905	33,466	102,297,500	327 3 0	6 6'50	2696 9 9	6 30
1906	36,291	109,757,100	331 5 0	6 7'30	2809 9 6	6'14
1907	36,356	114,558,300	317 7 6	6 4'10	3106 3 0	6'51
1908	35,681	118,195,300	301 17 7	6 0	3198 19 8	6'50
1909	33,706	120,978,500	278 12 3	5 6'80	3168 0 7	6'28

In conclusion, he remarked that they were very well off indeed as regarded obtaining the largest possible return for their capital outlay; and he wished to say, as an official of the burgh of Alloa, how well treated he was, and always had been, by his Committee. They worked on quiet lines—those which, he believed, made for the best results.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Members of the Yorkshire Junior Gas Association gathered in goodly numbers on Saturday, at Bradford, to a meeting the character of which was an experiment by the Council.

Seeing that the main purpose of a Junior Association is purely educational, and that therefore it is not only possible but most desirable that well-known and even threadbare topics should be handled, it was decided to make the meeting a private and non-reported one. It was hoped that under these circumstances a freedom in question-putting and answering would be indulged in which could hardly be hoped for in the blaze of full publicity, and that more retiring and reticent members would be thus induced to come forward to the help of their comrades. Confidence thus attained after initial breakings of the ice, might eventually show itself on full-dress occasions in the shape of speeches or papers prepared for publication. Then, as juniors have in many cases gained all their experience on one works, the source of their knowledge can thus be identified, and some gas organizations therefore view the public utterances of the junior members of their staffs with no large amount of favour. The discretion thus implicitly imposed finds its readiest realization in silence. At the same time it must be acknowledged that the work of the various Junior Associations has justified the general approval, interest, and help that they have received. The work would have been in the main impossible but for the friendliness and assistance of the Press and of the gas engineers of the country; and this has been repaid, at least partly, in judicious reticence on the private details of the gas-works represented, and the sterling merit and value of the contributions submitted at the meetings.

Still in many cases members have longed for the greater freedom and the wider opportunities of gaining and giving help that more private meetings would afford. It has been pointed out, for example, that most have had experience of sudden emergencies and difficulties that had to be promptly met, with perhaps limited or even meagre appliances. How crises were tided over might prove ultimately of great value to others who hear of them; but in many cases those concerned would show hesitation in pouring their troubles into everybody's ears through a press report.

Though such semi-private meetings with the usual regulation of debate greatly relaxed need not be regarded as a normal meeting of Junior Associations, it was felt that, as a possible new means

of increasing their usefulness, the experiment was well worth trying. On the present occasion, these expectations were fully realized. Under the somewhat informal conditions prevailing, the time passed quickly; contributions flowed freely; and the members finally expressed themselves as greatly profiting by what they had heard.

One of the members gave an explanation and demonstration of the Orsat gas analysis apparatus, followed by discussion and questions. Then followed discussions on "How and Where to Introduce Air for Oxide Revivification *in Situ*" and "The Conditions of the Official Testing of Meters." Each was introduced by a short paper and was freely discussed. One, at least, of these contributions is, by request of the members present, to be expanded to a full paper for publication in the near future. The meeting ultimately closed by lapse of time, and not by any exhaustion of interest or supply of speakers.

NEW GAS-WORKS PROJECTED FOR THE SUBURBS OF VIENNA.

The Corporation of the City of Vienna have recently invited tenders for the supply of the plant required for the new gas-works to be constructed at Leopoldau. The works will take over the supply of gas to the suburban districts of Vienna now supplied by the Imperial Continental Gas Association.

For the carbonizing plant needed, four firms tendered; and the tender of the firm of H. Koppers, of Essen, and their co-adjustors the West Bohemian Fire-Clay and Kaolin Works, has been accepted. It is for an installation of horizontal carbonizing chambers or ovens, with regenerative furnaces and central producers, of a total productive capacity of 7,400,000 cubic feet of coal gas per diem. The plant is to be equipped with special arrangements for the very thorough extraction of dust from the producer gas with a view to avoiding the injurious effects (specially noticeable with the coals commonly carbonized in Vienna) of the blown dust on the brickwork of the setting. The cleaning of the producer gas will also render it available for use in gas-engines for driving apparatus on the works. The amount of the tender is £136,800. The Contractors guarantee a make of gas equivalent to 11,483 cubic feet, at 60° Fahr., 30 inches barometer, and saturated, per ton of coal, working with a positive pressure of 7.9 inches of water. The average gross calorific power of the gas to be not less than 570 B.Th.U. per cubic foot. If the coal used contains more than 8 per cent. of ash, a corresponding deduction is to be allowed from the guaranteed make of gas. The fuel consumed in heating—reckoned in terms of dry coke containing not more than 11.4 per cent. of ash—is guaranteed not to exceed 12 per cent. of the weight of coal carbonized, inclusive of coke consumed in producing the steam required in the producers and for the power for operating the dust-extracting plant.

A similar plant, of a productive capacity of 1,765,000 cubic feet per diem, will come into operation at the Corporation gas-works at Simmering (Vienna) by the autumn of next year. Four Beale exhausters, each of a capacity of 210,000 cubic feet per hour, driven by steam-engines, are being supplied to the new Leopoldau works by the Berlin-Anhalt Engineering Company, and two station governors by the firm of Franz Manoschek, of Vienna.

Placing Landing-Blocks under an Old Gasholder.

Our readers are aware that one of the features of meetings of Gas Associations on the other side of the Atlantic is the presentation by various members of a number of useful hints, called "Wrinkles." One submitted at the last annual meeting of the American Gas Institute was by Mr. V. L. Elbert, the Works Superintendent of the St. Paul Gas Company, who described to his colleagues how he raised the inner lift of an old gasholder (let down for the insertion of an additional inlet-pipe) in order to place new rest-stones in position and raise the centre pier. The method adopted was as follows: The holder and tank had been thoroughly ventilated; and after work had been completed on the new inlet-pipe, water to the depth of a foot was run into the tank. Three men entered through the manhole, and a manhole cover of wood, with a heavy light of glass, was placed on the opening and bolted down in place of the regular manhole cover. A $\frac{3}{4}$ -inch hose was connected to the crown sheet on the under side to a $\frac{3}{4}$ -inch pipe nipple through the sheet, and a hose with a valve attached to the same nipple on the outside of the crown sheet, which answered as a speaking-tube communicating with men inside. Air was then pumped into the holder with a small plunger air-pump, connected to a 3-inch flange on the crown of the holder; and when the holder was at the proper height, the landing-stones were placed on beds of dry concrete mortar, and levelled from the water level in the pit. The glass in the manhole furnished enough light to get round in the pit; electric flashlights being used to furnish light to do the work. The job was all completed in $3\frac{1}{2}$ hours from the time the men entered to their exit from the holder, with no evil effects whatever. The glass cover could have been broken for the quick release of the men had they desired it.

REGISTER OF PATENTS.

Purification of Ammonia Spent Liquor.

RADCLIFFE, J., of East Barnet.

No. 16,924; Aug. 12, 1908.

In the course of his specification, the patentee says: It is well known that ammonia spent liquor, which consists of water containing in solution lime and its compounds, organic matter in various conditions—notably phenols, cyanogen compounds, and other bodies—is a waste substance for which it is difficult to find a use, and that it constitutes a nuisance in that it cannot be disposed of without injuriously affecting sewage treatment, or water courses and the like, wherever its ultimate destination may be. Further, the water, were it not contaminated, would be of value for steam raising and other purposes. Certain previous inventions have had as their object the purification of ammonia spent liquor in order to permit of its discharge to sewers without harmful effect, and which inventions have been successful. It has also previously been proposed to treat ammonia spent liquor in order to allow of its use for steam raising; but the methods adopted for this purpose have been expensive. It has not, however, hitherto been proposed to remove from ammonia spent liquor phenoloids—phenols, cresols, tar acids, and the like—and the present invention has for its object the removal of such bodies in a simple and inexpensive way; the process being such that cyanogen compounds can be removed at the same time. Valuable bye-products constituting actual impurities of the liquor are thus removed, and may be recovered by condensation or otherwise.

It is well known, he continues, that, upon the acidification of alkaline solutions of phenoloids, the phenoloids are liberated; and he takes advantage of this in carrying out his invention, according to which the removal of the phenoloids and cyanogen compounds from ammonia spent liquor is effected by acidifying the liquor by streams of gases or by strong acid, or a combination of the two. The impurities liberated are, in either case, carried away by intimate contact and/or repeated treatment with gases which need not necessarily be those used for acidifying the liquor. To promote the removal of the liberated impurities, it is preferable that the gases should be hot.

The most convenient gases to employ consist of carbonic acid combustion gases, and the like, as these are easily obtained hot, with the advantage that lime is precipitated, as is well known. Gases of this character may be used solely for acidification, and the liberated impurities carried away by a stream of inert gases, preferably hot, such as air, or a mixture of air and steam; or a strong acid alone may be used for acidification, or a combination of a strong acid and an acidifying gas. It is not advisable to employ reducing gases—for example, sulphurous acid—as by so doing the oxygen absorption test would be raised, and the reduction of this test is one of the principal effects of the treatment forming the subject of this invention.

It is advisable that the materials employed (principally strong acid and waste liquor) should be added in the proper proportions continuously and with regularity, as may be done by known means.

It is obvious that while carbonic acid will liberate only phenoloids, a strong acid, such as sulphuric acid, will liberate not only these bodies but gaseous compounds of cyanogen as well.

The repeated treatment and intimate contact, or a combination of both, may be effected by means of apparatus consisting of a series of scrubbers, or of one scrubber, arranged so that the liquor may successively pass through one or the series, or apparatus may be provided for successive treatment similar in ambit to that of the ordinary ammonia still. If scrubbers are used, it is advisable to have them standing in a tank, or arranged so that the tank bottom is some distance below the liquor level sealing the scrubber, so that the precipitate of carbonate of lime formed where combustion gases are used may fall away without choking the liquor outlets. The liquor may be sprayed or broken up by splash bars, and, if desired, atomizing by a jet of air may be employed.

The liquor, after purification, may be used for coke quenching, steam raising, scrubbing, and other purposes, or it may be treated in any other way. The exit gases may be condensed or otherwise treated for the recovery of bye-products.

Controlling Devices for Lighting Systems.

ANDERSON, D., of Farringdon Road, E.C.

No. 24,246; Nov. 11, 1908; No. 10,706; May 5, 1909.

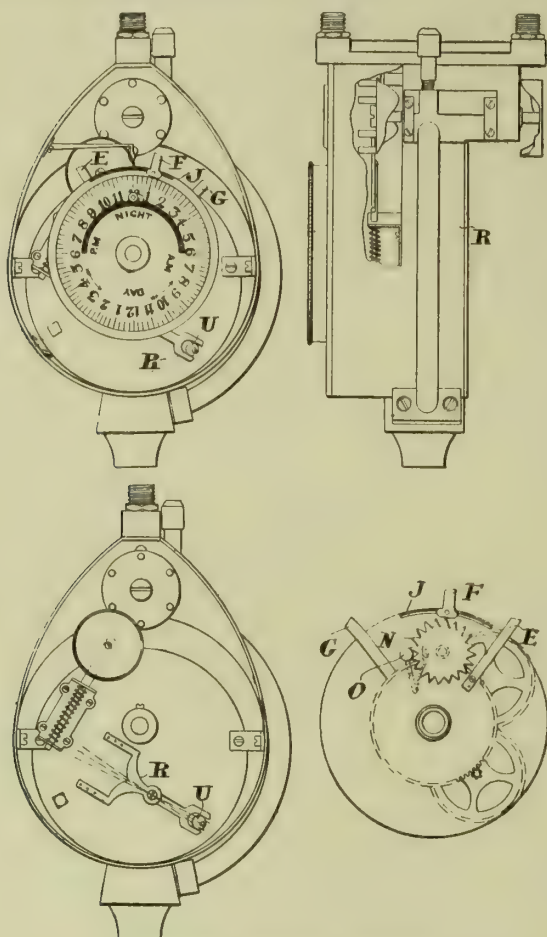
This invention relates to means whereby the lighting system may, at predetermined periods, be automatically adjusted to suit certain temporary requirements, and more particularly to devices of the type indicated in patent No. 27,849 of 1904.

The illustration (p. 756) represents one form of apparatus according to the invention—in front elevation, with the front cover removed; side view, with a portion of the casing broken away to show the fluid control valve; and front elevation of the controller, with the dial and tappet adjusting mechanism removed.

Where it is desired to control two burners in such a manner that, at a predetermined time, both shall be lit, at another time one of the two shall be extinguished, and at another later period the remaining light shall be extinguished, the mechanism employed may be an ordinary eight-day clock movement. On the main arbor (which revolves once in 24 hours) are mounted the dial and timing tappets E, F, and G. Behind the dial is a disc (also mounted on the arbor) having a slot J cut through it at a short distance from its circumference, and parallel to it, and within which at any place the tappet F, which extends beyond the disc and is provided with a set-screw, may be clamped. The slot extends over some three or four hours range on the dial face—this particular tappet being the one whose function it is to extinguish one set of lights; this period of three or four hours being the normal range within which such a function is to be performed.

The two other tappets, E and G, extending beyond the circumference of the disc, are mounted upon sleeves on the arbor at the back of the

disc, and are connected to one another through a train of gearing, one member of which carries a star-wheel N, provided with a click O to prevent vibration from causing it gradually to turn when not desired. The axis of the wheel N is extended to pass through the disc and clock dial, and has a squared end with which a watch key may be engaged, as desired. Each of the two adjustable tappets E G may have at its outer extremity a member having a slot concentric with the disc and having a tappet and set-screw engaging with them—thus allowing of adjustment of one of the tappets without the other, or one of them relatively to the other without using the train of gearing.



Anderson's Lighting Controller.

This whole mechanism, being upon the back of the dial and facing in an opposite direction, will, it is evident, travel over the face of the casing in which is placed the clockwork, and from which the main arbor projects. Upon the face of the casing is provided a forked member R, the distance between the two prongs of which is greater than the diameter of the wheel N. The fork is pivoted about the shank; and its further extremity is also forked to co-act with a cam U, whereby the pins upon the prong of the fork may be caused to bear upon either one side or the other of the wheel N, as it is brought round by the rotation of the disc, or the fork may be maintained in a neutral inoperative position. The cam U may either be actuated by hand, as desired, or it may be automatically actuated by a cam surface on a gear wheel operated by the clock train.

The controller operates as follows: The central tappet F having been set opposite the hour on a clock dial at which it is desired to extinguish one of the two burners of the system, and the other two tappets E and G having been set to the hours at which it is desired to light the burners or totally extinguish them, the clock dial is moved until the hour of the day at which the setting is being performed is opposite to a finger A on the casing, when it is rigidly clamped to the arbor of the clockwork and commences to rotate with it. By means of the forked member, once in every rotation of the dial, the star wheel N co-acts with the pins on one prong of the fork, and according to the side of the wheel N with which the pins co-act, the tappets are relatively brought together or separated from one another by a certain amount—every pin producing a movement of one tooth of the wheel. For example, a movement of one tooth may represent an increase of half-a-minute between the lighting up and extinguishing times. By this means there is provided an arrangement in which the daily increase or decrease in the length of daylight is compensated, and, according as this is on the increase or decrease, so the pins are caused to act on one side or the other by the cam on the year wheel, when this form is used, or by a hand adjustment of the cam U every six months when hand means are provided.

Controlling the Supply of Gas to Recording Calorimeters.

PARKINSON AND W. & B. COWAN, LIMITED, of Birmingham, and BEASLEY, F. G., of Smethwick.

No. 27,981; Dec. 23, 1908.

This invention relates to means for supplying gas to registering gas calorimeters and other instruments for standardizing, testing, and other scientific purposes, where it is essential for the supply to be absolutely constant and invariable in quantity. Reference to the arrangement was made in the "JOURNAL" for Sept. 21, p. 758.

For instance, the patentees in their specification write, to enable the

calorific value of a given gas to be ascertained with exactitude by a recording calorimeter, it is essential that an invariable unit quantity (or weight) of the gas should be delivered to the instrument in given unit time, irrespective of variations in temperature and barometric pressure or other disturbing factors; and the principal object of the invention is to provide a gas-controlling or regulating appliance whereby this result may be attained.

This gas-controller, adapted to be interposed between a sensitive pressure-governor connected with the main gas supply and the calorimeter or other instrument—comprises a drum (similar to an ordinary wet gas-meter drum) enclosed in a casing and rotated by the pressure of the gas. The drum is of a capacity suitable for delivering a predetermined number of cubic feet of gas per hour when turning at a certain number of revolutions per hour, and is connected with the regulating or controlling mechanism so as to ensure that it shall pass the metered gas either in constant volume of gas per time unit under all conditions of temperature and barometric pressure, or in absolutely uniform quantity per time unit, irrespective of any slight variations in the pressure of the gas supplied through the governor, or of any changes in the density, temperature, or other physical condition of the gas, or of any slight obstruction from tar or other deposits in the pipes on the delivery side, or other causes.

The governing or controlling of the measuring and delivering drum, as regards the passing of an invariable unit (volume or quantity, as the case may be) in a given unit time, is effected by gearing the drum (which is rotated only by the pressure of the gas) to pendulum or balance-wheel and escapement mechanism. In the case of a pendulum escapement, and when it is desired to deliver constant quantity per time unit as distinct from constant volume, provision is made for automatically altering the swing of the pendulum, and, consequently, the rate of the delivery rotation of the drum, in order to compensate for variations in the density and volume gas under the variations in barometric pressure and temperature.

Further, in order to counteract any intermittency or unsteadiness such as would occur as the consequence of the alternating engagements and disengagements of the escapement pallets and escape-wheel if the drum was geared directly or rigidly on to the controlling movement, the connection between the drum-spindle and the first wheel of the escapement gear train is made through a spring, or other flexible device, tensioned by the initial movement of the drum, and supplies the motive force for driving the escapement under the control of the pendulum. It also admits of the drum continuing to rotate steadily during the instants that the gear train is momentarily arrested by the engagement of an escapement pallet with the escape-wheel, and which rotation of the drum is transmitted to the spring and utilized to keeping the spring at the proper tension for maintaining a steady impulse on the escape gear, as well as a steady controlling resistance to the rotation of the drum under the driving pressure of the gas.

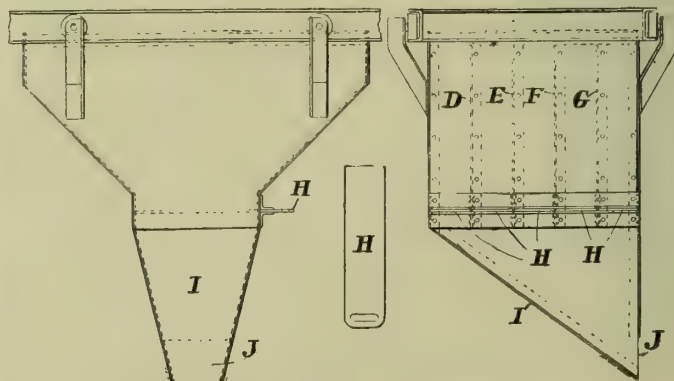
Feeding Measured Quantities of Coal.

DEMPSTER AND SONS, LIMITED, and BROADHEAD, J. W., of Elland.

No. 28,202; Dec. 28, 1908.

The principal object of this invention is to provide a receptacle or magazine for delivering at will a number of successive charges of coal to gas-retorts.

The "magazine" may be in the form of a travelling hopper, the main body of which is divided by partitions, the distance apart of which can be adjustable into a number of compartments each capable of being put into communication with a common outlet by a single slide or door or a separate door to each compartment. The outlet may be in the bottom of the hopper; one side or face being inclined, and the opposite side open. In this construction the slide works horizontally across the hopper—opening first the compartment at one end (say, the end nearest the outlet), then the second compartment, and so on. The amount of movement of the slide corresponding to the complete opening of each compartment is indicated by marks or otherwise, so as to give an external index. On the slide being actuated to open one compartment, the contents of the compartment drop on to the incline and pass out of the opening in the shoot.



Dempster and Broadhead's Coal-Charging Hopper.

Where a separate slide is fitted to each compartment, the quantity delivered can be regulated by pulling the door open (say) only half way. The contents will then run from the outlet until the angle of repose of the material is reached; leaving a portion of the contents on the partly-opened slide door.

The body of the hopper, shown provided with wheels running on rails, is divided by vertical partitions D, E, F, G into five open-topped compartments, each normally closed at the bottom by a horizontal slide H. The withdrawal of one of the slides allows the contents of the compartment to fall on to the inclined bottom I of the hopper and pass to the outlet J. In charging the hopper from a central position above, the outer compartments might receive a smaller quantity of

the material fed than the central one. In order to obviate this, the outer partitions may be inclined towards the centre—that is, they may be set on radial lines from an imaginary point above the hopper, so as to equalize the charge. This, however, is said not to be essential, as a slight movement of the travelling hopper during feeding will effect the same purpose.

Liquefaction of Illuminating Gas by Pressure.

BLAU, H., of Augsburg, Germany.

No. 2292; Jan. 30, 1909. Date claimed under International Convention, Jan. 31, 1908.

This invention relates to the liquefying, by pressure, of gases distilled from oils, shales, brown coal, and other bituminous materials; and its object is to remove from the mixture, during the liquefying process, hydrocarbons which boil between 30° and 100° C., and which, if present in the mixture after the liquefaction, do not revert to the gaseous state when the liquid is exposed to atmospheric pressure, or pressure slightly above atmospheric pressure. These hydrocarbons have heretofore been separated, prior to the liquefaction of the gaseous mixture by pressure, by cooling the mixture at normal pressure to a temperature of -10° or -20° C., whereby the hydrocarbons are liquefied, and thus separated from the more permanent gases in the mixture.

According to the present invention, however, the separation is effected without cooling the mixture below normal temperature, and in the course of the operation of liquefaction by pressure. For this purpose, the compression of the mixture (during which the gases are kept at normal temperature by cooling with water, as heretofore), is in the first instance carried to a pressure of approximately 20 or 30 atmospheres. At this pressure, the hydrocarbons referred to become liquid, and are separated from the more permanent gases. The latter, with the exception of such constituents as cannot be liquefied at normal temperature, are then liquefied by increasing the pressure to 100 atmospheres, or whatever pressure may be required. Prior to the compression, the gaseous mixture is subjected to the usual cleansing process.

The hydrocarbons liquefied at the pressure of 20 or 30 atmospheres have the property, the patentee states, of dissolving appreciable quantities of the residual gas; and at the pressure referred to, they become supersaturated with such gas. In order to recover the dissolved gas, the supersaturated liquid hydrocarbons are conducted to a chamber communicating with the suction-conduit of the compressor by which the illuminating gas is compressed. By this means, the dissolved gas is liberated and returned to the compressor.

Treatment of Tar.

COULSON, S. G., of Rotherham.

No. 7427; March 27, 1909.

This invention has for its object to render the tar "more remunerative to the producer by providing an economical process which is

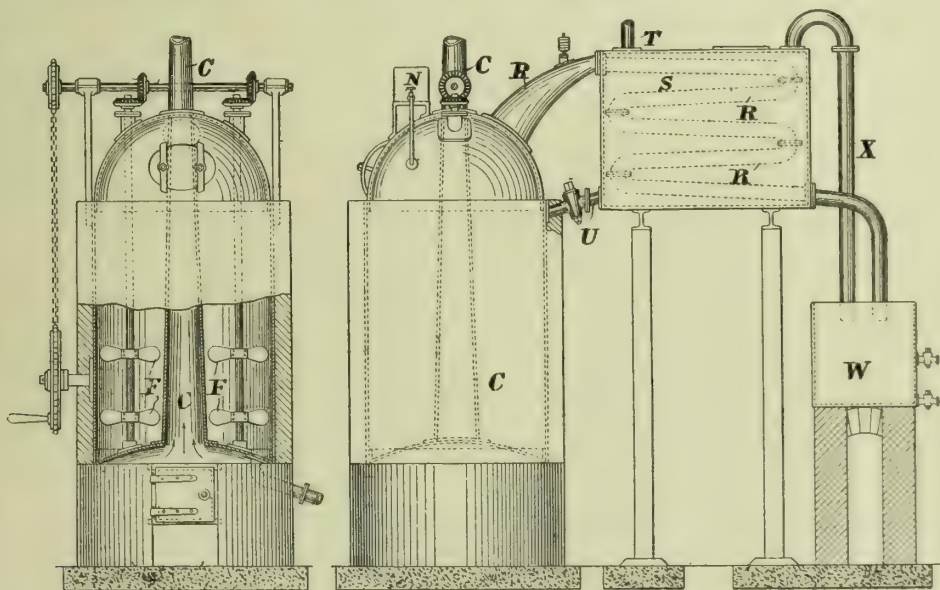
carried out in apparatus of simple form." It has been previously proposed, the patentee states, to solidify tar by the addition to it or admixture with it in an open vessel of sulphuric acid; but the "comparatively large quantities (such as 3 to 7 per cent.) of acid necessary render the process so costly as to prohibit commercial success; and it has been found that the process can only be successfully performed in a closed vessel owing to the sulphurous fumes which are given off." It has also been proposed to treat tar in a single closed vessel for enriching it by the addition of large quantities of sulphuric acid—viz., not less than 10 per cent.

The present invention comprises an improvement in the sulphuric acid process which is carried out in closed distilling and treatment apparatus whereby two operations may be carried out therein—that is to say, first, the simple distillation, and, secondly, where steam is not available, an operation in which the raw tar is run into the still and heated, and the volatile matter—such as naphtha, light oils, and creosote oils (say) those passing over up to about 270° C.—taken off (in ordinary distillation steam is now necessary to assist in passing over the anthracene oils having a distilling point of from 270° to 360° C.); the remaining material being a semi-pitch, to which is added, while still in the closed still, 1 to 2 per cent. by weight of sulphuric acid—the whole being thoroughly mixed by stirring. The product may now be run off into the cooling chamber or pitch-bay, and, when cold, will be quite hard.

The volatile matter passes over at about these temperatures: Light naphtha, 0° to 110° C.; light oils, 110° to 170° C.; carbolic oils, 170° to 225° C.; creosote oils, 225° C. to 270° C.; anthracene oils, 270° to 360° C. The changing points, however, vary with different tars; and thus it is said to be necessary to make an analysis of the tar in order to ascertain at what point it would be advisable to change in order to get the best yield of each product. Even a tar obtained from the same source will vary greatly from time to time.

Suitable apparatus for carrying out the process is shown. It comprises the still proper enclosed to the desired extent by brickwork and provided at its base with a suitable furnace from which leads a central stack or uptake C passing upwards through the domed cover. Within the still is an agitating or mixing mechanism, consisting of paddles or vanes F mounted on vertical shafts extending upwards through the cover, and rotatable by bevel gear, chain and sprocket gear, or other convenient manner. At the base of the still is the pitch outlet provided with a cock (not shown). The stirring mechanism is necessary when the acid described is being used, but may be dispensed with when simple distillation is being carried out. For the acid, a container N is mounted above the cover and provided with a discharge pipe having a cock, so that the acid may be admitted to the still in the quantities desired.

The vapour pipe R, zig-zag in shape, is connected with the dome of the still near to the internal stack; and the zig-zag portion passes through an auxiliary tank or vessel S containing coal tar, which serves as a condenser, into a receiver W. The vessel S is preferably of the same capacity as the still; and the tar is led to it through the pipe T.



Coulson's Tar-Still.

The vessel acts as a condenser, and simultaneously the vapour imparts its heat to the contents. When the treatment and distillation in the still are completed, the heated tar from the vessel is run into the still through the pipe U—thus "rendering the process substantially continuous, and effecting considerable economy in the cost of fuel." The water, naphtha, and other volatile constituents are driven off through the pipe X into the receiver W, which is provided with cocks at different levels for drawing off the contents of different densities.

Incandescence Mantles.

BAGRACHOW, G., of Paris.

No. 5598; March 8, 1909.

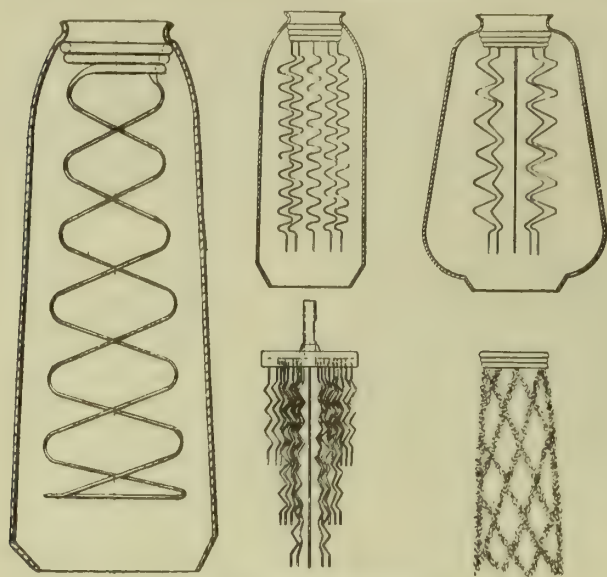
This incandescence mantle consists of a framework of filaments or pieces of quartz (rock crystal or silica) with which has been incorporated rare earths.

It has hitherto been suggested, the patentee points out, to coat filaments of incandescent media with a pulverulent layer of incandescing substance by repeatedly immersing it in a solution of salts, and raising it to incandescence after each immersion. It has been found, however, that by this process the oxides "do not firmly adhere to the filaments."

To obviate this, according to the present invention, the filaments are repeatedly softened by heat and then dipped, while hot, into a solution of rare earths after each softening, "whereby the latter become incorporated with the filaments"—the process being repeated until a sufficiently thick coating is deposited on the filaments.

The mantles illustrated are formed of filaments of quartz drawn out according to a variety of forms, and attached to a disc of glass or of quartz; and the disc can, in turn, be attached to the upper part of a protective chimney, or to a wide vessel of quartz or glass. The disc can also be provided with radial projections, in order to place it simply upon the upper edge of a chimney (waved or straight). The disc can, moreover, be in one piece, with a projection which permits of suspending the mantle in the usual manner from a hook fixed to the burner. In any case, it is cut out or has perforations for the free passage of the combustion gases.

When the model of the mantle is finished—that is, when the filaments of quartz in their final shape are secured to the disc—the mantle is heated in the flame of a bunsen burner for ordinary gas, or of a furnace with gas under air pressure, and is then plunged into a solution of rare earths. These rare earths are the same as those used for ordinary incandescence mantles made of thread, &c.; but in order that an incorporation may take place of the rare earths with the quartz, it



Bagrachow's Quartz Mantles.

is necessary to make use of solutions in amyllic alcohol, ether, &c. A suitable solution (preferably employed) is one made with alcohol of high strength—70° to 90° Beaume. This produces upon the quartz filaments of a rough coating more or less pronounced. The roughness is obtained gradually by plunging the filaments in the bath of rare earths and returning them to the flame of the heating burner. The oftener the filament is dipped and reheated, the rougher it becomes. These roughnesses are said to produce "a dazzling light, even when in the mild bunsen flame." By drawing out quartz softened by the heat, and dipping it in the bath of rare earths, it is said that "one can arrive also at the incorporation of the rare earths," and "filaments are thus obtained which give a fine incandescence and which can be compared to those of the electric lamps."

Mantles constructed in this way, it is claimed, possess various important advantages: "They are very little fragile, and do not run the risk of breakage at the least shock like ordinary mantles; they are capable of being mended—in fact, one can replace broken filaments by other filaments; one can also repair a damaged mantle—proceeding by a succession of heating operations whereby the filaments are alternately heated and dipped in the bath of rare earths."

APPLICATIONS FOR LETTERS PATENT.

- 27,589.—WANGELIN, F. G., "Water supply pipes." Nov. 26.
 27,611.—BADCOCK, E. B., "Internal-combustion pumps." Nov. 27.
 27,625.—BARNETT, H., "Compressing gas or air for lighting purposes." Nov. 27.
 27,678.—LONG, F. C., and ST. STEPHENS, R. DE H., "Temperature-indicating apparatus." Nov. 27.
 27,704.—BROOK, F. H., "Valves and cocks." Nov. 29.
 27,720.—AULD, J., "Stop-valves." Nov. 29.
 27,733.—STEPHENS, R. H., "Inverted burner." Nov. 29.
 27,744.—GRATIEUX, F., "Flexible gas-tubes." Nov. 29.
 27,745.—THOMAS, J., "Gas lamps and burners." Nov. 29.
 27,778.—RICHARDSON, J. S., "Regulator." Nov. 29.
 27,797.—STONE, J., and CO., LTD., and JAKEMAN, G. E., "Cocks and valves." Nov. 29.
 27,812.—ADAMSON, R. A., "Cleaning mains." Nov. 29.
 27,828.—PRINGLE, R. W., and RICHARDS, L. S., "Carbonization of coal." Nov. 29.
 27,835.—NOAKES, H. W., "Mantle support." Nov. 29.
 27,866.—ROSE, A., and BELLAMY, W., "Incandescent burners." Nov. 30.
 27,868.—ROSE, A., and BELLAMY, W., "Inverted burners." Nov. 30.
 27,869.—SÜSSMANN, H., "Incandescent burner." Nov. 30.
 27,872.—LAYCOCK, T., "Globes and holders." Nov. 30.
 27,918.—BOWEN, J., "Cocks and valves." Nov. 30.
 27,919.—OFENBAU, G. M. B. H., "Closing retorts." Nov. 30.
 27,921.—CLARK, F. & F. W., "Conveying coke." Nov. 30.
 27,945.—CARS, B., "Globes." Nov. 30.
 27,952.—DETERDING, C. A. G., "Acetylene inverted burner." Nov. 30.
 27,967.—HOARE, G. C., and ACKLAND, T., "Stopcocks and valves." Nov. 30.
 27,991.—DAVIES, W. W., "Taps or valves." Dec. 1.
 28,003.—GIBBONS BROS., LTD., and GREEN, G. W., "Charging gas-retorts." Dec. 1.
 28,027.—OFENBAU, G. M. B. H., "Closing retorts." Dec. 1.
 28,041.—CHRIMES, C. E., and WOOLHOUSE, A. F., "Liquid-meters." Dec. 1.
 28,054.—MOORES, W. G., "Purifying gas." Dec. 1.
 28,055.—MOORES, W. G., "Making gas from oils." Dec. 1.
 28,086.—GIBBS, C., "Gas fire-lighter." Dec. 2.
 28,095.—SHAW, A., "Blowers and exhausters." Dec. 2.
 28,111.—MASON, J., and MASTERS, R., "Lubricating gas-exhausters." Dec. 2.
 28,218.—NIESER, E., and PALESCHOWSKY, J., "Atmospheric burners." Dec. 3.
 28,318.—WALKER, W., "Rotary engine or blower." Dec. 4.
 28,329.—M'KENZIE, J., and RICHARDSON, H., "Vertical chambers used in connection with water and other mains and branches in roadways." Dec. 4.
 28,364.—RADCLIFFE, J., "Purification of ammonia waste liquid." Dec. 4.
 28,366.—ANDERSON, D., "Gas-lamps." Dec. 4.
 28,370.—MARTIN, A., "Gas-heated radiators." Dec. 4.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Supply of Gas at High Pressure.

SIR,—The interesting paper read by Mr. S. R. Barrett, and your editorial remarks on high-pressure gas [Nov. 30], recall some notes I published in 1902 relative to this subject. I then wrote as follows:—

HIGH-PRESSURE GAS.

I am confident there is much room left for improvement in the matter of distribution of gas. The day will come when high-pressure gas will be distributed through small and sound mains, instead of large and leaky ones. Even now it is not uncommon to meet with a gas company whose "unaccounted-for gas" is from 15 to 20 per cent. of the make. If it be as little as 5 per cent., we rejoice; but I hope we shall see the day when it will be reduced to less than 1 per cent., and when a satisfactory system of occasionally testing all mains and services will be adopted.

We all see that high-pressure gas-mains are being introduced in America—somewhat restricted at present, but capable of more all-round treatment. They have proved successful. Why not? What can be done with steam in this way, can be better done with gas.

High-pressure gas, however, is useless unless you have sound mains and services to convey it, and proper means of regulating its delivery to the consumers. The latter difficulty could be met by consumers' governors, or perhaps better by special burners.

While speaking of high-pressure gas, I have often thought that the time will come when gas will be both purified and stored at high pressure. We have got so into the habit of thinking that, to deal with gas in the process of purification, it is necessary that it should be in a highly-expanded condition, that the bare suggestion of purifying compressed gas comes as a shock to the nerves. But time will prove. Gas, like electricity, is yet in its infancy—at any rate, so far as its economic handling and delivery are concerned.

At the time the above notes were written, I do not think there was a single high-pressure gas supply in the country. Nor was there anything of the kind on the Continent. The United States alone had moved in this direction; and that to a very small extent indeed.

Five years before this—viz., in 1897—I suggested the adoption of a high-pressure main to the Bournemouth Gas Company; but it was not then adopted.

Since 1902, considerable strides have been made; but it is my firm belief that the practice of high-pressure gas supply will be extended later on, almost to the exclusion of every low-pressure supply.

All bulky old mains will be abolished, and steel mains of small diameter substituted for them. The chief thing now standing in the way of this is the mass of capital buried in underground cast-iron pipes. Unfortunately, the joints of such pipes are for the most part unfitted for resisting anything approaching high pressure.

The supply of high-pressure gas by the Birmingham Corporation, as described by Mr. Barrett, is at present only an appendage to the ordinary supply. The experience gained with this may probably lead to the more general application and use of high-pressure gas in this country, until eventually low-pressure gas may be discarded altogether.

71, King William Street, E.C., Dec. 6, 1909.

F. S. CRIPPS.

LEGAL INTELLIGENCE.

THE WELSBACH COMPANY'S TRADE MARK.

Clerkenwell Police Court.—Saturday, Dec. 11.

(Before Mr. BROS.)

The proceedings taken against the Welsbach Incandescent Gaslight Company, Limited, by the Wolfram (Tungsten) Metal Filament Lamps, Limited, for selling and exposing for sale goods to which, as was alleged, a false trade description had been applied (see *ante*, p. 628, and preceding issues of the "JOURNAL"), were brought to a close last Saturday by the withdrawal of the summonses.

Mr. RUFUS ISAACS, K.C. (who with Mr. H. A. COLEFAX and Mr. ERNEST LUNGE appeared in support of the summonses), said he had had an opportunity of discussing the matter with Mr. Walter; and he proposed to take a course which he hoped would meet with his Worship's approval, and would be considered proper in the circumstances, having regard to the investigation which had already taken place. They had realized that it must necessarily be, and had already been, a long, protracted, and expensive inquiry, and that between firms such as he represented, and that represented by his friend, there ought to be some means of arriving at a settlement of a dispute of the present character, so that they might avoid the necessity of continuing the proceedings. He was glad to say they had been able to reach a point at which it became useless to continue the investigation there, or to ask for any judgment from his Worship. His friend would state that Dr. Auer von Welsbach was not the inventor of the electric lamps sold by the Welsbach Company, and that those advertised by them were not the lamps made by the German Auer Company. He accepted without reserve the statement that Mr. Walter had made to him to the effect that the defendant Company had no intention of misleading any persons by the advertisement they issued, and that they did not intend to lead the

readers of that advertisement to believe either that Dr. Auer von Welsbach was the inventor of the lamp, or that it was manufactured by the Auer Company. His friend had also stated that the defendant Company would not again issue the advertisement in the previous form, nor any advertisement containing words calculated to lead persons to believe that Dr. Auer von Welsbach was the inventor, or that the Auer Company were the manufacturers, of the electric lamps they were selling. Accepting these statements, it appeared to him that the proceedings might end by the withdrawal of the summonses.

Mr. A. J. WALTER, K.C. (who with Mr. BODKIN represented the defendants), said he agreed with the remarks Mr. Rufus Isaacs had made, and he desired, on behalf of the Welsbach Company, to state that they had not the smallest intention, in issuing the advertisement complained of, to lead persons to believe that the lamp was the invention of Dr. Auer von Welsbach, or that it was manufactured by the Auer Company. They certainly did not intend to repeat the advertisement. Of course, they would continue to mark their goods with the name "Welsbach," and their trade mark "AUR" would be continued on their lamps.

Mr. BROS said he thought the parties were very wise. Inquiries such as the present must naturally be very expensive. Scientific witnesses and professional men had to be brought there at great expense; and then the inquiry was merely preliminary to another which would have been perhaps even more expensive. The time had not been wasted if it had had the result of the parties coming to an agreement in open Court. He had great satisfaction in knowing that the case was now going to be withdrawn.

Mr. RUFUS ISAACS: All the summonses will be withdrawn, and also the summonses that were pending against Mr. Laurence Fletcher. I accept his statement as to his having no intention to mislead.

The summonses were accordingly withdrawn.

LIQUIDATION OF THE WEST SUBURBAN GAS COMPANY.

In the King's Bench Division of the High Court of Justice, on Monday, Nov. 29, Mr. Justice Phillimore had before him an application by the West Suburban Gaslight and Coke Company, Limited, in liquidation, for the return of the sum of £400 paid by the Liquidator (Mr. A. Edwards) to the Official Receiver as Trustee in bankruptcy of H. P. Bernard, otherwise H. W. Gyde. It will be remembered that Gyde some time ago entered into partnership with Darby as stock-brokers, though, as a matter of fact, they bought up gas properties and floated companies to purchase them, at enhanced prices. On April 27, 1905, a conveyance was executed to Darby and the bankrupt, trading as Darby and Co., which included real estate and various gas plant; and on Aug. 10, 1905, Darby and the bankrupt conveyed the property to the West Suburban Gas Company. In the following year, the Uxbridge Gas Company entered into an agreement to buy up the undertaking of the West Suburban Company; and on Oct. 15, 1906, voluntary winding-up was agreed upon. As the result of arbitration proceedings, the Uxbridge Company had to pay the West Suburban Company £1808 as the price of their undertaking. It was then discovered that the two men were undischarged bankrupts; the Senior Official Receiver being Trustee of Gyde and the Official Receiver at Cardiff being Trustee of Darby. Gyde's Trustee claimed some portion of the purchase price, on the ground that the conveyance included real estate. After considerable negotiation, the value was fixed at £400; and on the 27th of October the conveyance was executed to the Uxbridge Company, who paid the purchase-money. After the conviction of Gyde, the original articles of partnership were discovered, and, following the decision of Mr. Justice Neville in the case of the Kent County Gas Company, application was made for repayment of the £400, on the ground that it had been paid under a mistake in law. For the Official Receiver, it was argued that there was nothing to show that the property was bought out of partnership moneys, and that the circumstances of this case were entirely dissimilar to those of the Kent County Company. Mr. Hansell appeared for the applicant; and Mr. Mellor for the respondent. His Lordship said he was clearly of opinion that this was partnership property, and that the money must be refunded; but the applicant would have to pay the costs of the Official Receiver, as he was responsible for the mistake, and also the sum of £27 15s. 4d. expenses incurred by the Trustee.

Prestatyn Urban District Council and the Gas-Works.—As the result of the parliamentary proceedings in the past session by which the Prestatyn Urban District Council obtained power to purchase the gas-works belonging to Lady M'Laren, an arbitration was held at the Surveyors' Institution on Monday and Tuesday last week to determine the price to be paid. The Arbitrator for the owner was Mr. Corbet Woodall; Mr. E. H. Stevenson acting in a similar capacity for the Council, and Sir Hugh Owen being the Umpire. The purchase price was put on the one side at about £20,000, and on the other at about £6000. At the close of the proceedings, of which a report is unavoidably held over, the Umpire reserved his decision.

Death from Gas Poisoning.—A youth named Walter Stanley Lillicrap, aged 18, was on Thursday morning last found in a water-closet at his parent's house suffering from gas poisoning. A doctor was summoned and artificial respiration was tried, but without result. At the inquest on Friday, it was stated that the deceased was an apprentice in the Royal Dockyard, Devonport, and sat for an examination the three previous days. He had not done so well as he expected, and seemed depressed on Wednesday evening, but was afterwards bright in his manner. He was missing at the usual time for going to work on Thursday, and on the closet being entered he was found lying against the door partly dressed. The gas-tap was turned on; but the father, who made the discovery and turned off the gas, did not know to what extent. It was suggested that the tap might have been left on by accident, and that deceased was overcome by the fumes. The Jury found that death was due to gas poisoning, but that there was not sufficient evidence to show whether it was accidental or otherwise.

MISCELLANEOUS NEWS.

CONTINENTAL UNION GAS COMPANY.

Exceptional and Eventful Year in the History of a Gas Undertaking.

The Ordinary General Meeting of the Company was held last Tuesday, at the London Offices, No. 7, Drapers' Gardens, Throgmorton Street, E.C.—Mr. J. H. BIRCHENOUGH, C.M.G., in the chair.

The SECRETARY (Mr. W. Martin) read the notice calling the meeting; and the Directors' report [*ante*, p. 552] and the statement of accounts were taken as read.

DIRECTORATE CHANGES.

The CHAIRMAN, before commencing his address, apologized for the absence of the late Chairman (Mr. Arthur Lucas), who was confined at home through an attack of influenza. Proceeding to move the adoption of the report and accounts, he first dealt with two points of domestic interest. He said that since the Directors last met the proprietors, Mr. R. Hesketh Jones had, to their regret, resigned his seat upon the Board. Mr. Jones had been a Director for nearly sixteen years; and by his wide experience, his profound interest in the affairs of the Company, his constant willingness to take even more than his share of the work, he made himself a most valued colleague. He felt, however, that the time had come when he ought to lighten his burdens; and the Board failed to convince him of the contrary. They missed, and should continue to miss, his assistance and advice. He (the Chairman) was sure he expressed the feelings of the proprietors, as well as those of the Board, when he said they hoped Mr. Jones might be spared to enjoy many years of lessened anxiety and responsibility. It had not been necessary to fill his place on the Board, because they had already an additional member, and had now returned to their original number. At the end of June, Mr. Lucas resigned the position of Chairman of the Company. He had been a Director for 22 years, and Chairman for nearly eleven years. His years of office had been laborious and eventful ones in the history of the Company. His colleagues knew, and the proprietors knew, how admirably, how devotedly, and how loyally Mr. Lucas had performed his duties. As one of his oldest friends, he might perhaps be allowed to speak with intimate personal knowledge. He knew no man who had more conscientiously fulfilled the duties of Chairman of a public company. Mr. Lucas had never hesitated to sacrifice his time, his convenience, and even his health where the interests of the Company were concerned. He (the Chairman) had only to remind the proprietors, for instance, of his visit to Italy after the great strike in the year 1901, when such a visit involved considerable personal risk, or of the worries which preceded the memorable lawsuit, and the long days of anxiety he passed in Court during the trial of the case he alluded to, to show that he in no way exaggerated. He had accompanied Mr. Lucas upon many visits of inspection to works upon the Continent, and so could speak with confidence of the high respect and regard in which he was held by the foreign staff. All his colleagues would, he knew, unite with him in paying a tribute to the unfailing courtesy and kindness of Mr. Lucas in the chair to each and all of them. They deeply regretted, and he was certain the proprietors shared the regret, that Mr. Lucas should have decided to seek a less onerous position. Though they lost his services as Chairman, he was happy to say he remained a member of the Board, and would, they trusted, continue for many years to give them the advantage of his great knowledge, his wide experience, and his loyal co-operation. His (the Chairman's) colleagues had been good enough to select him to succeed Mr. Lucas. He took the chair at a time of difficulty and some anxiety, but he had already found—as he knew he should find—that he could rely upon the kindness and loyal support of his colleagues. He felt sure he might equally rely upon the proprietors extending to him that indulgence which was never denied by any body of Englishmen to a man who honestly did his best to serve them.

MESSINA EARTHQUAKE—POSITION OF THE GAS-WORKS.

He would pass now to the more general affairs of the Company. The most important event of the year was undoubtedly the great and tragic earthquake which visited Sicily on Dec. 28 last. The details of the appalling catastrophe were no doubt still present to their minds, so he need not enlarge upon them. As soon as the Board heard the news, they asked Mr. Lacombe, the then Agent-General in Italy of the Union des Gaz, and Mr. Morton, the Chief Engineer at Genoa of the same Company, to proceed at once to Messina, in order to carry assistance to their unfortunate employees, and to ascertain the extent of the damage done to the Company's property. With great difficulty, and with considerable danger, they reached Messina, where they found the City in ruins, and a prey to horrors of every kind. The Company's general offices, shop, and manager's house were entirely destroyed; for a church—one of the largest in Messina—had fallen upon them, completely overwhelming them, and burying the Manager (Mr. Ruggeri), his wife, and daughter, under their ruins. The works (which, as the proprietors were aware, were situated upon the seashore just outside the town) were severely damaged, but by no means destroyed. It was impossible to gauge the actual damage done to the mains and public lamps, because the streets were covered with enormous piles of *débris*; but it was clear that the mains must have suffered severely, because the upheaval was most intense in the centre of the town. As speedily as Mr. Lacombe and Mr. Morton could, they ascertained the extent of the death roll, which, besides the Manager and his family, included the cashier, the storekeeper, and from 30 to 40 workmen. That more of their people had not perished, was due to the fact that the majority of them were off duty, and lived in a poor quarter of the town on high ground, outside the line of the earthquake movement. They found the survivors gathered together in the neighbourhood of the works; and, he need hardly say, terribly demoralized by the dreadful experiences they had passed through. Mr. Lacombe and Mr. Morton at once supplied them with money, and rendered them all the assistance in their power to tide over till a

permanent settlement could be arrived at. A trusty agent was left in charge of the Company's property; and he (the Chairman) was happy to say, he had faithfully performed his duty. They had to thank Mr. Lacombe and Mr. Morton for performing, with great courage and tact, an arduous task, carried out amid scenes calculated to try to the utmost both the nerves and the senses. Many of the Messina employees found their way, with such members of their families as survived, to Genoa and Milan. They were received with the greatest humanity and kindness by the representatives of the Union des Gaz; and, wherever possible, temporary work was found for them. At the suggestion of Mrs. Lucas and Miss Davenport-Hill, a subscription was opened in London—quite apart from the General City Relief Fund; and between £500 and £600 were most generously subscribed by shareholders and friends connected with the gas industry, both at home and abroad. By this means, the refugees were provided with clothing, and were assisted till they could be dealt with through the larger national funds. He took this opportunity of thanking most gratefully all those who so kindly contributed.

FROM THE MESSINA WRECK.

As soon as permission could be obtained from the authorities, their officers endeavoured to rescue from the works stocks of coal, coke, and other residuals. These had been sold. Meters and fittings were sent to Genoa, and were gradually being disposed of. In this way, they were able to secure property to the value of close upon £5000. At a later date, the Board sent a representative to Messina to deal with the claims of their employees and workmen who, under the organico, had rights to gratuities and pensions. He was happy to say that these claims had all been settled upon a basis which, he thought, was quite equitable to both parties. As they had to deal with about 160 persons, the task was necessarily a somewhat complicated one. He understood that many of these people had since emigrated to South America.

PRESENT POSITION—FUTURE AT MESSINA.

He now came to the present position of the undertaking at Messina, with regard to which the proprietors would naturally expect him to give some information. And here he had to deal with two questions—the town arrears and the future of the works. With reference to the first, he might say that, as soon as the Board reasonably could, they sent in a statement of claim to the Royal Commissioner, who, early in the year, took over, and was now exercising, the functions and powers of the Municipality. The proprietors might have seen in the Press that the Italian Government had passed special legislation with regard to the debts of municipalities affected by the earthquake, giving a legal extension of time during which their debts might be liquidated. The Company were, of course, subject to such legislation; and they would be dealt with in the same manner, and upon the same terms as other creditors—neither better nor worse. What these terms were, they did not at present know; but the Directors were taking the best legal advice as to the Company's exact rights, and would defend the interests of the stockholders with the most powerful legal assistance they could obtain in Italy. With regard to the future of the works, he could only make one or two observations. Though nearly a year had elapsed since the earthquake, it was only quite lately that progress of any kind whatever had been made with the rebuilding of the City. The Board were now informed that a beginning had been made of what was practically a new quarter of the town, to the west of the old city, and on the side furthest from the works. This, for the first time, brought the question of their future action into the range of practical politics. Before, however, they could come to a decision, it would be necessary to secure a technical report drawn up upon the spot; and this they were making immediate arrangements to obtain. The position was a complicated and delicate one; and in view of future negotiations, he should prefer to say as little as possible that day. He therefore asked the proprietors not to press for information. They might feel confident that the Directors were fully alive to the duty they owed to the proprietors to find the solution of the question which would leave them the least possible loss.

THE FINANCIAL EFFECT.

While he had no desire to minimize the misfortune which had overtaken the Company at Messina, he was anxious that its effects upon their finances should not be exaggerated. He thought perhaps it had been exaggerated in some quarters. What was the exact position? The undertaking at Messina—including the town debt—represented less than 10 per cent. of the Company's capital. Even supposing it had been wiped clean out (which was certainly not the case), they had against it a reserve of £40,000, a carry-forward of over £12,000, after writing off the sum of £22,000, as mentioned in the report, and further, they had a great reserve, which was not set out in the accounts. He referred to the fact that the Union des Gaz shares were taken at cost; whereas they were quoted in the market at a premium of over 60 per cent. He therefore thought he might claim that there was no need for pessimism. On the other hand, the Board felt that, whatever success might attend their efforts in the proceedings and negotiations he had referred to, there would be a considerable loss; and they believed they would best consult the interests of the proprietors by facing the position frankly and squarely, and that they would have their support in doing so. They had consequently decided to write off at once a first and very considerable instalment from the Messina outlay. As was stated in the report, they had taken £10,000 from the reserve fund (which, at the date of the last balance-sheet, stood at £50,000), and £12,000 from the total of profits available for distribution. By this means they reduced the amount standing to the debit of the Messina outlay from £82,000 to £60,000 odd. In order to effect this result, and to carry forward a slightly larger sum of undivided profits than last year—viz., £12,954, as against £11,126 last year—they were asking the proprietors to reduce the dividend from $\frac{6}{8}$ to 5 per cent. for the year. The Board ventured to think that this policy of looking a loss in the face, and making provision for it, would strengthen the position of the Company, and would meet with approval. ["Hear, hear."]

THE ANNUAL ACCOUNTS.

Looking at the accounts which accompanied the report, and turning to the general revenue account, it would be seen that the management

and general charges amounted to £2711, which was £81 more than in 1908. The actual charges were really less than last year; but, of course, nothing had been debited to Messina as in previous years. He should like to say at this point that both last year and this year the Directors had taken £1000 less in remuneration than they were authorized to take by the Articles of Association. On the other side of the account, the dividends on the Union des Gaz shares held by the Company amounted to £65,937, which showed an increase of £1813—due to the fact that the dividend upon the 4000 new shares was now paid in full. There was rather less for interest this year than last. The balance carried to the net revenue account was £67,098, as against £71,102 last year. Turning to the net revenue account, it would be seen that they had to add to the above figure the amount of £11,126—the balance forward from last year. These together made a total of £78,225. He had already explained that they were taking from this total £12,000 in reduction of the Messina outlay account, so that they were left with £66,225 available for distribution. If the final dividend of $2\frac{1}{2}$ per cent. for the half year was approved, they would, as already mentioned, carry forward £12,954, as against £11,126 last year. Under the circumstances, he thought the proprietors might be fairly satisfied with the position.

AFFAIRS OF THE UNION DES GAZ—NEW WORKS.

And now he would pass to the affairs of the Union des Gaz, in which Company they were so deeply interested. In the way of general information, he had not much to add to the statements in the report. In spite of increasing charges for debenture interest and debenture redemption (which were the necessary concomitants of a constantly developing business), the Union des Gaz had been able to maintain their dividend at 9 per cent., and to carry forward £13,358 to the new account. This was a very satisfactory result of the year's working. There was one point he wished to say a few words about, and that was capital expenditure. It would be noticed that a large sum had been spent at Milan, Genoa, and Strasburg, in all of which towns the business of the Union des Gaz continued to grow. At Milan and Genoa the Company were, as was known to the proprietors, constructing two most important new works; and he wished to point out that any future extensions of these works would be carried out at a much smaller rate of expenditure than was represented by the present initial outlay. When works were designed for a certain number of units, the first unit cost far more than subsequent units, because, at the outset, they had to buy the land, to lay down the connections in the works, to put in the large mains uniting the works with the town, to build gasholders in excess of immediate requirements, offices, &c.; but for subsequent units, a large portion of these charges was saved. Let them take a single example. The Bovisa works at Milan had cost £212,000 for the first unit, which had an output of 21,000,000 cubic metres. The second unit, which was in course of construction, would only cost £60,000 for an output of 27,000,000 cubic metres. He need not labour the point further. It would be seen that they were now entering upon a period of greatly reduced capital expenditure.

THE GREAT STRIKE OF GAS WORKERS IN ITALY.

ECONOMY SHARING REFUSED—REASONS FOR THE STRIKE.

As succinctly as possible, he would now deal with the great strike which was in progress at all the Italian works of the Union des Gaz during almost the whole of the month of November. Labour troubles in Italy had occupied a large place in the Chairman's speech for many years past. Mr. Lucas had from year to year kept the proprietors acquainted with the long struggle which had gone on uninterruptedly—sometimes more or less under the surface, sometimes breaking out into actual strikes, and cessation of work. Just two years ago, after a strike which had resulted in the Company yielding to the men's demand for an increase of 10 per cent. all round, on the understanding that certain important questions of discipline (closely connected with the men's refusal to do a fair day's work) should be referred to arbitration, Mr. Lucas gave a distinct warning that the Company had reached the limit of their concessions, and that further demands would be resisted to the utmost. Since that date, the Company had continued to do everything in their power to ameliorate the conditions of work, and to meet every legitimate grievance, without waiting for the award of the arbitrators to which he had just referred, the issue of which had for various reasons been delayed. Those of the proprietors who were present at the meeting last year would remember that a suggestion was made by Mr. Hunter with regard to the possibility of adopting some scheme of profit-sharing with the men; and Mr. Lucas undertook that the suggestion should be brought before the Board of the Union des Gaz, and should be carefully considered. Well, upon the lines of that idea a scheme was put forward by the Union des Gaz in the month of July last, offering the men of the Italian stations the half of any economies which might be effected in the labour bill of the year by a re-arrangement of the work upon a more rational, a more economical, and a more efficient system. When he reminded them that in Italy $2\frac{1}{2}$ tons of coal per man were carbonized, against 6 to 8 tons in England, France, and Germany, it would be seen that this scheme offered large opportunities of economy-sharing, both to the men and to the Company. The offer was not accepted. He was not sure it was seriously considered, because the more violent of the men's leaders were working up for another strike, and were anxious to bring it on at once for two reasons—first, because, although the arbitrators in connection with the settlement of 1907 had not given their award, it was known that the experts' report was favourable to the Company; and, secondly, because the Italian Government contemplated passing a law in January next for the prevention of strikes, and for making arbitration compulsory in connection with all public services.

THE MEN'S DEMANDS.

With these two possibilities in view, the leaders of the Federation thought it advisable to make a supreme effort to obtain as much as possible from the Company before the arbitrators gave their award, and before the proposed law was put into force. He ought in fairness to say that a large number of the men were opposed to the policy of the extremists; but it was the extreme policy which prevailed. On Oct. 19

the men's demands—embodied in a *memoriale*—were sent in; and the Company were given thirteen days to reply. The principal points were:

- 1.—An all-round increase of 10 per cent. in wages.
- 2.—A considerable number of special increases of pay, in addition to the above, and sundry shortenings of the hours of labour.
- 3.—The abandonment of the arbitration referred to above.
- 4.—The abolition of piecework.
- 5.—The suppression of all contract work.
- 6.—The establishment of an agency in the works for the taking on of all workmen and employees under the control of the men themselves.
- 7.—All stokers and assistants to be granted 24 days' holiday a year on full pay, in addition to the weekly day's rest lately granted by law.

If these demands had been granted in full, they would have cost the Union des Gaz something like £50,000 per annum. They were refused *en bloc*; and reasons for their refusal were given to the men, and were communicated to the authorities.

FOREWARNED AND FOREARMED.

He might say at once that the strike was not unexpected. Partial strikes or cessations of work had been continually occurring throughout the year for the most trivial reasons. There had been twenty in eight months. As soon as the Union des Gaz saw that a struggle was inevitable, every preparation was made to meet it, in order that the Company might fulfil, without any break, its contractual obligations to the municipal bodies, and to the inhabitants of the four cities they lighted in Italy. A careful plan of campaign was laid out. The services of trained mechanics were retained in England to take charge of all the machinery, stokers were recruited in Germany, and yard labour in Italy. Assistant engineers and stokers were held in readiness to proceed to Italy from Strasburg and the French works of the Company. The strike was declared on the evening of Tuesday, Nov. 2. The same evening the various works of the Company were occupied by troops, and were cleared of strikers who left in an orderly manner. The Englishmen were the first to arrive, and for twenty-four hours they aided the engineers and the few faithful men in keeping the furnaces going. At Bovisa, they made gas from the very first. On Wednesday night, special trains brought the "free workers" into the works at Milan without incident—to the great surprise of the strikers; and a similar result was attained at Genoa, with equal promptness—thus vindicating the skill and completeness with which the plans had been laid by the two chief officers of the Company. Twenty-four hours were spent in completing the organization of the new *personnel*, and in cleaning the furnaces and ovens, which had been left in a bad state by the strikers.

COURSE OF THE STRIKE.

From Thursday night, Nov. 4, the manufacture of gas proceeded smoothly; and by the end of the week it was practically normal both at Milan and Genoa. At first, the public lighting could not be maintained, as it was impossible to get the lamps lit; but after a few days the lamps were lighted in the middle of the night, and were kept burning night and day during the rest of the strike. He need hardly say that many acts of damage to public lamps were committed, and mains were in some instances torn up and ignited. These were dealt with by the authorities. He would not weary the proprietors with details, nor would he trouble them with the special difficulties incidental to each separate town—Milan, Genoa, Alessandria, and Modena. He would only say that in each town the Managers received adequate military protection, and that they gradually and surely overcame the great difficulties that confronted them. As soon as the Board were satisfied that the gas supply could be maintained, the Managers were instructed to issue a manifesto, with the approval of the authorities, stating that all the men were discharged, that the Company resumed their liberty of action, and were ready to re-admit applicants upon their signing the new conditions of engagement which had been drawn up. He wished to state very clearly that these conditions did not include any reduction whatever of wages, or any diminution whatever of privileges and advantages—such as pensions, sick pay, &c. Their object was solely to restore to the Company such control of their works as was absolutely essential for efficient and economical working. Under the old *organico*, the Company were absolutely powerless to organize their works on the basis of either efficiency or economy. They had to endeavour to fulfill their contractual obligations under conditions which had become intolerable, and indeed impossible. The principle they fought for was the right to adapt their organization to the economic requirements of the industry. The manifesto was posted up at Genoa on Nov. 9; and at Milan, Alessandria, and Modena, two days later. Its publication was speedily followed by the opening of negotiations on the part of the men, who offered to withdraw their *memoriale*, and to return to work upon the old conditions. The Company, however, regarding the acceptance of the new regulations as vital to any settlement, held firm. He might say at this point that letters were received from several of their large shareholders encouraging the Board of the Union des Gaz to maintain this attitude.

COLLAPSE OF THE STRIKE.

It was unnecessary to give the details of the protracted negotiations which were carried on during the next ten or twelve days. At Milan discussions proceeded almost continuously between representatives of the men, the Prefect, the Syndic, and the Company's Manager (Mr. Grüss). On Nov. 21, an agreement was arrived at, but was refused by the men on the 23rd. At the instance of the authorities, some concessions of detail were made by the Manager, the most important of which was the institution of a permanent Board of Reference—consisting of two representatives of the Company, two of the men, with an independent umpire—to which certain disciplinary questions would in future be referred. This agreement was accepted by the men's representatives—subject to a ballot of the men themselves. The ballot took place on the 25th, when 600 voted against acceptance, 300 for, and about 800 did not vote. The Company's Manager then posted up a notice to the effect that all the men who had not signed their acceptance of the agreed conditions by four p.m. on the 26th would be definitely replaced by other applicants. More than 1000 men signed the agreement in the course of the day; and on the 27th, the strike was

at an end, and work was resumed by the whole body of workmen. He had dealt mainly with the history of the strike at Milan, because it was at Milan that labour troubles had always been most acute, and the difficulties of the Company most aggravated. Much that he had described applied equally to Genoa, and in a lesser degree to Alessandria and Modena. At Genoa, Mr. Morton had made the same complete and skilful preparations as Mr. Grüss had made at Milan; and he maintained throughout the same inalterably firm attitude. He had this advantage over Milan, that the whole body of his clerks remained faithful to the Company, and rendered him valuable assistance. All through the strike, and in the final negotiations which led to a settlement, he acted in complete independence of—although in close consultation with—Milan; and it was to this policy of individual action that the success of the Company might in part be attributed. The acceptance by the men at Genoa of the new regulations was as complete as at Milan; and in one or two respects, the settlement at Genoa was more favourable to the Company. In the negotiations both at Milan and Genoa, the Company had the advice and assistance of Mr. Rolando Ricci—one of the most distinguished lawyers in North Italy.

FREEDOM THE RESULT.

The proprietors might fairly ask him what the Union des Gaz had gained by this costly struggle. His reply was that they had freed themselves from the old *organico*, which for years had bound them hand and foot, and was surely strangling them. There never was any desire on the part of the Company either to reduce wages, or to cancel the privileges which had been gradually granted to the men. All that the Company fought for was liberty to manage their works with a maximum of efficiency. The old *organico* was now replaced by a new *regolamento*, which gave the Company the right to take on, and to promote, the men they thought most suitable for each class of work; to reduce the number of their employees, with due notice, if, in the opinion of the Managers, reductions were justified by such causes as changes in machinery or processes of manufacture, or changes in the system of accounts; and generally to regulate the staff according to the exigencies of the business. These seemed very elementary rights for an employer to possess; but they had been denied to the Company for some years. It was well worth all the expense and anxiety of the past month to have regained them. He was confident now that the struggle was over, the Company would treat all its *personnel* with consideration, would continue steadily to improve the conditions of labour in every department, as they had done in past, and would welcome a gradual increase of individual wages if it were accompanied by a genuine and unmistakable increase of efficiency on the part of the men. He ventured to hope that a brighter day had dawned for the Union des Gaz in Italy, and for all those whom they employed.

A DESERVED TRIBUTE OF PRAISE.

Before he sat down, he must say a few words about the Company's representatives and staff in Italy, upon whom the burden and heat of the fight had fallen. The Union des Gaz had been most fortunate in having men so courageous, so unflinching, so loyal, and so devoted, to represent them in their hour of difficulty. Of Mr. Grüss, he could not speak too highly. He made all his preparations with consummate skill, and with an unflinching grasp of details. He (the Chairman) had already pointed out the promptitude with which an extemporized *personnel* was got into the Milan works, and began the manufacture of gas. That spoke for itself. Then for nearly a month Mr. Grüss was subjected to pressure from the authorities, the Press, and the public, and to threats and abuse from the more violent of the strikers. He was never intimidated; he never flinched for one moment; he never lost sight of the essential points upon which concession was impossible, until he finally brought about the satisfactory arrangement that he (the Chairman) had described. It was a great performance; and the thanks of the Company were due to Mr. Grüss for it. He was ably seconded by Mr. Di Bisogno, Mr. Hovey (the Chief of the Technical Staff), Mr. Freyss (the Chief Engineer of the French stations), Mr. Blow, Mr. Cuffia, Mr. Bocchi, the Sub-Engineers, and the able gentlemen sent from Strasburg and the French works. He could not mention all by name; but one and all deserved well of the Company for their hard and devoted work. In Mr. Morton, at Genoa, the Union des Gaz were equally fortunate. He possessed those qualities which, they were proud to think, belonged to many Englishmen—coolness, patience, courage, and staunchness. He (the Chairman) could only say that his performance at Genoa was a worthy pendant to the performance of Mr. Grüss at Milan. Much that he had said of Mr. Grüss was applicable, in equal measure, to Mr. Morton; and to him the thanks of the Company were equally due. Mr. Morton was admirably assisted by Mr. Cucchi, Mr. Cesari, Mr. Bickley, and, indeed, by all the staff at Genoa. The Company had also to thank warmly Mr. Pesce, their Manager at Alessandria, and Mr. Maggioni, their Manager at Modena. They were also deeply indebted to the heads of those industrial establishments and gas companies in this country, through whose assistance they were able to secure and send to Italy skilled mechanics to take charge of the machinery throughout the strike; and he took this opportunity of thanking them on behalf of the Union des Gaz. His tale of thanks would not be complete if he did not bear grateful witness to the protection afforded to the Company by the military and police authorities in Italy. Absolutely impartial, they secured to the Company full liberty of work, and enabled them, with the least possible interruption, to maintain the public service. He feared he had detained the proprietors too long at a busy hour of the day; but the events of the year had been so full of interest and importance that he felt he owed them the most ample information. He concluded by formally moving that the report and accounts be received and adopted.

The DEPUTY-CHAIRMAN (Mr. Frederick Tendron) seconded the motion.

ACKNOWLEDGMENTS FROM THE PROPRIETORS.

Mr. H. E. JONES said the recital of the Company's misfortunes of the last few years, and the courage and fortitude with which the Board had met them, demanded the sympathy of the proprietors, and next their admiration. Above all things, he thought the Board had dealt very wisely with the questions associated with the terrible loss at Messina. He admired the courage and sound finance with which the Directors had appropriated so much of the reserve and profits for this

purpose. The courage, too, with which they had met the labour strike in Italy also deserved the gratitude not only of the proprietors, but of all people interested in the industry of gas. It was only when they could find such men as (the late) Sir George Livesey, Mr. Grüss, Mr. Morton, and others, that they could show people they must not be unreasonable. However, it seemed they had now passed through the trouble at the works. He heartily congratulated the Board on the state of the accounts, and the courage they had shown under extraordinary pressure.

Mr. WALTER HUNTER said he was sure the proprietors greatly appreciated the work and the courage that the Board and the heads of departments in Italy had shown under the very difficult circumstances that had arisen during the past year. It only proved once more that if one would only be just, one need not fear. Firmness of mind was the only way of dealing with men as in dealing with boys. As the Chairman said, he (Mr. Hunter) advocated the application of co-partnership at the last meeting; and, notwithstanding the Chairman's remarks, he still hoped that some day or other it might take effect. It seemed to him they ought again to follow the example of Sir George Livesey. Sir George first beat his men in fight; and then he gave them co-partnership. That was a course he would recommend under present circumstances to the careful consideration of the Board. The proprietors thanked the Chairman for his admirable and lucid speech; and they greatly appreciated the services of the Board and the heads of departments in the terrible struggle of the year.

The CHAIRMAN thanked Mr. Jones for his exceedingly kind remarks; and he should like to say to Mr. Hunter that the Board would not lose sight of the principle of profit-sharing. They agreed with him that, after a victory such as they had won, it was much easier to adopt a system of the kind than it was before.

The motion was unanimously carried.

THE DIVIDENDS.

Proposed by the CHAIRMAN, and seconded by Mr. N. E. B. GAREY, a resolution was passed declaring a dividend of 5 per cent. on the ordinary stock and 7 per cent. on the preference stock, after deducting the interim dividend of $2\frac{1}{2}$ per cent. on the former and $3\frac{1}{2}$ per cent. on the latter—the balance of $2\frac{1}{2}$ per cent. on the ordinary stock being paid free of tax, and the $3\frac{1}{2}$ per cent. on the preference stock less tax.

RE-ELECTION OF DIRECTORS AND AUDITORS.

The DEPUTY-CHAIRMAN moved the re-election of Mr. Birchenough to his seat at the Board. After the able discourse to which they had listened that morning, he was sure the proprietors would accept the motion without hesitation. The Chairman had referred to Mr. Lucas, and had pointed out that he never spared himself, but did all that was humanly possible for the good of the Company. Among the good things he did was to introduce Mr. Birchenough to the Board.

Mr. A. F. PHILLIPS seconded the motion, which was carried.

Proposed by the CHAIRMAN, and seconded by Mr. PHILLIPS, Mr. R. S. Gardiner was also re-elected.

Both the CHAIRMAN and Mr. GARDINER acknowledged the renewed expression of the confidence of the proprietors.

Moved by Mr. WALTER HUNTER, and seconded by Mr. CAVE ORME, the Auditors (Mr. A. T. Eastman and Mr. C. P. Crookenden, F.C.A.) were reappointed.

VOTES OF THANKS.

Mr. PHILLIPS said he had much pleasure in moving that the thanks of the meeting be given to the Secretaries, Managers, and the Engineers of the Company and of the Union des Gaz, both in London and abroad, for the special services rendered by them in the past year. The proprietors would have gleaned from the Chairman's address the arduous character of the year through which their officers had passed, especially those in Italy. He was himself in Italy immediately before the strike; and he could bear testimony to the excellent preparations that had been made by Mr. Grüss in Milan and by Mr. Morton in Genoa. The proprietors could form no idea of the enormous strain these two gentlemen had had to bear during the month of the strike. He must also particularly mention their excellent Secretary, Mr. Martin. The time that he had during the strike was difficult to realize. He was in the office from morning till evening, seven days a week, continually receiving long telegrams, and consulting with the Chairman as to the replies. Practically for three weeks or a month Mr. Martin had no rest. He (Mr. Phillips) was only surprised he was able to bear the great strain and carry on the negotiations so satisfactorily. Without him, the Company's position would have been somewhat difficult.

Mr. R. S. GARDINER seconded the motion, remarking that its passing ought not to be a purely perfunctory matter on this occasion. All on the proprietors' and the Directors' sides of the table realized how greatly their thanks were due, and how hardly they had been earned.

The CHAIRMAN remarked that he had himself been in contact with the office every day for at least a month; and he could add his testimony to that of Mr. Phillips as to the admirable way in which the work had been done in the London office, as well as in Italy.

The motion was carried by acclamation.

Mr. MARTIN said, on behalf of himself and all concerned in the motion, he thanked Mr. Phillips, Mr. Gardiner, and the Chairman for their kind remarks, and the proprietors for their approval. But notwithstanding all the complimentary things said about himself and his colleagues abroad and in London, the general management, without loyal and hearty co-operation, would not be so efficient.

Mr. E. WOOLLEY observed that there had already been remarks from the proprietors' side of the table as to the services of the Chairman and Directors; but it was desired to emphasize and enforce these remarks by passing a vote of thanks. He happened to be himself interested in an industry carried on in Italy on a small scale; and so he could fully realize what the Directors had suffered.

Mr. E. A. GOULDING, in seconding, remarked that the Board had had great difficulties in front of them, and the proprietors had again and again had this difficulty of a labour strike hanging over them. But he felt that the difficulty was now behind them, and that its back had been broken. It was mainly due to the way the Board had grasped the question, and settled it, that they were in the very satisfactory position existing that day.

The motion was heartily carried.

The CHAIRMAN, in responding, said one thing that encouraged the Board in times of difficulty such as the months through which they had been passing, was the consciousness that they had behind them a most generous body of proprietors, who recognized that the Board were doing their best, and so supported them.

This concluded the proceedings, which, through the peculiar circumstances of the year, had been somewhat more protracted than usual.

BISHOP'S STORTFORD COUNCIL AND THE GAS-WORKS.

Application to Parliament for Power to Purchase.

At the Meeting of the Bishop's Stortford Urban District Council last Tuesday, there were two motions on the agenda with regard to a proposal to purchase the undertaking of the Bishop's Stortford and District Gas Company. The first was—"That in the opinion of this Council the time has arrived when, in the interests of the ratepayers, it is desirable that the gas-works should be acquired by the Council for their benefit;" the second—"That a poll of the town be taken to ascertain whether the inhabitants are in favour of the purchase or not."

The VICE-CHAIRMAN (Mr. H. Kent) said before moving the first resolution, which stood in his name, he would suggest that the two resolutions might be consolidated.

The CHAIRMAN (Mr. J. L. Glasscock) said he had consulted the Clerk with regard to the second resolution, and was afraid that it was out of order, as the Council had no power to vote money for taking a poll of the parish.

The VICE-CHAIRMAN said, as the first motion must stand alone, he would move it as it appeared upon the agenda. He looked upon the action the Council were taking as practically the last struggle it was possible for them to enter into with regard to the gas question. If they did not do something that night, they would be placed in such a position that he thought they could say "Good-bye" for ever to the possibility of the municipalization of the gas-works of the town. The last time the Council divided on the question, it did so in such a manner that there were six on one side and seven on the other. If the town had then taken the advice given to it, it would to-day have had one of the finest assets that any municipality could have in its possession. At that time the capital of the Gas Company stood at £10,000 or £12,000. He knew that the market price then was somewhere in the neighbourhood of £22 10s. per £10 share. The Council missed the opportunity because there were certain members—good members of the Council, good citizens, good townsmen—who were afraid of arbitration; and they lost one of the most golden opportunities that could ever present itself to a local authority. They then came down to another stage, when he strongly argued in favour of purchase. This was the time when the previous Bill was put forward by the Gas Company, and the Company was changed into what was now known as the Bishop's Stortford and District Gas Company. At that period the Council, by a fairly good majority, went to the extent of getting inserted into the Bill a purchase clause which should be operative for a period of twelve months. It carried with it conditions; but if the town had availed themselves of them it would have been a good thing. At that time the Council called in an expert on gas. He knew that some looked upon that gentleman as one of the strongest men in the gas world. He was one of the strongest men in the gas world against municipalization; and therefore when the inquiry was held he (Mr. Kent) was not surprised that some of the members thought it would be doing a serious wrong and would be burdening the ratepayers for many years if it purchased the gas-works. But when they reviewed with an unprejudiced mind the municipalization of various gas undertakings throughout the country, and looked at the figures which were produced, they were forced to come to the conclusion that municipalization had been a success from the very beginning. Naturally, there had been some failures; but they must not gauge the mistakes unless they also put on the other side the advantages which had come to the community in the many places where the municipalization of the works had been a success. Having cited cases in support of these statements, the speaker came back to Bishop's Stortford. He said the Gas Company, according to their last balance-sheet, made about 46 million cubic feet of gas per annum, that they were paying dividend on a capital of £34,620, and that the borrowed capital was something like £11,400—making a total of £46,000. But there was a certain amount of capital in the £46,000 which had nothing to do with Bishop's Stortford. He could not tell what was now the consumption in the outer area. He knew that, prior to taking over the Stansted works, Bishop's Stortford burnt something like 30 million cubic feet of gas per annum. If with the extended consumption they were now supplying 38 millions, it would show that about 5 or 6 millions went to Stansted. They knew what the condition of things was. It appeared that the inner circle was paying the piper to-day to keep the people of Stansted in good trim and fettle to defend the Gas Company. When they came to consider the outer area, which was scheduled with a maximum price of 5s., and also the inner circle scheduled with a maximum of 4s., they found that the outer circle had been given a benefit of 1s. 3d. and Bishop's Stortford only a benefit of 3d. from the maximum; and it was time, if this thing did go through, that they should declare that the outer circle should not be given a benefit to the detriment of the inner. He felt satisfied he had done his duty in bringing the motion forward; and he sincerely hoped there might be sufficient members of the Council who saw the urgent necessity of utilizing what he might call the last opportunity of purchasing the undertaking of the Gas Company.

Mr. NEWBY said he had not the slightest hesitation in seconding the motion. The Gas Company was one of the best paying concerns they had in Bishop's Stortford; and if the Council made up their minds to buy, and the present most efficient management could be retained, no injustice would be done to anyone, and the proprietors would get a very good price for their shares.

Mr. WATERMAN, as one who many years ago advocated the purchase of the gas-works, when they could have been bought at a much smaller

cost than now, supported the motion. He agreed with Mr. Kent that the gas-works in the hands of the Council would be one of the finest assets the town could have.

Mr. EDWARDS remarked that while it might have been advisable for the town to purchase the gas-works when they were valued at £10,000 or £12,000, he could not see that it would be advisable to do so now. A year or two ago the Council succeeded in obtaining an Electric Lighting Order, which they held at the present time. They had thought fit to get expert advice on it, and found that electric light could be installed for about £13,000. They could use electricity for power, light, and heat; and he took it that this was all the town needed. He considered it would be a great deal wiser if the Council went in for electric lighting straight away. If they spent £100,000 in the purchase of the gas-works, it seemed to him that it would hamper the town, and be a charge on the ratepayers for many years to come.

Mr. CARRUTHERS remarked that the most deadly opponent of the Electric Lighting Order would be the Gas Company. There was no doubt that if the town purchased the gas-works at a reasonable price they could be made to pay. He did not think anyone had the right to mention £100,000 as the price, as this was a question which would come on in due course. What the Council had now to do was to get to know whether or not the town was in favour of the proposal. Therefore he did not see his way clear to merge his motion with that of Mr. Kent. If the Council decided to proceed with the purchase of the gas-works, he would propose that a vote of the town be taken.

The CHAIRMAN (interposing) pointed out that Mr. Carruthers' motion was out of order.

Mr. CARRUTHERS said the position was different to-day from what it was on the last occasion that this question was discussed. The Gas Company were about to form a big combine, which would be something in the nature of a trust. The Company was a very powerful one; but the proposed combine would be all-powerful. In his judgment, Bishop's Stortford was being exploited as a bait to the villages around to come into the combine. He felt that the position was altogether different from what it had been in the past; and he hoped there would be public spirit enough in the Council to say they would have what belonged to them—the right to provide their own gas. He had pleasure in supporting the motion.

Mr. HOLLAND said he was as strongly as Mr. Kent, or anybody in the Council, in favour of municipalizing the gas-works; but he was a trader, and liked to know what he was going to purchase before he put his signature to anything. In this case, he did not know what the Council would have to pay; and if a vote was pressed that evening, he should vote against it. They would have to pay a very big price for the property; and whether the Council ought to saddle the town with the risk of making the gas-works pay was a very serious matter.

The CHAIRMAN remarked that they would all be agreeable to the acquisition of the gas-works on condition that they were purchased on reasonable terms; but no one who had spoken had been able to give any information on this point. He thought it would be wise before the Council decided to purchase the works at a cost of £100,000 or a little less, that they should bear in mind they had other things in view, and that these might come on at any time. Four years ago he recorded his vote against the purchase of the gas-works for the reason that the amount the town would probably have to pay would be excessive. If this was so then, what would be his position to-day? The sale price must be considerably larger, and therefore he could not, without further information and more definite figures, feel justified, as a representative of the ratepayers, in giving his vote for the proposal.

After some further discussion,

The VICE-CHAIRMAN replied. He said that £12,000 or £13,000 was mentioned as the purchase price of the gas-works at one time. But never since he had been on the Council had there been any idea that they could be purchased for anything like £13,000. He asked the members not to be led away with the idea that there would be a huge increase in the rates by the municipalization of the gas-works. The probability was that the rates would go down. From every standpoint they looked at the matter, he was convinced that it must be for the benefit of the town to purchase the Gas Company's undertaking.

Mr. PRYER said that, as very few members could vote on the motion that night, he hoped Mr. Kent would postpone it for a time and allow the subject to be ventilated in the town.

This, however, was not done; and on the motion being put, it was carried by five votes to four. Three members of the Council who were unable to vote and one who had left the meeting (Mr. Holland) were against the motion.

It was then decided that the necessary work arising out of the resolution should be undertaken, and that the Council should promote a Bill to acquire the Gas Company's undertaking; Messrs. Baker and Co., Parliamentary Agents, being appointed for the purpose.

The Council's Parliamentary Notice.

In accordance with the resolution passed by the District Council, the statutory notice for the Bill, dated Dec. 8, appeared in the local paper later in the week. It sets forth that application will be made by the Council for authority to purchase, by compulsion or agreement, the undertaking of the Bishop's Stortford District Gas Company, and take over all their rights and powers. Provision will be made for the settlement by arbitration, in default of agreement, of the amount of the purchase-money or compensation to be paid to the Company. The Council wish to be authorized to carry on the undertaking, improve the existing works, construct new ones, and supply gas within the urban district of Bishop's Stortford and the limits of supply of the Company, or such reduced limits as may be prescribed. The Bill will contain the usual provisions in regard to matters incidental to a gas undertaking—such as the price, pressure, quality, and testing of gas; the regulation of pipes and fittings, &c.; the purchase and sale of land; the sale or letting on hire of meters, fittings, engines, stoves, &c.; the levying of rates and charges; and the supply of gas in bulk. Authority will be asked to borrow the necessary money for purchasing and carrying on the undertaking, on the security of the revenues of the Council and the district fund and general district rate. It is also proposed to ask Parliament to amend the Bishop's Stortford Electric Lighting Order, 1905.

UNIVERSITY OF LEEDS.

Lectures on Gas Manufacture and Bye-Product Coking Processes.

We have received from Professor W. A. Bone, D.Sc., F.R.S., the Head of the Department of Fuel and Gas Engineering at the University of Leeds, a circular announcing that, in connection with the work of the Department, arrangements have been made for the delivery of special courses of lectures on "The Manufacture of Coal Gas" and "Bye-Product Coking Processes," which will be open to all persons engaged in either of the industries concerned.

MANUFACTURE OF COAL GAS.

A course of twenty lectures will be given by Dr. Harold G. Colman on Wednesdays, at 6 p.m., and Thursdays, at 9 a.m., during the second term (ten consecutive weeks), commencing on Wednesday, Jan. 12, 1910, and continuing until Thursday, March 17. The fee for the course will be £1 1s.

Synopsis.—A general description of the plant and processes involved in the manufacture of coal gas and carburetted water gas. Description and valuation of coals suitable for gas making. Analysis of coal. The chemical and physical changes involved in the carbonization of coal. Effects of temperature and other factors on the nature of the products. Horizontal, inclined, and vertical retorts. Construction of retort-settings. Methods of maintaining uniform temperatures throughout the retorts, with simultaneous economy in fuel consumption. The initial treatment of volatile products evolved from the retorts. Hydraulic and dry mains. Condensation. Elimination of tar fog and naphthalene. Exhausters. Wet and dry purification. Cyanide recovery. Other bye-products—e.g., coke, tar, ammoniacal liquor, &c. Manufacture of ammonium sulphate. Spent oxide, spent lime, &c. Manufacture and carburetted of water gas. The analytical control of gas-manufacturing processes. Discussion of present-day requirements for a public gas supply.

It is pointed out in the circular that the arrangements for the course will enable students living at a distance from Leeds to attend two lectures by staying one night per week in Leeds. Overnight accommodation for a limited number of students can be provided at Lyddon Hall, the Hall of Residence of the University, at an inclusive charge of 6s. for dinner, bed, and breakfast. Early application for this accommodation should be made to the Warden, Lyddon Hall, Leeds. Students are, however, at liberty to make other arrangements, and the University authorities will supply a list of registered lodgings.

BYE-PRODUCT COKING PROCESSES.

A course of eight lectures on this subject will be given by Mr. Ernest Bury, M.Sc., of the Brackley Coke-Works, Little Hulton, near Bolton (Lancs.), on Saturday afternoons, at three o'clock, commencing Saturday, Jan. 15, 1910. The fee for the course will be £1 1s.

Synopsis.—Historical introduction. Development of bye-product coking processes considered from a general standpoint. Various types of ovens and their construction. Gas condensing and scrubbing plant. Ammonia recovery and the manufacture of ammonium sulphate. Treatment of waste gases from the sulphate plant. Recovery and refining of benzol. Utilization of coke-oven gas. Selection of coking coals. Preparation of coal for carbonization. Slack washing. Disintegrators. The scientific control and management of a bye-product coking plant. The utilization of coke-oven gas for illuminating purposes. The future of the process in relation to the national economy of coal supplies.

Each lecture will be followed by a class for discussion and demonstrations on the scientific control of a bye-product coking plant.

Intending students are requested to send in their names without delay to the Registrar of the University, specifying the course or courses which they desire to attend. The fees for the respective courses are payable in advance on the date of the first lecture. Other inquiries regarding the courses should be addressed to Professor William A. Bone, D.Sc., F.R.S., the Head of the Department of Fuel and Gas Engineering, on or before next Tuesday (the 21st inst.).

BRITISH COALITE COMPANY.

Advance Details of the Report and Accounts.

In their issue of yesterday, the "Daily Mail" wrote: Awaited by many with keen interest, the report of the British Coalite Company for the year to Sept. 30 is on the point of publication. We are able to give some of its main features, which, for the present, may be allowed to speak for themselves without comment from us.

The report will state that as the year has been occupied almost entirely in development and constructional work, no profit has been realized. As a matter of fact, the sales of coalite and bye-products amounted during the year to £11,376. The biggest item of revenue earned during the year was interest payable by the parent Coalite Company on calls in arrear—£12,398 in interest, of which about half had been paid at Sept. 30. The expenditure of the year has exceeded the revenue by £21,895; the main items of expenditure being about £16,000 for coal, £13,000 for wages and salaries at the works, and £10,000 for Directors' fees, salaries, and legal expenses.

The report, it will be found, will mention the extensive plant and works being erected at Barking, Wednesfield, Plymouth, and Hythe. Somewhat apologetically, it will state that the delay in completion has been unavoidable, as the economical expenditure of a large capital cannot be hurried. But the Directors will express their "fullest confidence in the immediate financial success of the undertaking." The plants at the works of the Plymouth and Hythe Gas Companies are, it is stated, giving steady returns—the gas being rich in illuminating power; and further contracts are being negotiated with other gas companies. The

Company has received a diploma and a medal for smoke abatement exhibits. Finally, the demand for coalite, the report will state, increases daily.

Against the million sterling of capital, the balance-sheet will show that about half the sum is represented by inventions and patents; that £335,000 has been spent on land and works and the like; that the expenses in connection with the formation of the Company amount for £85,809; and that the cash at the bank and in hand amounts to £7485. Of the £750,000 of £1 shares actually issued for cash, £29,104 have been forfeited; and the calls in arrear on other shares amount to £233,551. That will be shown in the balance-sheet; but the report will explain that since the accounts were made up a further sum of £62,500 has been received from the parent Company (Coalite, Limited) in reduction of the liability on unpaid calls, and that the balance will be liquidated early in the ensuing year. The Auditors point out that an item of £153,380 for which the Company take credit as expenditure at the works is subject to adjustment owing to dismantling and reconstruction, and that no provision has been made for depreciation.

THE LATE MR. G. HAMPTON BARBER.

Resolution of the Birmingham City Council.

At the Meeting of the Birmingham City Council last Tuesday, the Lord Mayor (Mr. W. H. Bowater) moved: "That this Council desire to record their sincere appreciation of the valuable services rendered by the late Mr. George Hampton Barber as Secretary and Manager of the Corporation Gas Department, to express their deep regret at his decease, and to convey to Mrs. Hampton Barber and family their respectful sympathy." In Mr. Barber, he said, the city had lost one of its most efficient and devoted officials. His business qualities and his organizing capacity were recognized as soon as he came to Birmingham; and nine years ago he was unanimously selected out of 120 applicants for the position vacated by Mr. Edwin Smith. The confidence of the Gas Committee and the Council was abundantly justified by the success with which he administered the department with increased efficiency and enlarged profits. It was particularly unfortunate that the Gas Committee should have lost the services of such an administrator at a time when further developments were in hand; and it was especially sad that he should have been so suddenly removed from a domestic circle which had already been saddened by the serious illness of Mrs. Barber. In his private as well as his public capacity the removal of his strong and optimistic personality was an almost irreparable loss. Their sympathy was especially due to the invalid widow and large family he had left behind.

In seconding the resolution, Alderman Sir Hallowell Rogers said he did not think they could realize the loss which the Gas Department had sustained by Mr. Barber's premature death. During the whole time of his secretaryship, he gave himself unsparingly and devotedly to the business of the department. Mr. Barber was one of the ablest business men he had ever met; and he had no hesitation in saying that the increased profit from the Gas Department had been largely due to Mr. Barber himself.

This resolution was carried.

IMPROVEMENTS AT THE BURTON GAS-WORKS.

Reconstruction of Retort-Houses.

At the Meeting of the Burton-upon-Trent Corporation last Wednesday, an important scheme for the extension of the gas-works was sanctioned.

Alderman LOWE, the Chairman of the Gas Committee, submitted a proposition that Mr. J. Ferguson Bell, the Council's Consulting Gas Engineer, should be instructed to prepare drawings and obtain tenders for carrying out the first section of the scheme for reconstructing the old retort-houses, the estimated cost of which will be about £16,000, and that the Gas Committee should be empowered to accept a tender for the work. He said he had gone very fully into the scheme when it was brought before the Council some months ago. He then stated that a new gasholder was needed, with the re-setting of the retorts in the most recent of the retort-houses (No. 5), and that they should build the first half of a new house, with modern improvements, in place of Nos. 1 to 4. The work at No. 5 house had been completed at a cost of about £2000, the gasholder they hoped would be completed in another month or so, and they wanted to proceed at once with the retort-house. The half which they were proposing to build would have 20 settings of retorts capable of carbonizing 120 tons of coal per day. The original estimate for the whole retort-house was £25,000; and they were proposing to build rather more than half, at an outside cost of £16,000. The Committee asked permission to accept tenders, as they would have to pull down three houses (Nos. 2, 3, and 4), leaving the other two, which were capable of producing $1\frac{1}{4}$ million cubic feet of gas per 24 hours. On the previous day, they sent out upwards of $1\frac{1}{2}$ million cubic feet; so it would be seen that if they did not get the work done before the beginning of next winter, they would be in an intolerable position. They would not be ready to bring the tenders before the Council at the January meeting; and if they waited till February, the contracts would have to be signed, and it would be March before they could start. They would save six weeks, which would be a material amount of time when next winter was coming on. At present every ton of coal had to be handled a number of times, which cost something like 2s. 6d. a ton; but with the new retort-house they expected to get the work done for half the cost, in addition to which they would obtain a greater yield of gas per ton, with better and more profitable residuals. The advantages were altogether out of proportion to the original cost; and when they had this house, they would be in a position to manufacture gas considerably cheaper than they could at present, and the consumers and ratepayers would receive the benefit.

Mr. KING seconded the motion.

Mr. WARDLE said the question might occur to many why vertical

retorts were not being put up. The reason was because they in Burton wanted gas of higher candle power than could be obtained with that system. The class of retort they proposed to adopt would be cheaper and better, for the general purposes of a town like Burton, than the vertical retort.

Alderman LOWE supported this statement.

The motion was then put and carried.

DECAY OF PRIVATE BILL LEGISLATION.

In the course of a lengthy article under this heading in the "Pall Mall Gazette," a Parliamentary Agent made last week the subjoined remarks.

The notices for Private Bills to be promoted next session have now all been published in the "Gazette." The number of Bills of which notice has been given is 118. There may be a couple of Scotch "Substituted Bills," but the total cannot exceed 120. This is said to be the lowest on record; it is certainly the smallest number for many years. When the notices for next session, and the Bills passed during the last few sessions, come to be analyzed, it will be found that the decline has been most marked in Bills authorizing new railways, tramways, and other public works, involving large capital expenditure.

There are thirty-four Bills promoted by municipal authorities. Many of these are "Police and Sanitary" Bills—that is to say, Bills conferring on local authorities powers of regulation in excess of those given by the general law. Some aim at acquiring existing company undertakings. There are a few which seek new powers for the construction of water-works. This is a sort of expenditure which will not brook delay. But very few municipalities are proposing to carry out any works which they can possibly postpone. The small number of municipal tramway schemes is especially significant. The big corporations have acquired and electrified the tramways in their principal streets. They know that the operation of the municipal veto in Parliament makes them safe against company intrusion; and they sit down comfortably to wait for better times before they begin to so extend their systems as to give an adequate general service such as is given in most towns out of England. Meanwhile, the unemployed are occupied, with the aid of contributions from Imperial funds, in making artificial lakes. The principal cause of the cessation of municipal enterprise is, of course, the dearthness of money. Unrest makes even Socialism stand still. Though small sums can readily be borrowed on good terms in the North of England from local investors, large loans are difficult to raise without depressing quotations for existing issues; and many local authorities have had to pay nearly 4 per cent.

The slump in municipal work might have its compensations if there were any corresponding increase in private enterprise. But this is unfortunately in even worse case. The only bright spot is gas. There are twenty Bills promoted by gas companies of which gas supply is the sole or principal object. Parliamentary regulation of the gas industry has been specially successful. The sliding-scale has rewarded cheap service by larger dividends. The auction clauses have almost entirely prevented company-mongering, and have, indeed, brought into existence a new class of investors who buy and sell their shares at the Auction Mart, and are more or less indifferent to Stock Exchange quotations. The best gas companies can now raise new capital on as favourable terms as railway companies. The auction clauses have created a little haven in the sea of unrest. There are fourteen company Water Bills; but many of them relate to very small places, and it is hard to avoid the suspicion that in some cases the chief object of proceeding by Bill rather than by Provisional Order has been to secure the incorporation of a parliamentary company. Parliamentary companies are not subject to the strict requirements of the Companies Consolidation Act in relation to the disclosure of contracts in the prospectus. This a matter which, in the case of new companies, might well be met by the insertion of a clause in the Act of Incorporation. There are only two Bills for electrical supply, other than electrical supply by gas companies. There is no doubt that, except for the counties of Northumberland and Durham, England is very much behind other countries in electrical supply. It cannot be supposed, therefore, that there are not a multitude of opportunities for the profitable investment of capital. Some part of the blame may be attributed to the Act of 1882. More, perhaps, may be put down to the mistakes of those who inaugurated some of the power schemes. But there is no question that at present sound electrical enterprises cannot obtain fresh capital on anything like such terms as are usual in the case of public companies operating in other civilized countries.

Protecting Dams from Lightning.

In proposing the adoption by the Birmingham City Council of the Water Committee's report, Alderman Beale remarked that they had had before them a very interesting little engineering proposition with regard to the protection of the Welsh dams from the effects of lightning—a subject which had given them great anxiety. Sir Oliver Lodge had been consulted, and had confirmed them in the view that a good solution of the difficulty would be to connect the lightning conductors with the water, which was a valuable disperser of the electric fluid. It was necessary, however, always to "earth" the conductor, if he might so speak, on the surface of the water. This gave some difficulty, owing to the continual rise and fall of the level. Sir Oliver Lodge suggested a buoy moored away from the dam, to which the conductor could be connected. This idea had been carried out with modifications by Mr. Macaulay. The buoy was so arranged that the points of discharge should always be on the surface of the water, even when rocking from a high wind. They hoped they would have no opportunity of testing whether they had done right or not; but it had been an interesting work.

The price of gas at Swansea is to be reduced 2d. per 1000 cubic feet in the New Year.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Fog has again been experienced this week, in the midland district of Scotland, not so protracted as the visitation three weeks ago, but in some parts very dense. The statement was made in the "Glasgow Herald" on Tuesday regarding the experience of Monday, that the citizens generally required to resort to the use of artificial light for business and domestic purposes, and that there was consequently a renewal of the pressure experienced by the Gas Department on the previous occasion. Mr. Wilson and his staff were, however, well prepared for such an emergency. Though no figures could be given, it was estimated that the demand for gas on the previous day would be somewhat similar to that of Tuesday, Nov. 16, which was the darkest day experienced during the recent foggy weather. The amount of gas then consumed was over 37 million cubic feet. The manufacture at that date was at the rate of 27 million cubic feet per day, and consequently all the reserve stock had to be brought into requisition to cope with the extraordinary demand. Since then, however, additional retorts had been set going at the gas-works, with the result that the daily manufacture had been increased to 31 million cubic feet. This was considered sufficient to meet all the requirements of the city; and it was confidently anticipated that, should the foggy conditions not last longer than a week, there would not be the slightest possibility of a shortage in the gas supply. On the same day, there appeared in the "Scotsman," with reference to the experience in Edinburgh, the statement that at the gas-works at Granton the output during the daylight hours—say, between nine o'clock and half-past three—was increased 100 per cent. This necessitated the consumption of 100 tons more than the normal quantity of coal. On Wednesday, the statement was made in the "Glasgow Herald" that during the 24 hours which ended at six o'clock the previous morning, the consumption of gas reached the enormous total of 37,890,000 cubic feet, exceeding that of Nov. 16, when 37,200,000 cubic feet were supplied. Additional retorts had been put on, and a daily output of 33 millions could now be attained.

The Town Council of Glasgow held a special meeting on Monday to consider the Gas Consolidation Order; but not much of consequence transpired on the occasion, except that some of the councillors who hold pronounced views were afforded an opportunity of giving them an airing. The recommendations of the Parliamentary Bills Committee, as given in these "Notes" last week, were first agreed to, and then the clauses of the draft Order were considered. Bailie Alston moved that the words "dynamos and ranges" be re-inserted in the clause giving the Corporation power to manufacture. He did not think they should give away anything they could retain. The Corporation had never interfered with private enterprise, except where private enterprise failed. He was not suggesting that private enterprise would fail to supply sufficient dynamos and ranges; but he thought the Corporation should have power to supply these in case of failure. Mr. Moir pro-

posed that the word "manufacture" should be deleted. The Corporation, he said, had over and over again voted against the establishment of a municipal workshop, and yet in that clause they took power to set up all kinds of municipal workshops. He did not think this was any part of the Corporation's business. The Town Clerk ruled that it would be incompetent at this stage, and without notice, to take away any existing power. The clause, as contained in the draft, was adopted, Mr. P. E. Stewart asked if, under the clause giving a rebate to consumers of not more than 5 per cent. for prompt payment, the rebate would be given to all consumers. Mr. M. W. Montgomery said the clause was to give them power, if they thought fit, to allow a rebate. Mr. Stewart considered that 5 per cent. was a high price. Consumers waiting for three months would lose 5 per cent., or 20 per cent. per annum; while the Corporation, on the other hand, if everybody paid cash, would probably lose from £35,000 to £40,000 a year. Lord Provost M'Innes Shaw said the clause was inserted in every Gas Bill, but usually 10 per cent. was given as the maximum, instead of 5 per cent. as they proposed. Mr. Montgomery did not think there was much chance of the power being put into operation in a hurry; but they would have the power, and it was possible at some time they would find it very useful. The clause was adopted. Clause 27 proposes that appliances for testing the illuminating power of the gas be provided in each of the works. Mr. P. G. Stewart said he understood that at present the gas was tested by Mr. Tatlock, the City Analyst, at the works. There was a prevailing idea that the gas they got in Glasgow was not up to the standard. Mr. Tatlock went to the works at various times well known to the officials, and preparations were made accordingly. Would it not be better to follow the example of London and other English centres, where the gas was not tested at the source of manufacture, but after it had travelled a mile or two along the pipes. Mr. Montgomery assured the Council that no official preparations were made for the visit of the Analyst to the works. If Mr. Stewart cared to test the gas a mile or two along the pipes, he would find the same illuminating power as at its source. Mr. Stewart reiterated his statement that preparations were made when it was known there was going to be a test. He could get twenty witnesses to prove it. He moved that the clause be taken back and amended, so that the tests might be made away from the works. The proposal was defeated, and the clause adopted. Mr. D. M. Stevenson thought that the proposed uniform rate of 2½ per cent. as a contribution to the sinking fund was the creating of a rather risky precedent if they considered that it would render them liable to make that contribution upon future undertakings, and in view of the heavy writing down required for their plant. He thought the Parliamentary Bills Committee should be given power to modify the clause, if they thought it necessary. The Convener of the Committee said they had that power; and the clause was adopted. Mr. J. Battersby, upon the clause dealing with superannuation, said it guaranteed a gratuity or allowance to every employee of the Corporation, and he thought it would be very much better if power were taken to have friendly societies formed. Mr. D. M. Stevenson pointed out that eight or ten years ago the Corporation took power to do what Mr. Battersby suggested; and though the

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scheme then proposed was rejected, the authority remained. The Town Clerk said that was so. This and other clauses were agreed to; and the Order as drafted was adopted.

Speaking in the Dumfries Town Council last week, Judge Thomson, the Convener of the Gas Committee, said that for years the Manager had reported on the state of the retort-house; and it was now considered necessary that they should have a new retort-house and coal-store. The cost was estimated at £5600. A deputation had visited several places to see if they could get any hints as to the improved methods which were now in use elsewhere. They found, for instance, that hand stoking could never do what machine stoking was doing. At Stirling, the capital of the works amounted to £82,000, and the production was 130 million cubic feet, as compared with an original capital of £58,700 and a production of 113 million cubic feet at Dumfries. It had also to be borne in mind that the consumption of gas in Dumfries was going up rapidly. Their capital debt had been reduced to £28,889; and he regarded this as a most satisfactory feature of their works. Thus situated, if they were to spend from £10,000 to £15,000, they would place the gas-works in a position which would enable them to do well, and also to supply cheap gas. In Stirling, with the aid of stoking machinery they were able to effect a saving of £2000 a year; and putting it pretty low in Dumfries, they ought to bring about a saving of £1100 by putting in machinery. The gas supply in Stirling was in the hands of a Company, who were paying a dividend of 10 per cent. per annum; and the price of gas was 2s. 6d., as compared with 2s. 10d. in Dumfries. In Kilmarnock, they had spent £60,000 in putting in new machinery; and at Falkirk, where the production of gas was 207 million cubic feet, the price was 3s. 2d. The Council agreed that the Gas Managers should submit a report and plans of a new retort-house, bench, and coal-store, with stoking machinery, and the probable cost.

The changed position which electric lighting now occupies relatively to gas lighting was illustrated by two incidents which took place in this district this week. In the Cupar Town Council, it is reported, a discussion took place in connection with the electric lighting of the streets. It was stated that the lighting was very unsatisfactory, and that it might be better to go back to gas. The matter was sent back to the Lighting Committee to make investigation. In the Cowdenbeath Town Council there was submitted an offer by the Gas Company to light the streets by gas. Bailie Shand moved that the High Street be lighted by high-pressure gas-lamps, keeping the electric lamps for the side streets. The Council agreed to have a copy of the Gas Company's offer furnished to each councillor, and that the subject of street lighting should be discussed at a future meeting.

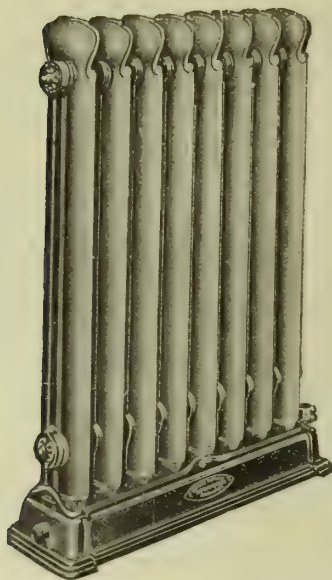
A conference between the Carnoustie Town Council and the Directors of the Carnoustie Gaslight Company, regarding the proposed gas transfer, took place on Thursday. On behalf of the Town Council, Provost Walker intimated that they were prepared to increase their offer for the Company's whole undertaking from £19,580 to £21,000; and he expressed the earnest hope that the shareholders of the Company would favourably entertain this latest offer. Ex-Provost Ramsay, the Chairman of the Directors, stated that the offer would

receive their careful consideration. The conference was a most harmonious and friendly one, and it is stated that a hopeful feeling prevails that the negotiations will end in a transfer being effected.

A somewhat violent explosion of gas took place last night at No. 31, Blythswood Drive, Glasgow. The house is at present closed, and is in charge of a servant who does not live in it, but who has been in the habit of looking in every day to see if all was right. She was in the act of lighting the gas at a gas-alier in the front bedroom when the explosion occurred. By the force of it the woman was thrown down and was badly burned. The interior of the house suffered much damage. Every window was blown out, as were also some in the house above; and the ceiling of the bedroom below was blown down, as well as a window blown out. A slight fire broke out; but the Fire Brigade had no difficulty in extinguishing it.

Although Mr. Mackinnon obtained no support in the Kirkcaldy Town Council in his opposition to the gas transfer there, the opponents of the proposal are not inactive, but have taken to the holding of public meetings in the promotion of their opposition. One of these was held last Monday evening. Mr. John Blyth, J.P., who presided, said he hoped that the interest taken in the gas question through the efforts of Councillor Mackinnon would increase, so that after everybody had considered the matter they would be able, if possible, to prevent the taking over of the gas-works by the Corporation. In the course of an elaborate argument, in which statistics were used freely, the Chairman endeavoured to show that the rate of increase in the consumption of gas in Kirkcaldy had been checked during the past six years, and that the check had been experienced simultaneously with the introduction of electric lighting. In the six years from 1897 to 1902, he said, the increased consumption of gas amounted to 37 million cubic feet, which was equal to 40 per cent.; whereas in the six years since then the increase had been only 7 million cubic feet, or 5 per cent. There was a long discussion, in which Mr. Mackinnon and Mr. Wright, both members of the Town Council, spoke. No resolution was proposed.

Price of Coke at Devonport.—Considerable discussion took place at a meeting of the Devonport Town Council last Thursday on a resolution of the Gas Committee instructing the Gas Engineer (Mr. W. P. Tervet) to supply coke to *bona-fide* Devonport hawkers at 1s. per ton less than the current price. Mr. Daymond contended that the arrangement was unbusinesslike, and that the staff at the gas-works were placed in an awkward position through having to sell coke at prices ranging from 10s. to 16s. per ton. Mr. Harvey thought the present arrangements for selling coke must be intended as a joke. Much of the cheap coke probably went to Plymouth. Alderman Tozer, the Chairman of the Gas Committee, said the sale to hawkers at 1s. less than the current price was to be tried for a month only. That which went to Plymouth was paid for at the rate of 16s. per ton; so that if, as had been suggested, hundreds of tons of coke were going to Plymouth, it was a good thing for the gas undertaking. The Committee looked at the matter entirely from a business standpoint.



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of Radiator buyers was let out a hole or two in favour of the "Steamless" early in the 1908 season. Prejudice was soon dislodged, and the *tolerant* attitude has now given place to an "*All Steamless*" frame of mind.

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A glance at the notes in the margin will serve as a reminder of what we mean.

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CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, Dec. 10.

Demand has been well sustained all through the week, and a further advance in prices has taken place. Dealers having apparently covered the bulk of their requirements for December delivery, the tone hardly seems quite so strong at the close. The values now are £11 5s. to £11 6s. 3d. per ton f.o.b. Hull, £11 6s. 3d. to £11 7s. 6d. per ton f.o.b. Liverpool, and £11 7s. 6d. to £11 8s. 9d. per ton f.o.b. Leith. For January-June next year, £11 10s. per ton f.o.b. Leith is reported as having been paid in several instances, and makers have now raised their quotations for this period to £11 12s. 6d. per ton. So far, however, this action on their part has only resulted in checking further business for the delivery named.

Nitrate of Soda.

This article continues quietly steady at 9s. 3d. per cwt. for ordinary, and 9s. 6d. for 96 per cent. quality on spot; but orders are by no means plentiful.

Tar Products.

LONDON, Dec. 13.

The markets for tar products have been steady throughout the past week. Pitch has been decidedly better in tone, as makers report having been offered an advanced price for January-June delivery, which in most cases they have declined. Business has been done on the east coast at 26s. 6d. On the west coast, pitch is decidedly scarce, and very good figures are reported to have been offered for small lots for near delivery. Continental buyers still appear disposed to withhold their purchasing, believing that the present rise is only temporary; but it is hoped that, in view of the fact that there appears to be a fair quantity to be bought and not very much to be sold, their hopes will be disappointed. Creosote is quiet; and it is improbable that there will be any great improvement in this article for the next few months. Benzol is very firm indeed for prompt delivery, and 6d. has been freely paid in the North for 90 per cent. for both prompt and forward delivery; while in London there is very little obtainable. Good prices are reported to have been paid for 50 to 90 per cent. benzol, which is also very steady. Toluol is firm, although buyers appear to have retired from the market for the present. Solvent naphtha is steady, and there is a good demand for it for the first few months of next year. Carbolic acid is very weak; and crystals appear to be almost unsaleable. Refined naphthalene is quiet; but salts are in good demand.

The average values during the week were: Tar, 13s. to 17s., *ex* works. Pitch, London, 26s. 3d. to 26s. 9d.; east coast, 26s. to 26s. 6d.; west coast, 25s. 6d. to 26s. 6d. f.a.s. Mersey ports, 26s. 6d. f.o.b. others. Benzol, 90 per cent., casks included, London, 6½d.; North, 6d.; 50-90 per cent., casks included, London, 7½d.; North, 7d. Toluol, casks included, London, 9½d. to 9¾d.; North, 9d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3½d. to 4d.; solvent naphtha, casks included, London, 1s. 0½d. to 1s. 1½d.; North,

11½d. to 1s.; heavy naphtha, casks included, London, 10½d. to 11½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east coast, 10½d.; west coast, 10½d. Refined naphthalene, £4 10s. to £8 10s.; salts, 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been firm during the past week, and prices have actually advanced to the extent of 2s. 6d. per ton. The principal Gas Companies report that they have declined £11 10s. for January-June, and ask £11 12s. 6d.; while the ordinary makes could not be secured upon Beckett terms for prompt delivery under £11 2s. 6d. to £11 3s. 9d. In Hull, business is reported to have been done at £11 2s. 6d. to £11 5s.; and in Liverpool, at £11 5s. to £11 6s. 3d. In Leith, manufacturers report having declined £11 7s. 6d. for prompt, and £11 10s. for January-June, and are asking £11 12s. 6d. for the latter period.

COAL TRADE REPORTS.

Northern Coal Trade.

With the better demand for coals that is often found in December, there is also a desire on the part of some users lest there should be difficulty as to working under the Eight Hours Act, which operates in the Northern coalfield after the end of the month. In the steam coal trade, the inquiry is strong; and the price of best Northumbrians is from 11s. 4½d. to 11s. 6d. per ton f.o.b. Second-class steams are 9s. 3d. to 9s. 9d. per ton; and steam smalls vary from 5s. 3d. to 6s. 3d., the latter being a little more abundant. In the gas coal trade, the demand is now at its fullest, and the deliveries on the long contracts are very heavy; so that the output is well taken up. Durham gas coals vary in price from 9s. 6d. to 11s. 1½d. per ton f.o.b., according to quality, for the usual classes, and up to 11s. 6d. for "Wear" specials. In contracts, that for Malmö has been settled for specials, at a price said to be equal to 11s. 6d. per ton f.o.b. A cargo has also been contracted for for Australia, but the prices are not stated. The contract for Stockholm gas-works (120,000 tons), for delivery over next year, has been decided. The price is believed to be equal to about 10s. 6d. per ton f.o.b., which is probably 1s. 6d. per ton more than the average price on the contracts that are now expiring. Gas coke follows the firmness of other kinds, though it is plentiful, and is quoted from 13s. to 13s. 6d. per ton f.o.b.

Scotch Coal Trade.

On account of severe weather, there has been a greatly increased demand for coal for home consumption, with a consequent advance in prices to the extent of from 6d. to 1s. per ton. Foggy weather, how-



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ever, again interfered with transit. The prices now quoted are: Ell 10s. to 11s. per ton f.o.b. Glasgow, splint 10s. 9d. to 11s., and steam 9s. 3d. to 9s. 6d. The shipments for the week amounted to 277,417 tons—a decrease of 46,176 tons upon the preceding week, and of 12,310 tons upon the corresponding week of last year. For the year to date, the total shipments have been 14,321,252 tons—an increase of 647,725 tons upon the corresponding period.

Hastings Gas-Works Flooded.

Last Saturday week and the following day were particularly unpleasant in Hastings—thunder and lightning, torrential rains, and hailstorms, great cold, with intermittent gales of wind, being the prevailing weather conditions. The excessively heavy rain nearly had the effect on the Sunday night of interfering with the town's gas supply. An unprecedented rush of water broke through a dam at the gas-works at Glyne Gap, and flooded the retort-house and coal-store to a depth of a foot. If it had been but a little higher, it might have put out the fires, with calamitous results to the illumination of the streets. The works lie in the bed of a watershed, and to control the flow of water, a large quantity of which is used for the purposes of the works, the Company had erected three dams, and installed a couple of ejectors, capable of pumping 300 gallons a minute. Soon after one o'clock, the extraordinarily large volume of water flowing down broke through one of the dams, overwhelmed the pumps, and then had things all its own way. The men in the retort-house gallantly remained at their posts, though they had to wade about in water over their knees, and were placed under further difficulties by the interference of the inundation with the process of collecting the coal and removing the coke. But there was no interruption of the lighting service; though hampered as the workmen were by the presence of the water in the retort-house and in the coal-stores, the manufacture of the gas was carried on with considerable difficulty. Mr. C. F. Botley, the Engineer-in-Charge at the works, was called up early in the morning, and he at once secured the assistance of the Fire Brigade in coping with the water; and a steamer and a pumping engine were brought into use. Even with these means, it was not until eleven on Monday night that the water was finally pumped away; and work was carried on all last week under the disadvantages and inconveniences caused by the unexpected inrush of water.

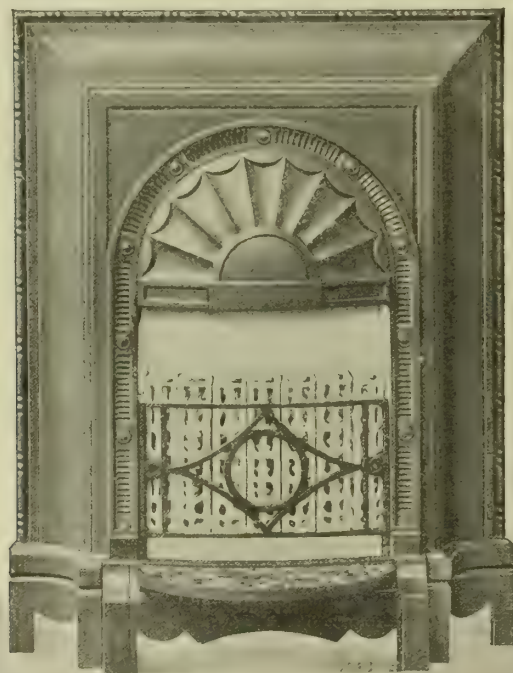
Automatic Public Lighting in Battersea.—The Lighting Committee of the Battersea Borough Council have accepted an offer from the Gas-light and Coke Company to fit the remaining public gas-lamps in their district with the Rostin apparatus, so that the lamps may be lighted and extinguished from the Company's works. At the expiration of four years, a reduction in the charges of 2s. per lamp per annum is to be made for each lamp fitted with the apparatus. The Committee report that 165 lamps in Nine Elms district have for some time been worked by the system, and have proved satisfactory.

Proposed Reduction in Price at Winsford.

The Winsford (Cheshire) Urban District Council had before them last Wednesday a motion by Mr. T. Ivison to reduce the price of gas for lighting and cooking to 3s. per 1000 cubic feet by ordinary meter, and to 3s. 1d. to consumers using slot-meters, with a charge of 2s. 6d. per 1000 cubic feet for power. In submitting his motion, Mr. Ivison said he was a great believer in the consumer having gas at actual cost price. He did not think they ought to make a profit on the works, because after something like 22 or 23 years the ratepayers would have handed over to them property worth probably from £60,000 to £70,000. When the works were acquired by the Council in 1901, the price of gas was 4s. 2d.; and he argued that the reductions which had been made on this figure always resulted in a considerable increase in consumption. Five years ago, when the price was brought down from 3s. 6d. to 3s. 3d., the consumption was 10 million cubic feet; and he estimated that next year they would sell at least 26 millions—it might be considerably more, as their sales had increased during the past four-and-a-half years at the rate of 2 million cubic feet per annum. Last year they made a profit of £1900; and his suggestion was that they should take from this sum £325, representing a reduction of 3d. per 1000 cubic feet on an estimated sale of 26 millions next year. This would leave them £1688, out of which they would be able to repay the loan, and still have £320 for new works and extensions. The chief argument of the opponents of the proposal was that the present was not the right time to make a reduction in price; the suggestion being that the matter be again considered at the end of March, when the Council would have figures showing how the new works were meeting the expected requirements. In the result, the motion was rejected by six votes to four.

Necessity for Deputations.—Speaking at the annual dinner of the local Association of Engineers, the Lord Mayor of Leeds (Mr. W. Penrose Green) referred to the magnitude of the Corporation trading concerns. No private enterprise in the city, he said, could compare with them; and the annual capital expenditure which they involved would give some idea to practical minds of the vast extent of the undertakings. He confessed that at one time he had no great opinion of the men who managed these concerns—not by any means the opinion he ought to have had. Since he had come into closer contact with the work of the Corporation, however, he realized that the men who were managing them were among the smartest men in the city; and when the ratepayers considered how much time these men spent weekly for their benefit, they should at least extend to them their thanks. But of thanks they got little. He often thought that the comparatively small allowances that were made to city councillors when they undertook deputation work were made far too much of, when the size and importance of these trading concerns were considered. Deputations were very necessary if members of the Corporation were to keep abreast of the latest improvements and most up-to-date methods.

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Repair of Pavements Damaged by Leakage.

An important question with regard to the repair of pavement injured by leakage from water-pipes was brought before the Westminster City Council at their meeting last Thursday. The Works Committee reported that the wood pavement in Wellington Street, south of York Street, was found to have subsided on the 10th ult., and on investigation the ground beneath the pavement was discovered to be soft and saturated with water; water also lying on the surface of the subsoil to a depth of about 2½ inches. On the 12th, the City Engineer (Mr. J. W. Bradley, M.Inst.C.E.) served notice on the Metropolitan Water Board, in accordance with section 112 of the Metropolitan Management Act, 1855, requiring them to make good the whole of the damaged pavement; and the Board's men attended on the 13th, excavated the ground, and found on a 4-inch main a leaky joint which they repaired. A requisition from the Board, dated that day, to reinstate an area of pavement 8 ft. by 6 ft., was received by the City Engineer on the 16th ult. The area of pavement damaged measured about 30 ft. by 9 ft., and on receipt of the above-mentioned requisition the Engineer served notice upon the Board that the measurements stated in the requisition were insufficient. The Board having failed to comply with the first notice, and the pavement having become dangerous, it was fenced and watched, and subsequently repaired by the Council's contractors. The Board had not sent any reply to the Council's notices, except the requisition to reinstate the small portion of pavement actually disturbed by them for the purpose of repairing their pipe. The work the Board executed in Wellington Street for the purpose of repairing the leakage of their pipe was not the taking up of a sufficient area of the damaged portion of the pavement referred to in a notice served on the Board by the Council's Engineer on the 12th of November; and the work so done by the Board was not a taking up of the pavement to the satisfaction of the Council. The Committee said they had approved and ratified the acts done by the Engineer, and had referred the case to the Town Clerk, with instructions to take such action as he might deem necessary with regard to the Board's non-compliance with the notice of Nov. 12, and the recovery of the expenses of making good the pavement.

Ashford (Kent) Gas Supply.—At the last meeting of the Ashford (Kent) Urban District Council, it was decided to make a further reduction in the price of gas, of 2d. per 1000 cubic feet, as from the December quarter. At the same time, acting on the report of the Engineer and Manager (Mr. H. R. Turner), further concessions were determined upon to encourage the demand for gas by allowing the free services of a maintenance man to attend to incandescent burners, providing the consumer pays for all materials used. Cookers will be fixed free; an increase in the number of fittings to slot consumers will be allowed; and these consumers will have the privilege of selecting inverted gas-fittings if preferred.

Suffocation by Gas in Soho.

In the Westminster Coroner's Court, on Monday last week, Mr. Troutbeck held an inquiry concerning the death of Mendel Tasselcourt, aged 44, a tailor, who was found suffocated in a house in St. Anne's Court, Dean Street, Soho, on the previous Saturday morning. His son, Alexis, aged 18, was found unconscious; but he is recovering. Dora Tasselcourt stated that the deceased man was her husband. He slept in a small room with one of his sons, and they retired to rest at 12.30 a.m. on Saturday. Fourpence had been put into the gas-meter at 6.30 p.m. on Friday. At seven o'clock on Saturday morning, witness went to call her husband and son, but was unable to make them hear; and on the door being burst open one was found dead and the other insensible. The room was full of gas. The daughter of the previous witness said the only ventilation to the room was a small hole in the top of the door. Witness burst open the door, and discovered that her father and brother were lying on the floor, as if they had tried to get out after finding themselves partially overcome. The gas was escaping from the only burner in the room. Inspector Renfry informed the Coroner that the so-called room in which the two men slept was little more than a cupboard. Its dimensions were 9 ft. by 6 ft. and 8 ft. 6 in. high. A police-constable who was called to the house said the father had been removed to the landing, and the son, who was on a bed, appeared to be lifeless. He resorted to artificial respiration, and succeeded in bringing the lad round. Dr. Edward Clarkson said the constable had used great discretion in his treatment of the lad, who was suffering from poisoning by coal gas; but sleeping in such a box as the room was, would produce illness without any escaping gas. Dr. Freyberger, who made an autopsy, said death was due to suffocation from poisoning by gas. It was stated that there was no defect in either the gas-meter or the burner. A verdict of "Accidental death" was returned.

Gas Profits at Loughborough.—The statement of accounts of the Loughborough Corporation gas undertaking for the half year ended Sept. 30 shows receipts amounting to £7846, made up as follows: Sale of gas, £5646; residuals, £1323; public lamps, £177; and rent of stoves and slot installation, £700. The expenditure totalled £5945, leaving a balance to be carried to the profit and loss account of £1901. The profit on revenue account is £339 more than for the corresponding period of last year.

New South Wales Coal Strike and the Sydney Gas Supply.—Our readers are aware, from the reports which have appeared in the daily papers, that a strike of coal miners is going on in New South Wales, and it is necessarily imperilling the gas supply. According to a telegram recently received through Reuter's Agency, owing to the strike of the coal lumpers, the Union men will not handle the Sydney Gas Company's coal alongside the wharves; and it is feared that the gas supply will cease at the end of the present week.

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Scotch Agent: JNO. D. GIBSON, 2, Causeyside Street, Paisley.

The Cement Industry and the Supply of Coke.

An intimation was given last Friday to the employees of Messrs. Tolhurst and Sons, cement manufacturers, Northfleet, that, owing to a shortage of coke, unless fresh supplies were obtained in a few days, the works would be closed for two or three weeks. Messrs. Tolhurst, whose coke has been supplied by the Gaslight and Coke Company, received a letter from them on Wednesday, stating: "We are faced with a heavy accumulation of craft waiting to load coke at Beckton; and as there is likely to be considerable delay, we shall be glad if you will arrange not to send any more barges into Beckton until we can advise you that the turns will be normal, so as to avoid loss to you through delay, which at present is unavoidable." Messrs. Tolhurst replied: "We have coke to last us about a week, if so long; and unless we can get a supply, our factory will come to a standstill, and all our men will be out of employ." The announcement has caused great anxiety in Northfleet, where there is already much distress.

Quality of Barnet Gas.

At the last meeting of the East Barnet Valley Urban District Council, Mr. Ford moved that a qualified person be appointed to test as often as necessary the gas supplied in the district. As the Council knew, there had been complaints; and to every one a reply was sent suggesting that the Barnet Gas Company should be allowed to fit up a certain kind of burner. Mr. Abbott, the Building Inspector, might be able to make the suggested tests. Mr. Waller, in seconding the motion, said that if it was proved that the gas was deficient in quality, the Company would, no doubt, be prepared to remedy the matter at once. The motion was not brought forward in a spirit of hostility, but of friendliness. Mr. Glass said he had made a number of tests of various systems of lighting, and he believed that, with proper appliances, gas was as good an illuminant as could be obtained. The Company were fully alive to the necessity for supplying good gas; and he was sure the gas in the district was superior to that supplied in other areas. In conclusion, he urged that the matter should be amicably arranged with the Company. The Chairman (Mr. Hasluck) said he had received a letter from Mr. Bancroft, the Company's Engineer and Manager, furnishing the following particulars as to the illuminating power of the gas during the past month: Highest, 17.4 candles; lowest, 16.3 candles; average, 16.7 candles. The Chairman added that the Company were not compelled to supply gas of more than 14-candle power. In the result, the motion was carried, and the Works Committee were instructed to consider the best way of making the tests.

Gas-Stoves Popular at Burton-on-Trent.—The Gas Committee of the Burton-upon-Trent Corporation some time ago decided to fix, free of charge for prepayment consumers, 500 stoves in place of the small grillers previously supplied. The results have been so satisfactory that at the meeting of the Town Council on Wednesday last, it was decided, on the recommendation of the Committee, to purchase 1000 more. The consumption of gas last month was upwards of 2 million cubic feet more than in the corresponding month of last year; and the increase is attributed to the more extended use of gas-stoves.

Scunthorpe and the Gas Supply of Crosby.—A Local Government Board inquiry has been held by Mr. F. J. Willis into an application by the Scunthorpe Urban District Council for powers by Provisional Order to amend their Gas and Water Act, 1899, so as to include the township of Crosby in their area of supply. The only debatable point raised at the inquiry was with regard to an application from Crosby to definitely fix the price of gas. Scunthorpe supply their own consumers at 3s. 4d. per 1000 cubic feet. The Inspector suggested a clause in the Order to the effect that Crosby should pay Scunthorpe 3s. 6½d. per 1000 cubic feet until their consumption rose to 5 millions per annum; and when this amount was reached, they should have it at the same price as Scunthorpe consumers. The parties agreed to this.

The Water Supply of Abercarn.—By fourteen votes to one, the Abercarn Urban District Council have passed a resolution to the effect that they should apply in the next session of Parliament, in conjunction with the Urban District Councils of Abertillery and Risca, or one of them, for a Bill to constitute and incorporate a Water Board and to authorize the Board to construct works for obtaining a supply of water from the Gwynne Fawr and to supply water throughout the urban districts of Abertillery, Abercarn, and Risca, and the portion of the urban district of Mynyddislwyn within the present limits of supply of the Risca Urban Council, and for other purposes; and that the expenses be defrayed in the first place out of the general district rate, and ultimately out of money to be borrowed under the provisions of the Act.

Exmouth Water Bill.—A special meeting of the Exmouth District Council was held last Wednesday to formally sanction the proposed application to Parliament for an Act authorizing the Council to proceed with the extension of the water-works. The Chairman (Mr. W. C. Creedy) proposed the necessary resolution. Mr. Beavis elicited from the Solicitor to the Council that the proposed Bill did not repeal a clause in a former Act which prohibited boring for water in certain places, and said that if the supply from the proposed well at Dotton failed, they could not bore elsewhere, and the whole scheme would be of no use. The Council's hands were tied to this extent, and he liked the present Bill less than the one which was proposed last year. Mr. Harris, the Solicitor, said Parliament would not give the Council or anyone else power to bore for water at unspecified places. The Rev. O. J. Reichel objected that the borrowing powers of the Council were not sufficiently defined in the Bill. By one clause they had unlimited power for borrowing in excess of the £18,000 which was the estimated cost of the scheme. He was also opposed to the proposition to supply places outside the district. If it was necessary to supply a large district with water, it was the business of a Water Company, and not of the Council. Mr. Abell said the supply of places adjacent to the Council's area would not entail any burden on the ratepayers. People taking the water would have to pay the same rate as at Exmouth, and have to bring their pipes to the main. The motion was adopted by 12 votes to 6.

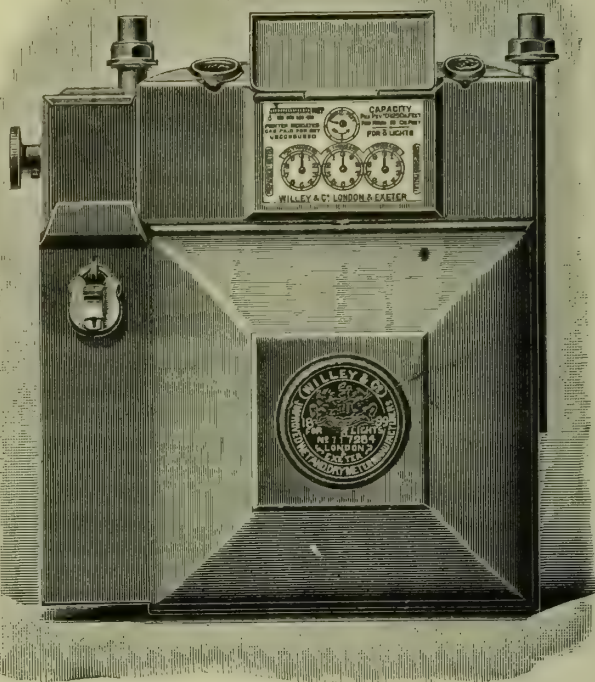
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Praise for the Rotherham Gas-Works Management.

At the eleventh annual tea and concert of the Rotherham Gas-Works Cricket Club, which took place on the 4th inst. in St. George's Hall, Alderman Gummer, J.P., the Chairman of the Gas Committee of the Corporation, who presided, referred in appreciative terms to the management of the gas-works by Mr. J. S. Naylor, the Gas Engineer and Manager. He said that during the last three years the make of gas had increased to the extent of 20 million cubic feet, and the sales by 25 millions; while 12,345 cubic feet of gas had been obtained per ton of coal carbonized, which he believed was the highest record of any gas undertaking in the country. Thanks were due to Mr. Naylor for the able manner in which he had conducted the works, and to the stokers and other employees for their efficient services. The Gas Department was the most important one of the Corporation, and the gas-works had been kept thoroughly up to date; the amount spent on repairs and renewals this year having been £7420. The leakage had been ably tackled by Mr. Naylor. It was very high at the time of his appointment; but it had been reduced by 2 per cent., which meant a saving of 3 million cubic feet of gas per annum. The question had often been asked how it was they could not sell gas as cheaply as Sheffield. But when it was remembered that during the last thirty years close upon £100,000 out of the profits of the gas undertaking had been handed over to the relief of the rates, they would have some idea how it was that gas in Rotherham was dearer than in Sheffield. As the other departments required relief, and as the Gas Department was the only milch cow, they had to find the money. The Borough Auditor (Mr. C. H. Moss, J.P.) said the Chairman, the Manager, and the Chief Clerk (Mr. F. Hyland) were a credit to the Gas Department; and the carbonization record which had been mentioned was extremely creditable to Mr. Naylor and all concerned. Alderman Grundy also spoke approvingly of the management of the gas undertaking.

The Wages Question at the Rochdale Gas-Works.—The Gas and Electricity Committee of the Rochdale Corporation further discussed last Wednesday the application of the labourers at the gas-works for an advance in wages. The previous week (see *ante*, p. 694), the Town Council rejected a recommendation of the Committee that to settle the problem of what wages should be paid to Corporation labourers, a Joint Committee should be appointed representing all departments employing labour. The Committee now decided that in future the wages of labourers at the gas-works should be at the rate of 5½d. per hour, instead of being paid by the day. The decision of the Committee means practically an advance from 24s. to 25s. 6d. a week, inclusive of holiday pay.

The Buenos Ayres Gas Amalgamation.—Our readers are aware that the contract entered into with the Municipality of Buenos Ayres for the fusion with the Primitiva Gas and Electric Lighting Company, Limited, of the River Plate and Buenos Ayres (New) Gas Companies has been ratified; and provisional agreements have been entered into for the acquisition of the whole of the assets of the latter Companies by the former. The necessary meetings for the adoption of these agreements have been convened for next Tuesday. In view of the amalgamation, it is proposed that the Board of the Primitiva Company shall be increased to ten, by the appointment of members of the Boards of the two other Companies concerned; also that their remuneration shall be raised in the first instance to £6200 per annum, to be gradually lowered to £3200 as the number of Directors is reduced to five. In the belief that the fusion of the undertakings will be beneficial to the shareholders of all the Companies, the Board of the Primitiva Company have no hesitation in recommending the shareholders to accept it.

Sale of Stocks and Shares.—At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards placed two new issues of capital by order of Directors. The first lots consisted of "C" £10 shares in the Harrow and Stanmore Gas Company ranking for a standard dividend of 7 per cent., subject to the sliding-scale; the last dividend paid on similar shares having been at the rate of £7 7s. per cent. per annum. They fetched from £14 15s. to £15 2s. 6d. each; the average being £15 os. 3d. The other new issue was 500 £10 new ordinary 5 per cent. maximum shares, and £5000 of 4 per cent. perpetual debenture stock of the Southend Water Company. The dividend on similar shares for the year ended Dec. 31 last was 4½ per cent.; and those offered on Tuesday fetched £10 2s. 6d. and £10 5s. each—the debenture stock selling at £10 1s. to £10 4s. per £100. On the same occasion, some £10 fully-paid ordinary shares in the Lowestoft Water and Gas Company, ranking for a maximum dividend of 10 per cent. per annum, but carrying 7½ per cent., realized £16 to £16 5s. per share; and some additional £10 shares (7 per cent. maximum dividend, but carrying 5½ per cent.), £11 10s. each. These shares were sold for a private owner.

Crowborough and Street Lighting.—A parish meeting has been held at Crowborough for the purpose of deciding whether the Lighting and Watching Act should be adopted; but the result was of a negative character, in spite of the eloquent arguments in favour of a public lighting system. A scheme had been proposed under which a 3d. rate would be necessary for three years. At the expiration of this time, however, the lamps would have been paid for; and then there would only be the cost of gas and the maintenance. One gentleman said that at present it was difficult enough to get gas for the houses; and he did not see how, if 82 public lamps were placed in the streets, the Gas Company were going to supply the requisite quantity of gas. Mr. Irwin A. Cook, the Manager of the Gas Company, stated that during the past summer new plant had been laid down at the works, which would enable the Company to supply gas at any pressure necessary; and he could safely say that, if the street-lamps were put up, it would not affect the pressure to any extent whatever. The Chairman (Mr. W. Froy) remarked that the Gas Company had promised to enter into an agreement to supply gas to the Council at 10 per cent. less than the usual rate, which would bring the price to about 4s. per 1000 cubic feet. On the resolution being put to the meeting, 33 only voted for it; and the Chairman announced that, as only about one-third of those present had voted, the matter would fall through.

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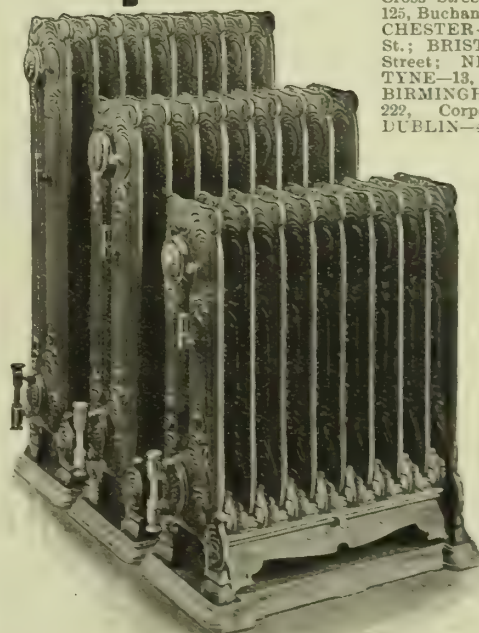
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May's Radiators, Limited, has been registered with a capital of £5000, in £1 shares, to acquire an invention relating to gas-saving appliances and letters patent granted in respect thereof to William May, of 38, Southend Road, East Ham, and to enter into an agreement with him and others.

A serious gas explosion occurred last Friday morning at St. James's Church, New Brighton. Most of the windows were blown out, and extensive damage was done to the organ and the chancel fittings. A defect in the gas-main under the church is supposed to have been the cause of the explosion.

The Cardiff Technical Schools Committee last Thursday received deputations concerning the proposed formation of a class for gas-fitters. A deputation of operative and master plumbers (of which the respective spokesmen were Mr. Lowe and Mr. Sawyer) objected to the teaching of joint-wiping; and Mr. Langford, for the Gas Company, said that, owing to the changes that had taken place in the utilization of gas for

heating and motive purposes, gas-fitters required to know more now than had been previously required of them. After prolonged discussion it was decided to defer the matter until the Committee had obtained the advice of the City and Guilds of London Institute as to what could properly be included in a syllabus for plumbers, and what in a syllabus for gas-fitters.

At the annual general meeting of Messrs. James Milne and Son, Limited, on Thursday, the Directors will report that the net result of the working in the year ended Sept. 30 last, including the balance brought forward, is a loss of £4773. It is explained that, owing to the extreme depression in trade, it was necessary to work at very low prices in order to keep the connection together; and this, coupled with an inevitable reduction of turnover, rendered it impossible to earn any profits. The Directors state that the works and branches are all fully equipped, and able to take advantage of any improvement in trade that may occur.

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SHEFFIELD GASLIGHT COMPANY. Tenders by Dec. 21.

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Steel Roofs, &c.

SHEFFIELD GASLIGHT COMPANY. Tenders by Dec. 21.

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COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

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GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 731.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Oct. 14	7	Alliance & Dublin 10 p.c.	17-18	..	5 11 1	195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
298,955	10	"	7	Do. 7 p.c.	12½-13	..	5 7 8	561,000	Stk.	"	10	Liverpool United A.	223-225	..	4 8 11
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	718,100	"	"	7	Do. B.	166-168	..	4 3 4
200,000	5	Oct. 28	6½	Bombay, Ltd.	5½-6	..	5 8 4	306,083	"	June 25	4	Do. Deb. Stk.	104-106	..	3 15 6
40,000	5	"	6½	Do. New, £4 paid.	4½-4½	..	5 9 1	75,000	5	Nov. 26	6	Malta & Mediterranean.	4½-5	..	6 0 0
50,000	13	Aug. 26	15	Bourne- 10 p.c.	28-28½	..	5 5 3	560,000	100	Oct. 1	5	Met. of 15 p.c. Deb.	99-102	..	4 18 0
311,810	10	"	7	mouth Gas B 7 p.c.	162-163	..	4 3 7	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
75,000	10	"	6	and Water Pref. 6 p.c.	152-153	..	3 16 2	541,920	20	Nov. 11	3½	Monte Video, Ltd.	12½-13	..	5 7 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	253-256	..	4 17 8	1,775,892	Stk.	July 29	4½	Newcastle & Gt. North Con.	106-108	..	4 3 4
300,000	"	"	9½	Do. New	190-192	..	4 19 0	518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	93-94	..	3 14 6
50,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13-13½	..	5 3 8
206,250	"	June 11	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	300,000	Stk.	Nov. 26	8	Oriental, Ltd.	137-139	..	5 15 1
220,000	Stk.	Sep. 10	11	Brighton & Hove Orig.	208-213	..	5 3 3	60,000	5	Sep. 10	8	Ottoman, Ltd.	68-68½	..	6 5 6
246,320	"	"	8	Do. A Ord. Stk.	150-152	..	5 5 3	31,800	53	Aug. 26	13	Portsea Island A.	137-139	..	4 19 0
469,000	20	Oct. 14	10	British	42½-43½	..	4 11 11	60,000	50	"	13	Do. B.	129-131	..	4 19 3
109,000	Stk.	Aug. 26	6	Bromley A 5 p.c.	118-120	..	5 0 0	100,000	50	"	12	Do. C.	120-123	..	4 17 7
165,700	"	"	4½	Do. B 3½ p.c.	88-90	..	5 0 0	114,800	50	"	10	Do. D and E.	101-103	..	4 17 1
82,278	"	"	5½	Do. C 5 p.c.	106-108	..	5 1 10	398,490	5	Oct. 28	7	Primitiva Ord.	6½-7½	..	4 18 3
55,000	"	June 25	3½	Do. 3½ p.c. Deb.	88-90	..	3 17 9	796,980	5	July 29	5	Do. 5 p.c. Pref.	5½-6	..	4 13 0
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	13½-14	..	5 0 0	488,902	100	Dec. 1	4	Do. 4 p.c. Deb.	94-96	..	4 3 4
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	96-98	..	4 1 8	1,000,000	10	Oct. 14	8	River Plate Ord.	16½-17	..	4 14 2
100,000	10	"	—	Cape Town & Dis., Ltd.	3-4	..	—	312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	97-99	..	4 0 10
100,000	10	"	—	Do. 4½ p.c. Pref.	5½-5½	..	—	250,000	10	Sep. 29	8	San Paulo, Ltd.	14½-15	..	5 6 8
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	47½-48½	..	6 3 9	62,500	10	"	5	Do. 6 p.c. Pref.	11½-12½	..	4 16 2
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82-84	..	5 7 2	125,000	50	July 1	6	Do. 5 p.c. Deb.	51-52	..	4 6 2
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	108½-110½	..	4 10 6	135,000	Stk.	Sep. 10	10	Sheffield A.	230-232	..	4 6 2
1,493,280	Stk.	Aug. 26	5½	Commercial 4 p.c. Stk.	103-111	..	4 13 8	209,981	"	"	10	Do. B.	230-232	..	4 6 2
560,000	"	"	5	Do. 3½ p.c. do.	103-105	..	4 15 3	523,500	"	"	10	Do. C.	230-232	..	4 6 2
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	70,000	10	Oct. 14	10	South African	12½-12½	..	7 16 11
800,000	Stk.	Dec. 10	5	Continental Union, Ltd.	95-97½	..	5 3 1	6,429,895	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	119-121	..	4 8 1
200,000	"	"	7	Do. 7 p.c. Pref.	127-129	..	5 0 9	1,895,445	"	July 14	3	Do. 3 p.c. Deb.	81-83	..	3 12 3
492,270	Stk.	"	5	Derby Con. Stk.	131-123	..	4 1 4	209,823	Stk.	Aug. 26	8	South Shields Con. Stk.	160-162	..	4 18 9
55,000	"	Oct. 2	4	Do. Deb. Stk.	103-105	..	3 16 2	605,000	Stk.	Aug. 12	5½	S'th Suburb'n Ord. 5 p.c.	119-121	..	4 10 11
148,995	"	July 14	5	East Hull 5 p.c. Ord.	97-99	..	5 1 0	60,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
486,090	10	"	12	European, Ltd.	24½-25	..	4 16 10	117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	122-124	..	4 0 8
354,060	10	"	12	Do. £7 10s. paid.	18-19	..	4 14 9	502,310	Stk.	Nov. 11	5	Southampton Ord.	109-111	..	4 10 1
15,141,545	Stk.	Aug. 12	4½	Gas 4 p.c. Ord.	102½-103½	..	4 10 1	120,000	Stk.	Aug. 12	6½	Tottenham A 5 p.c.	133-135	..	5 1 9
2,600,000	"	"	3½	light 3½ p.c. max.	87-89	..	3 18 8	453,940	"	"	58	and B 3½ p.c.	111-113	..	4 15 3
3,799,735	"	"	4	Do. 4 p.c. Con. Pref.	103-105	..	3 16 2	149,470	"	June 25	4	Edmonton 4 p.c. Deb.	100-102	..	3 18 5
4,193,975	"	June 11	3	Coke 3 p.c. Con. Deb.	82-84	..	3 11 5	182,380	10	June 11	8	Tuscan, Ltd.	9-9½	..	8 6
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	92-94	..	5 6 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	101-102	..	4 18 0
82,500	"	"	6½	Do. do. 5 p.c.	117-119	..	5 9 3	236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	110-112	..	4 9 3
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	17½-18	..	6 2 3	255,636	Stk.	Aug. 26	6½	Wands- B 3½ p.c.	139-141	..	4 14 0
131,070	Stk.	Sep. 10	6½	Ilford A and C	144-146	..	4 9 0	79,416	"	June 25	3	Do. 3 p.c. Deb. Stk.	73-75	..	4 0 0
65,780	"	"	5	Do. B	108-110	..	4 10 11	895,872	"	Aug. 12	5½	West Ham 5 p.c. Ord.	123-125	..	4 0 0
55,500	"	June 25	4	Do. 4 p.c. Deb.	102-104	..	3 16 11	210,000	"	"	5	Do. 5 p.c. Pref.	127-129	..	3 17 6
4,940,000	Stk.	Nov. 11	8	Imperial Continental	175-177	..	4 10 5	253,300	"	June 25	4	Do. 4 p.c. Deb. Stk.	108-110	..	3 12 9
1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	94-96	..	3 12 11								

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Town Clerk.

Oldham, Dec. 2, 1909.

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Tenders, endorsed "Tender for Tar," to be addressed to
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4, Chapel Walks, MANCHESTER, not later than the 21st
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Manchester, Dec. 7, 1909.

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later than the first post on Tuesday, the 21st day of
December.

WM. HAMBY,
Secretary.

Commercial Street, Sheffield,
Dec. 1, 1909.

CITY OF CHICHESTER GAS COMPANY.

NOTICE is Hereby Given, that the
TRANSFER BOOKS of the FOUR PER CENT.
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to the 31st of December, 1909, both inclusive.

By order,
VICTOR V. VICK,
Secretary.

Offices: Stockbridge Road,
Chichester, Dec. 9, 1909.

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COMPANY.

NOTICE is Hereby Given, that the
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on the 24th of December, 1909, and RE-OPENED on
the 1st of January, 1910.

By order of the Board,
ERNEST W. DREW,
Secretary.

6 & 7, Queen Street,
London, E.C., December, 1909.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the
TRANSFER BOOKS of this Company, relating
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By order of the Board,
WILLIAM E. ROBERTS,
Secretary.

63, Chancery Lane, W.C.,
Dec. 14, 1909.

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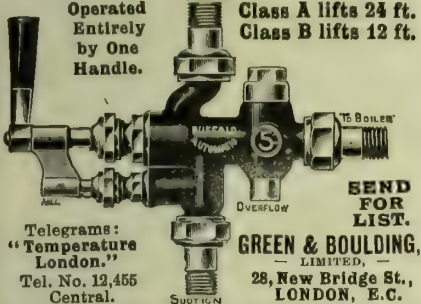
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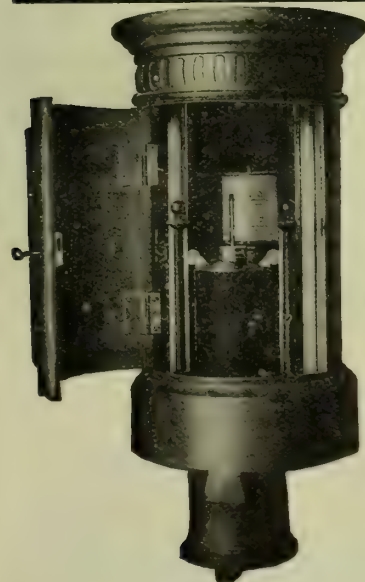


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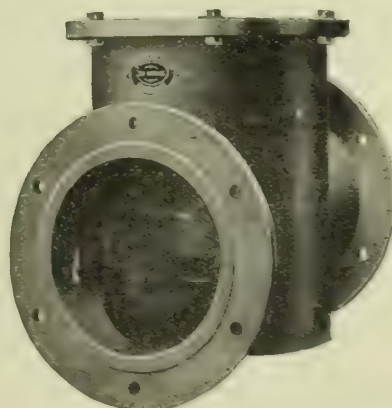
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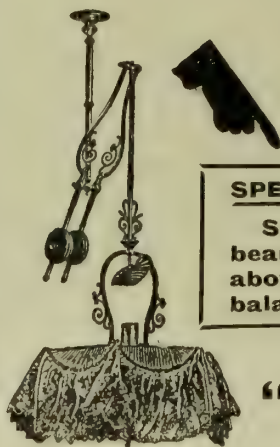
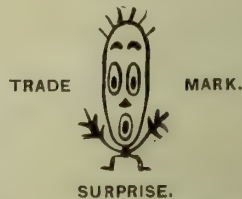
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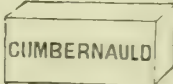
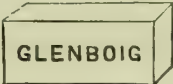
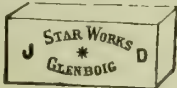
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

THE GLENBOIG UNION FIRE-CLAY CO., LTD.

GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

TRADE
MARKS.



The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.
The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

GAS-RETORTS, FIRE-BRICKS,
BLOCKS, &c., &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undertaken we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analysis where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

DEAR SIRS,

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	8.03	3.49
Silica, combined	43.20	49.77
Alumina	36.55	42.10
Ferric oxide	1.80	2.08
Titanic oxide	1.30	1.50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0.92	1.06
Loss on Ignition	13.20	—
	100.00	100.00

PHYSICAL RESULTS.

Density	2.65
Volume weight	1.90
Porosity	15.4 %
Linear shrinkage at 100° C.	3.70 %
" " " 1050° C.	4.76 %
" " " Total	8.46 %
Volume shrinkage at 100° C.	10.7 %
" " " 1050° C.	12.6 %
" " " Total	23.3 %
Plasticity	20.0 %
Fire Stability	1850 C. equiv. to 3362 F.

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,
JOHN T. NORMAN.



To Gas Companies and Corporation Gas-Works.
GAS STOVE RENEWAL PLANT.
SAVE YOUR COOKERS.

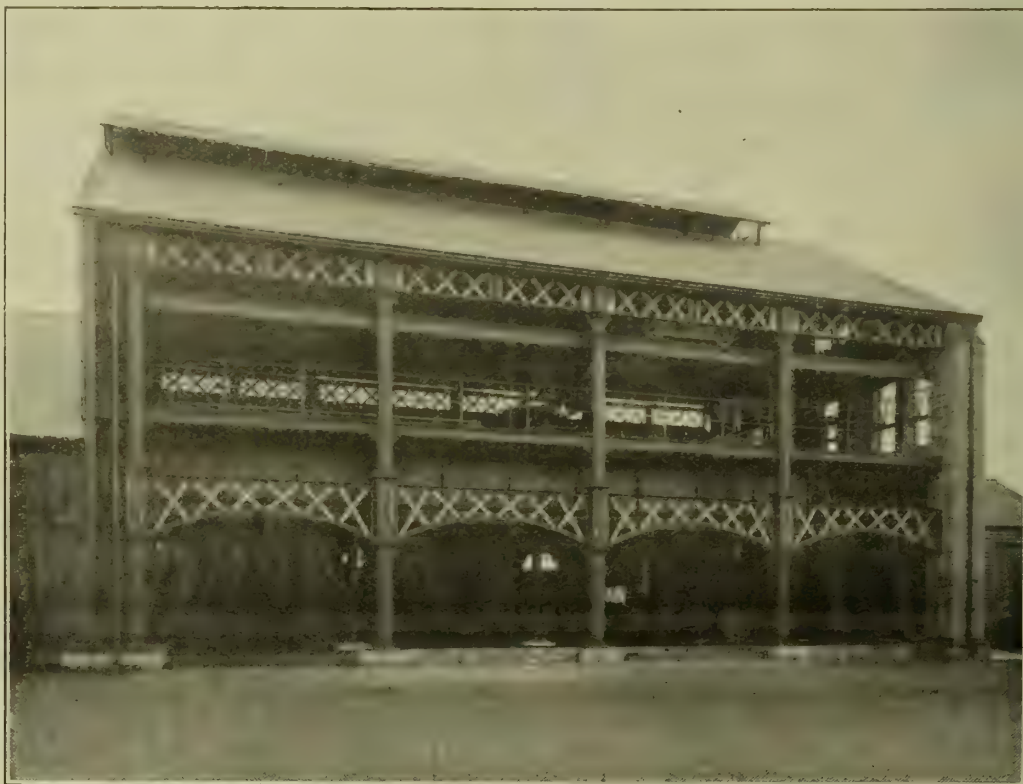
Make them into **NEW ONES** with the
Bambridge Patent Flexible Shaft Co.'s Outfits.

No Experienced Labour Required.

After the Grease is removed, Stoves can be Cleaned and Polished
equal to New. With a saving of at least **75** per cent. of the usual Cost.



BAMBRIDGE PATENT FLEXIBLE SHAFT COMPANY, LTD.,
KETTERING, ENGLAND.



BEDFORD GAS-WORKS—T. DANN, Esq., Engineer.

Purifiers 30 ft. by 25 ft.

Milbourne's Patent

**Valves.
 Cover Fasteners.
 Discharge Shoots.**

C. & W. WALKER, LTD.,

DONNINGTON, NEWPORT, SALOP.
 London Office: 110, CANNON STREET, E.C.

THE SILICA FIRE-BRICK COMPANY,
BOUGHTIBRIDGE.

RADIATE MORE HEAT

BY USING

SILCO BRICK RETORTS.

SILCO BRICKS prevent all settling of setting.

SILICA BRICKS for Combustion Chambers, any shape.

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RAHAM,

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MORTON
& CO.,
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Telephone:
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Horizontal Retort
Benches.**

CONTRACTORS TO
The Vertical Retort
Syndicate, Ltd., London,

FOR ALL THE
BRICKWORK

IN THE

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**VERTICAL RETORT
INSTALLATIONS.**

COAL CONVEYING

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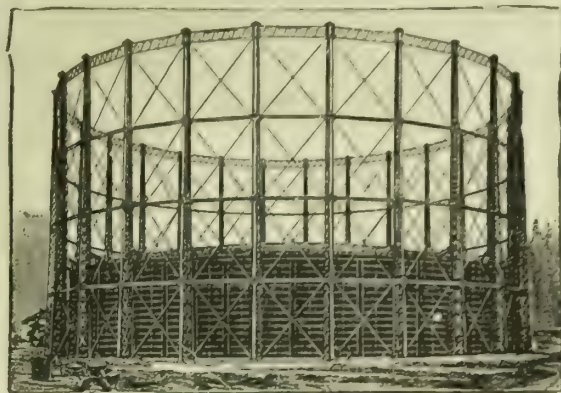
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CONVEYORS,

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BIRMINGHAM.



Triple Lift Gasholder, 212 ft. 6 in. diameter by 45 feet Lifts, erected at Garston, Liverpool.

Manufacturers
and
Erectors of

GASHOLDERS.
GAS PLANTS.
STEEL PIPES.
STEEL TANKS.
CONSTRUCTIONAL STEEL
WORK.

**HUMPHREYS & GLASGOW'S CARBURETTED
WATER-GAS PLANTS.**

Aggregate capacity of Plant supplied
227,800,000 cubic feet daily.

"RAPID" MANUAL AND POWER CHARGING MACHINES.

SIMPLE AND INEXPENSIVE.



"RAPID" MANUAL CHARGER AND SCOOP CARRIAGE WORKING AT BRENTWOOD GAS-WORKS, ESSEX.

**INCREASED
YIELD OF GAS
and
REDUCTION
OF FUEL
CONSUMPTION.**

WRITE FOR PARTICULARS
to

BIGGS, WALL & Co.,
Gas Engineers,
13, CROSS STREET,
FINSBURY, E.C.,
LONDON.

Also for name of Works where you
can see Machines in operation.

COAL TAR PRODUCTS.

Benzol, Toluol, Solvent Naphtha, Creosote Oils, Grease Oils, Carbohc Acid, Dark Cresylic Acid, Granulated (Crude) and Sublimed Naphthalene, Anthracene, Refined Tar and Pitch. Sulphate of Ammonia up to 20·75 per cent. Nitrogen.

For Prices apply to the **SOUTH METROPOLITAN GAS COMPANY,**

Works: **ORDNANCE WHARF,**

709, OLD KENT ROAD, LONDON, S.E.

EAST GREENWICH, LONDON, S.E.

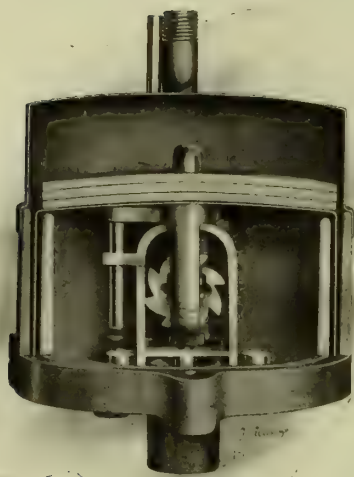
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The "A. & M." Patent Automatic Gas Apparatus for Street Lighting.

Small.
Simple.

Efficient.
Cheap.

CONTROLLED FROM THE GAS-WORKS.



SECTIONAL DIAGRAM. HALF FULL SIZE.

Saves Labour, Gas, Mantles, and Glasses.

Can be brought into action at any hour.

Requires no Winding.

Can Extinguish Different Lights at Different Times as required.

Nothing but Metal in it. No Leather, no Rubber, no Glass.

Has Stood the Test of Years.

Is "All British." Nothing Made Abroad.

ALDER & MACKAY,

EDINBURGH, BRADFORD, BIRMINGHAM, and LONDON.

ESTABLISHED 1850.

The Name of

MOBBERLEY & PERRY, STOURBRIDGE,

LIMITED,

on Gas Retorts and Fire-Clay Goods

is a

GUARANTEE OF BEST STOURBRIDGE QUALITY.

Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

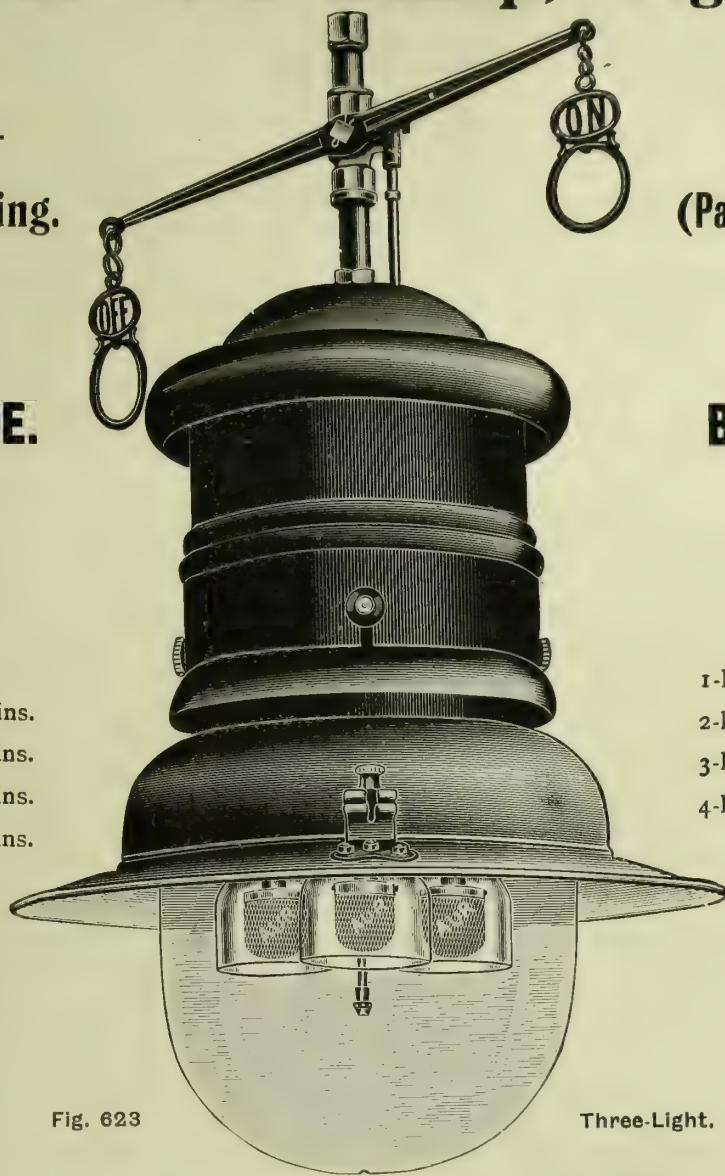


Fig. 623

Three-Light.

Height over all.

1-light . . .	1 ft. 8 ins.
2-light . . .	2 ft. 4 ins.
3-light . . .	2 ft. 4 ins.
4-light . . .	2 ft. 7 ins.

Width over all.

1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 5 ins.
3-light . . .	1 ft. 5 ins.
4-light . . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	29 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6
Case contains . . .	80	18	18	12	Welsbach Mantles, each		6d.	subject as usual.	Not made

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.
Welsbach House, 344-354, Gray's Inn Road, London, W.C.

Telegrams and Cables: "WELSBACH LONDON."

Telephone 2410 NORTH.

CONTINUOUS CARBONIZATION

**GLOVER-WEST
PATENTS.**

IN

**VERTICAL
RETORTS**

*Description and
Particulars of Tests
will be forwarded
on request.*

COST OF LABOUR

REDUCED TO

2 $\frac{3}{4}$ d. PER TON OF COAL CARBONIZED.

See "JOURNAL OF GAS LIGHTING," Nov. 2, 1909.

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104, QUEEN VICTORIA STREET,
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Engineers,

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No. 14,406 London (Central).

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Imitation is the sincerest Form
of Flattery.



Tubes of other Origin are often Sold as

MANNESMANN TUBES,

But none are Genuine if they do not bear
our Trade Mark as per above facsimile.

THE
BRITISH MANNESMANN TUBE CO.,
LTD.,
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Makers of
WELDLESS STEEL SPIGOT and FAUCET, SCREWED
and SOCKETTED, FLANGED, &c., TUBES, TUBULAR
LAMP POSTS, DRUMS, &c.

CLEANING COOKERS AND LANTERN REFLECTORS

Undoubtedly the Finest and Best Preparation on the
Market for **quickly** removing Burnt Grease from
the Enamelled Lining of Cookers and Cleaning
Lantern Reflectors is

Clarks "GASCOLITE."

(Registered Trade Mark.)

Can either be applied with a Brush, allowed to
stand, Cold, for a few hours, or with Heat for about
Half-an-Hour, when Liners and Reflectors can be
washed off with Hot or Cold Water and will appear
as **new**, or, **put into Tanks** with **Boiling**
Water, when Liners and Reflectors will be cleaned
in about 20 Minutes.

In cases where a **steam pipe** is connected to
bottom of tank, stoves or liners can be **perfectly**
cleaned in 5 to 10 minutes.

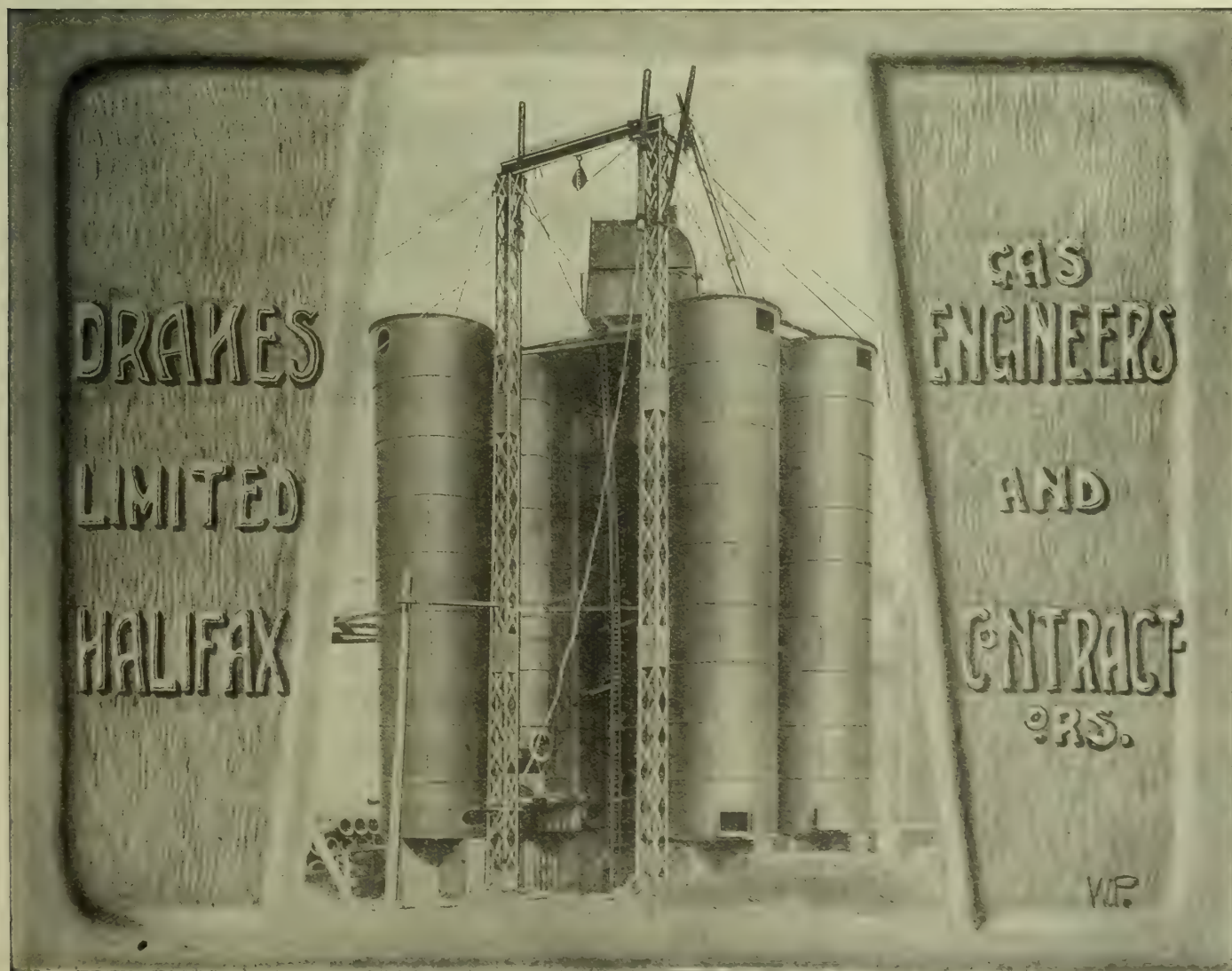
This Result can only be obtained at **lightning**
speed by using "**Gascolite**."

Now being used successfully by Gas Companies
throughout the United Kingdom and Abroad.

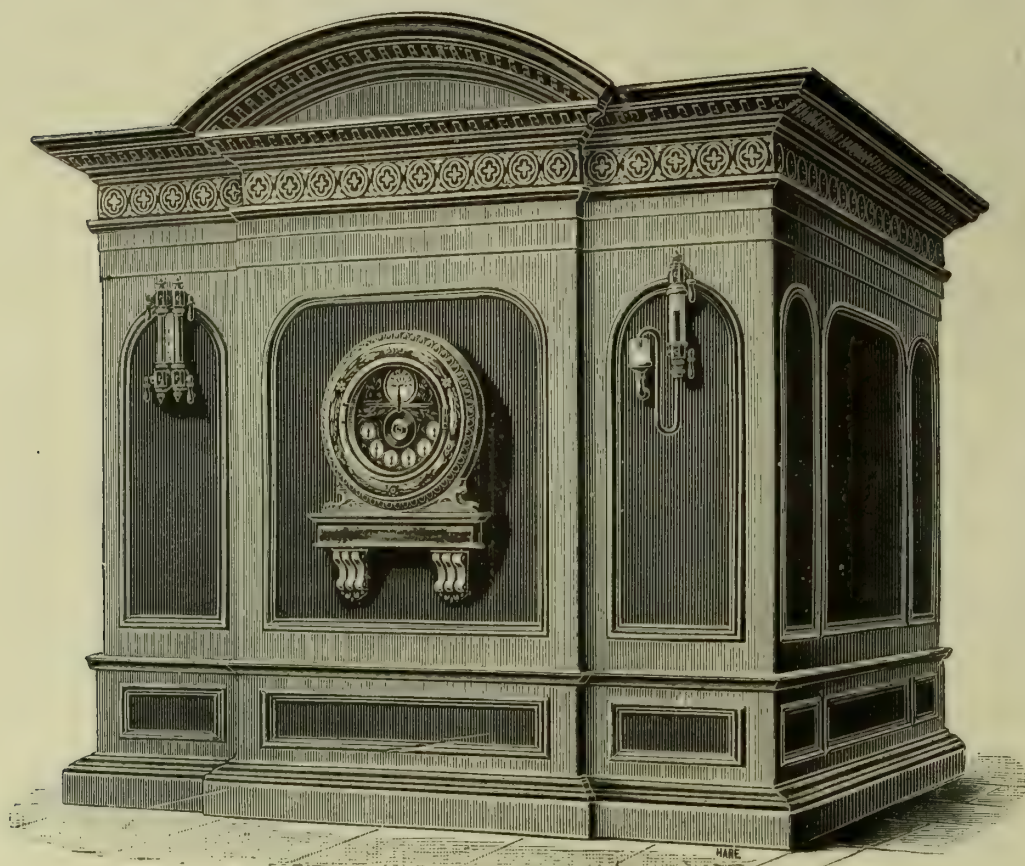
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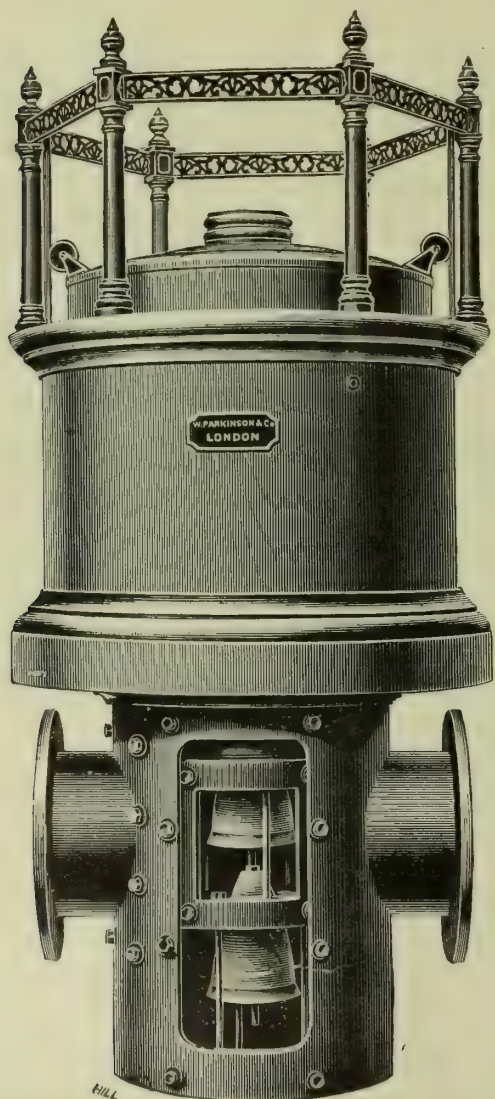
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PARKINSON'S PATENT EQUILIBRIUM GOVERNORS.

**Specially adapted for High
Pressures.**

**FITTED WITH SIX COLUMNS and GIRDERS.
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WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CVIII. No. 2432.]

LONDON, DECEMBER 21, 1909.

[61ST YEAR. PRICE 6d.

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SAFETY GAS-MAIN STOPPER,

FOR SHUTTING OFF GAS IN MAINS
TEMPORARILY DURING ALTERA-
TIONS AND REPAIRS.



GAS-LEAK INDICATORS,

With all Latest Improvements.

SHORT'S IMPROVED
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For Ground Use, Flush Boxes, &c.
For Purifier Blow-off Valves.

Highly Sensitive. Long Range.
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ANY PATTERN MADE INTERCHANGEABLE WITH THE PART NOW IN USE.

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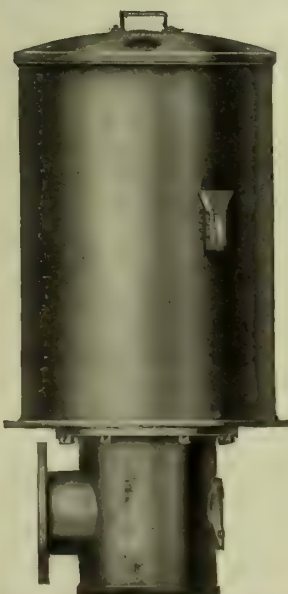
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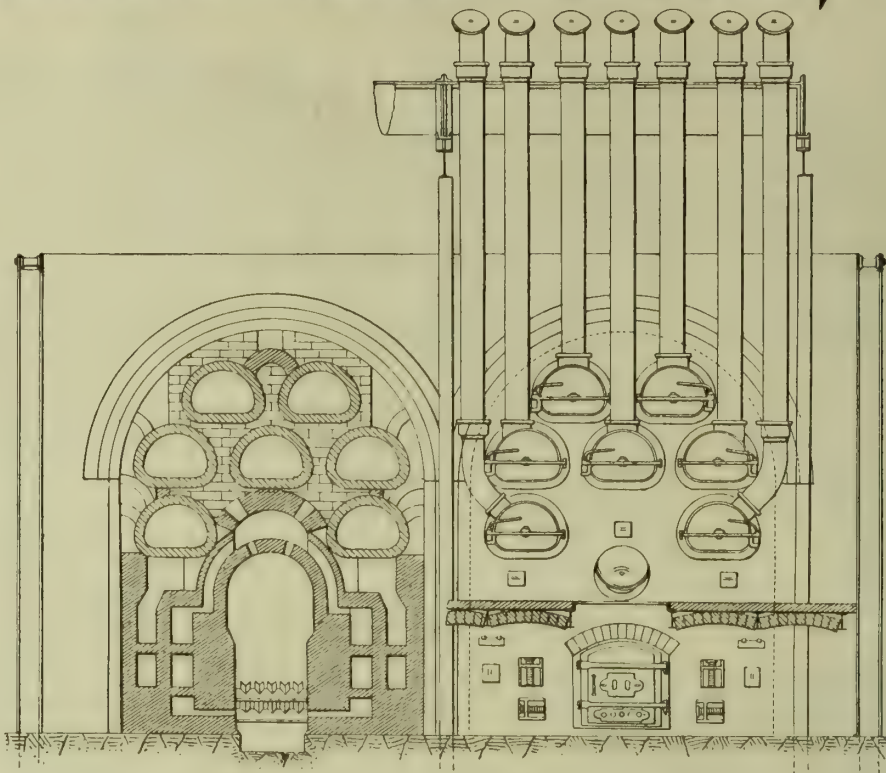
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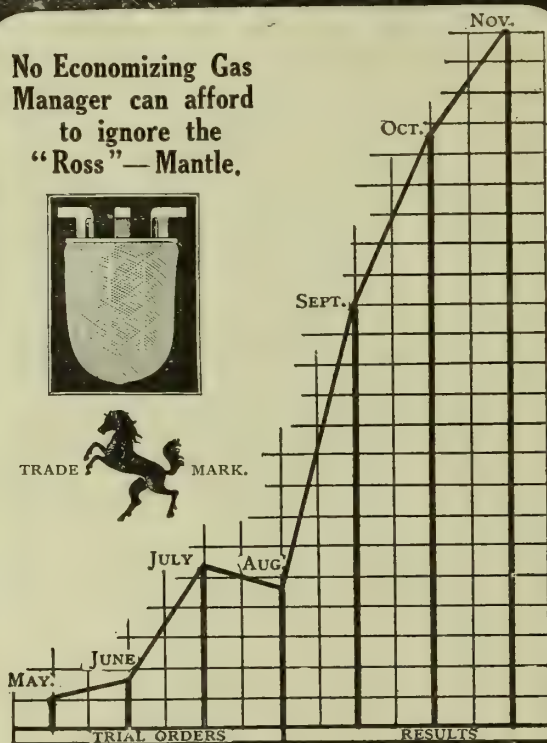
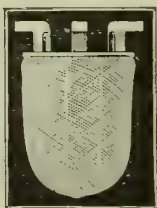


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No Economizing Gas
Manager can afford
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This diagram of monthly Sales shows the success of the "Ross" Patent Mantle since we first brought it to the notice of the British Gas Companies in May last. The curve speaks for itself.

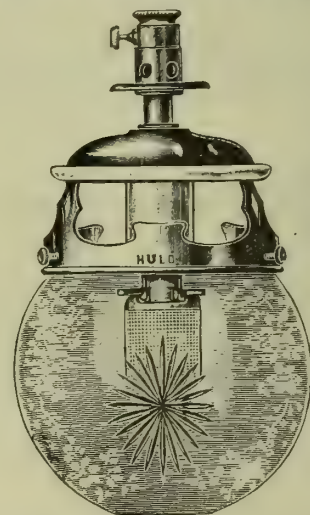
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Our "HULO" INVERTED BURNER

Heavy
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Brilliant
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FURTHER IMPROVEMENTS BUT
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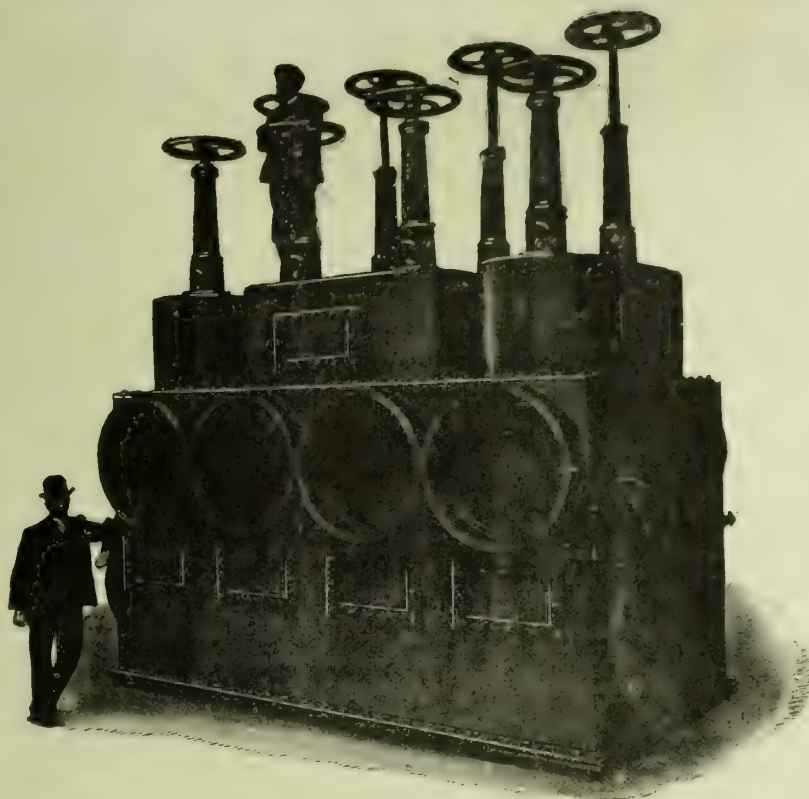
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PATENT COIN PREPAYMENT GAS-METER

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The Inverted Burner has met with great success, but it has by no means

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The Lucas Light was the first and original self-intensive high-power lamp, and its steady sale to-day proves its value.

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No high pressure required.

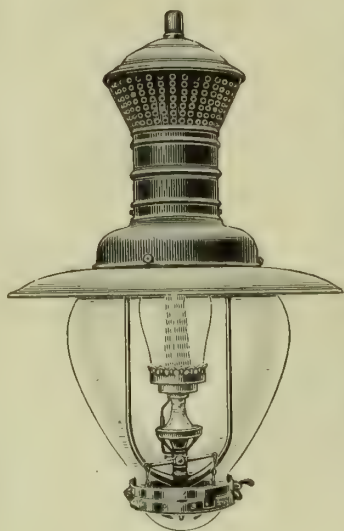
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The "Lucas" is the best lamp for Public Halls, Factories, Workshops, Streets, Railway Stations, &c., and the prices compare favourably with those of any similar type of lamp.

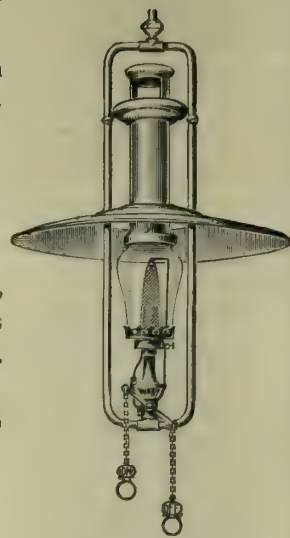
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Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Workop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

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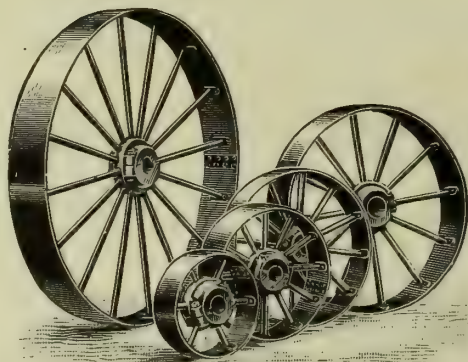
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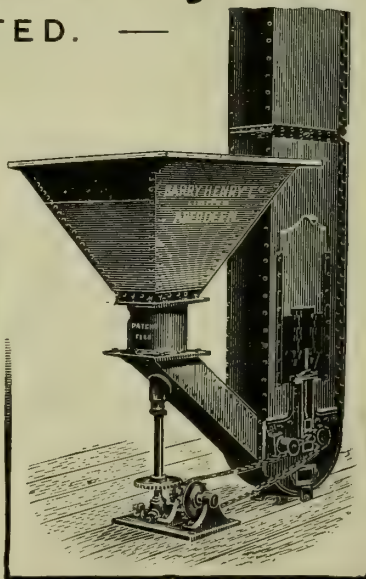
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STRUCTURAL IRON AND STEEL WORK.
SCRUBBING AND PURIFYING
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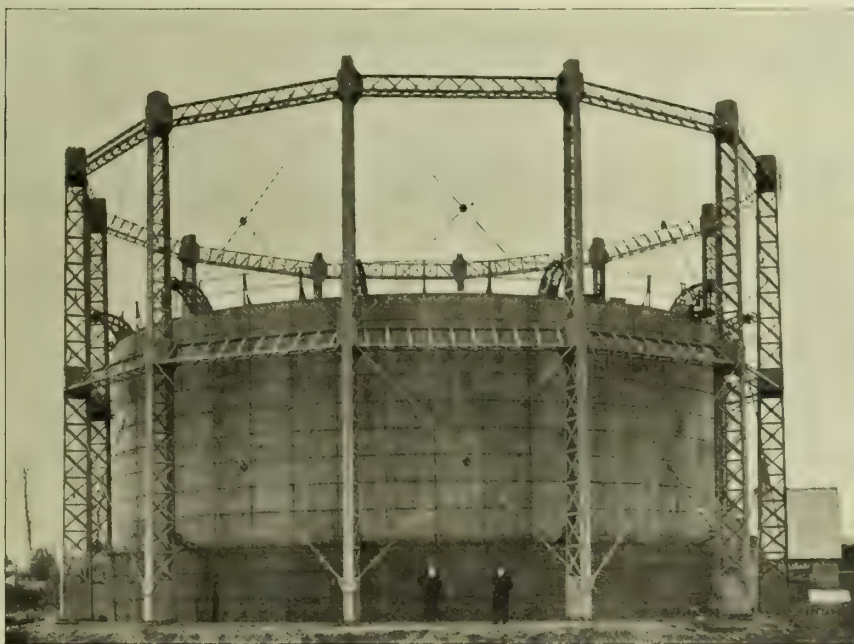
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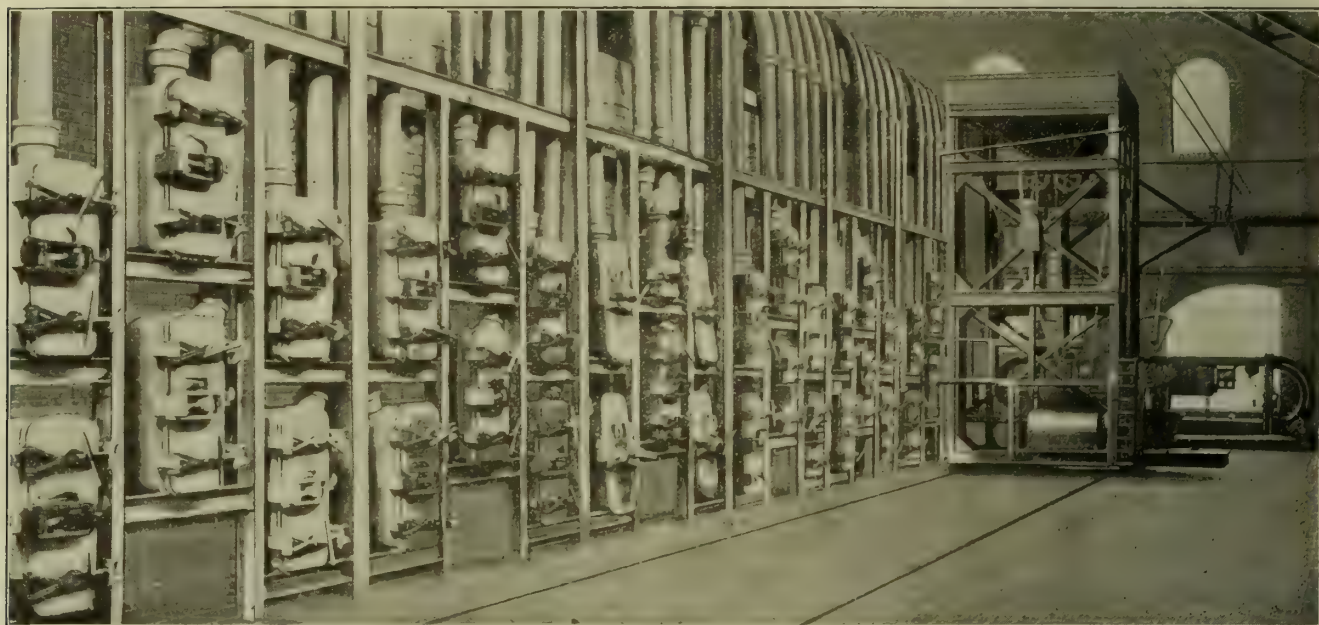
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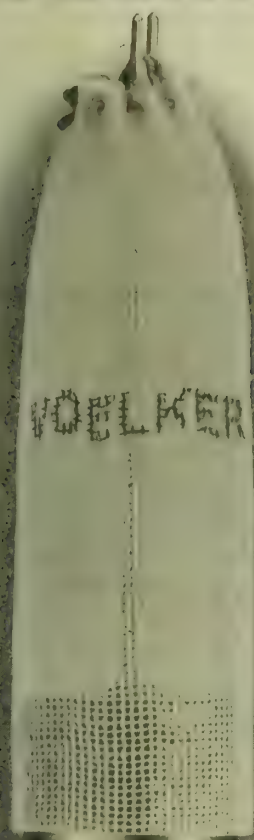
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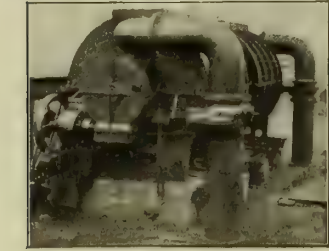
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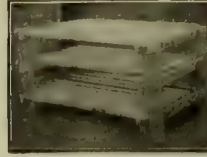


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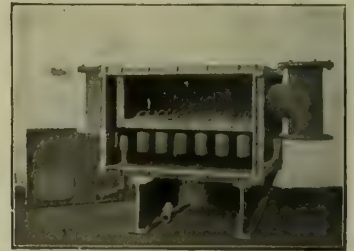
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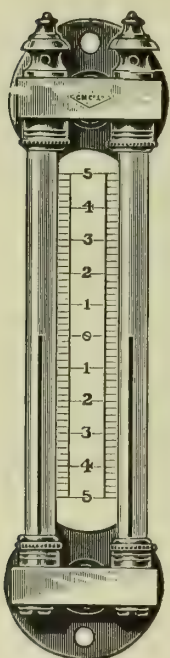
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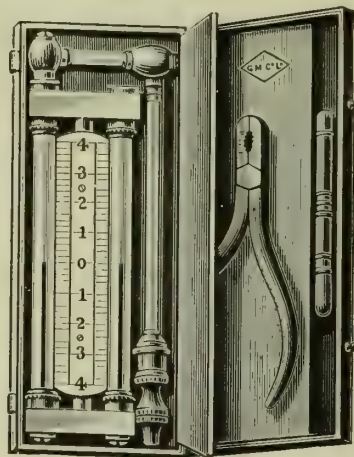
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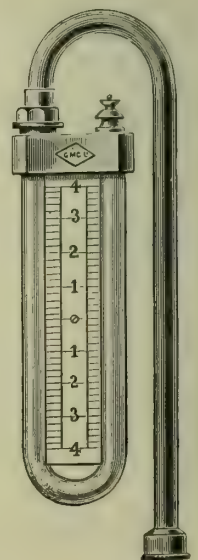
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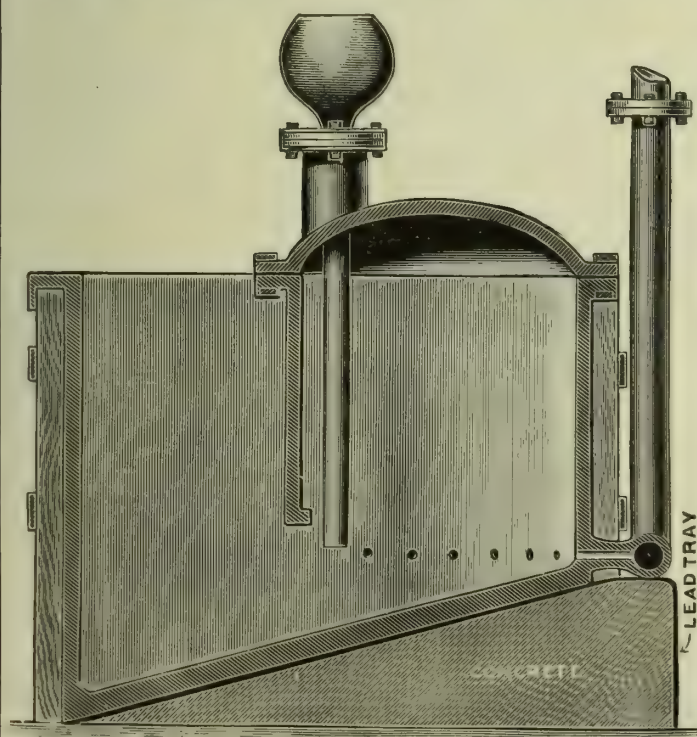
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Birmingham . . .	1,500,000	Haarlem, Holland . . .	850,000	St. Albans . . .	700,000
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Bournemouth . . .	1,000,000	Hebden Bridge . . .	200,000	Santiago de Cuba . . .	400,000
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Bremen, Germany . . .	550,000	Holyoke, Mass. . .	600,000	Schwelm, Westphalia . . .	100,000
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Bridgwater . . .	200,000	Ipswich . . .	750,000	Southampton (2nd) . . .	500,000
Bridlington . . .	150,000	Kampen, Holland . . .	350,000	Southampton (3rd) . . .	600,000
Bridlington (2nd) . . .	200,000	Kiel, Sleswig . . .	1,000,000	Southgate . . .	400,000
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Brussels-Anderlecht (2nd) . . .	350,000	Lea Bridge (3rd) . . .	400,000	Stockholm . . .	1,500,000
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Brussels-St. Josse . . .	1,000,000	Leiden (2nd) . . .	575,000	Stockport (3rd) . . .	400,000
Brussels-St. Josse (2nd) . . .	600,000	Leigh, Lancs. . .	350,000	Stockton-on-Tees . . .	500,000
Brussels-Ville . . .	750,000	Lemberg, Galicia . . .	260,000	Swansea . . .	750,000
Brussels-Ville (2nd) . . .	750,000	Lemberg (2nd) . . .	500,000	Swansea (2nd) . . .	1,000,000
Brussels-Ville (3rd) . . .	1,500,000	Liège, Belgium . . .	1,000,000	Swansea (3rd) . . .	450,000
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EDITOR & PUBLISHER: WALTER KING.

OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CVIII., No. 2432.—TUESDAY, DECEMBER 21, 1909.

EDITORIAL NOTES—GAS, &c.

The Hamburg Holocaust.

THE further particulars of the great gasholder disaster at Hamburg which are given in another column of to-day's "JOURNAL," convey two items of information which all our readers will receive with sincere thankfulness. The first is that the loss of life and limb is given by the "Journal für Gasbeleuchtung" at a lower figure than that quoted by us from the daily press last week. The number of lives lost is now stated to have been eighteen; and the number of persons seriously injured is reduced to about twenty-three. Heavy though the sacrifice of human life still remains, we rejoice to be able to correct the earlier reports which made it much heavier. The second welcome item of news is that Mr. E. Körting of the Imperial Continental Gas Association has been chosen by the Public Prosecutor to assist in the inquiry into the cause of the disaster, apparently in a capacity similar to that of a technical assessor or adviser of the judge in an English court of law. The choice is a happy one, for few gas engineers in the world, and probably no one of his colleagues among German gas men, have had so cosmopolitan a training and experience in gas-works construction and maintenance. His ability and sound judgment should go far towards ensuring the origin of the disaster being clearly revealed by the official inquiry.

While we must await the technical evidence to be given at the inquiry before presuming to form a definite opinion as to the cause of the accident to the large new gasholder, certain facts already stand out in the reports of the occurrence which admit of certain conclusions, and no other, being drawn. It now seems clear that gas first escaped from the gasholder through a rift in the ceiling of the vault or chamber in the interior of the tank. Whether the structural material of this ceiling was mainly concrete and reinforced concrete, or whether steel sheets were also used, we are not certain; but whatever the material, it appears that this ceiling carried a layer of water about 6 inches in depth, to ensure it being tight to gas. It also had to bear the pressure thrown by the gasholder when full of gas, which was equivalent to nearly 11 inches of water. The total pressure on the roof of the vault was therefore equivalent to that of a layer of water about 17 inches deep, or to about 88 lbs. per square foot of surface. The approximate diameter of the circular roof, on which there was this pressure, was 230 to 240 feet. What construction was adopted for supporting the roof is not yet known to us in any detail. But it is now certain that, through fault of design or of execution, the roof gave way and the gas poured through the gap into the vault. It is unnecessary to seek far for a source of light at which the immense volume of escaping gas would be ignited, for the vault appears to have housed a kitchen and a canteen. The consequences of the ignition of the gas have already been told. The one outstanding fact is that this type of construction of a gasholder tank of large dimensions is in virtue of these consequences, if for no other reason, henceforth not merely doomed, but damned.

We do not know definitely on what grounds the authorities of the Hamburg gas undertaking decided to erect their new large gasholder in an elevated annular tank partly in steel and partly in concrete. A railway could have been carried round the tank instead of beneath it; and if the diameter had been thereby reduced by a few feet, the height of the gasholder could have been extended to maintain the desired gas storage capacity. The canteen and kitchen are hardly worth consideration in this connection, especially as it appears that, with what now seems a preternatural sense of fitness, the authorities had devoted most of the vault or interior chamber of the tank to the storage of fire-bricks! Herr Scheuss, the German patentee of the type of tank construction adopted, affords us a clue to the reason which

probably chiefly determined its choice in this case, in that he claims in his patent specification that this construction is less costly than others. The cost of the Hamburg gasholder, exclusive of the cost of the foundations, works out at almost exactly £7 per 1000 cubic feet of gas. Large gasholders have certainly been constructed in this country at a lower cost per 1000 cubic feet of storage space; but it may be admitted that the Hamburg cost was not high. The economy, if any, of the special type of tank construction, however, has been, as the events have turned out, very dearly bought at Hamburg.

Standard Burner Bills.

COPIES of the three Bills through which some 47 Gas Companies (including 49 undertakings, counting the three represented by the British Gaslight Company) are proposing to obtain the consent of Parliament to the substitution of the existing standard burners by the "Metropolitan" No. 2 burner have been forwarded to us by the Parliamentary Agents (Messrs. R. W. Cooper and Sons). One change—that of burner only—is all that is sought through the measures. There is no proposal for altering the nominal standard illuminating power of the gas mentioned in the Acts of the Companies concerned. The claims to the substitution of the new standard burner for old ones are modestly stated in the preamble of the Bill; but there is much more that can be put forward by way of emphasizing the points there presented, should it be necessary to produce evidence to meet any opposition that may arise. At present there is not much talk of hostility. There has been some; but this has been apparently started by reading somewhat ancient writings in regard to the questions of illuminating power and testing, without having regard to the more recent parliamentary history connected with the subject. As we have said on previous occasions, Parliament has already shown that it is not now going back on its consistent practice, in this matter of the standard burner, during the past four sessions, nor is Parliament now going to repudiate the advice of the Board of Trade Committee presided over by Lord Rayleigh, and that of the Metropolitan Gas Referees. Nor will Parliament—they refused to do so in the case of Coatbridge last session—impose a dual standard of quality for gas. It must be either one or the other, not both, unless a Company agree. The functions of Parliament do not, or ought not, to include the meting out of injustice; nor is it right of any local authority to expect Parliament to do so. One commodity, one parliamentary standard by which quality is adjudged. That is sufficient; and the principle has ruled through the history of gas lighting since a penal standard test was first imposed. There is subject in these points to which we will return at an early date; but meantime it is hoped that there will be little waste of money, as money has been fruitlessly wasted in previous sessions, by local authorities trying to overthrow a standard instrument that has been accepted by Parliament as proper and fair.

Scientific Illumination Measurements.

It is an excellent feature (which we are pleased to see is being developed more and more) of the Junior Associations that they court the assistance of men who have recognized standing in some particular line of technical work in the gas industry. The Junior Gas Associations should be above all things educational bodies; and they should seek to get their teachers from the best available quarters—teachers who are themselves both students and practitioners. The lecture and the lecturer that the Southern Junior Association had before them when Mr. Jacques Abady dealt with the subject of "Light—And Some Reflections" (as reported last week) were examples of what should be. And may we say a few words in complimentary vein? Mr. Abady divested himself entirely of any association with any manufacturing concern, and stood before the members of the Association as a

student of his subject—a student not merely moved by the very proper desire of ensuring commercial success, but as one who enters into a subject that has had an almost life-long engagement of thoughts and work for the pure love of the thing. If we were looking for teachers in special branches of work, we should turn to those manufacturing places where there existed good commercial success, and where we knew experience was large and varied. Who can know more of gasholders than those who are every day at work designing, making, or erecting them, and who have had to erect them under diverse conditions? Who can know more of photometers for measuring sources of light and illuminating effect than those who are day by day engaged in making them, and who are day by day working in competition to perfect them, so far as they are amenable to a perfect state?

Therefore, as might have been expected, from the well of experience and practice Mr. Abady gave freely to the Southern Juniors on the perennially absorbing subject of light measurement. "Avoid empiricism" was his text; and truly in connection with the subject of photometry, the monition is required by many of the latter-day arrivals on the illumination platform. There are instances of men who seem to regard complication, and the introduction of purely personal ideals into instruments and practices, as being figurative of science and theory. They deceive themselves; and their counterfeit presentments are anything but acceptable to those who have lived in, and learned of, their subject through many years. In all things, so far as it is possible, whether in testing lighting sources or the resulting illumination, nothing should be left to empiricism; the instruments, methods, and conditions should all be standardized on scientific lines. But photometry will never be an exact science while it can only be conducted by the intervention—and there is no help for this—of any personal factor. The observer's acts and eyesight play an important part in what is, if people will only permit it to be so, otherwise a scientific operation. The plea that Mr. Abady made for the greatest possible accuracy in photometrical operations has the sympathy of the gas industry, and that accuracy is more necessary to-day in view of the great combat that has started between the lights for supremacy in the matter of illuminating efficiency for specific purposes. But the measurement of the relative illuminating efficiency of different light sources can only be properly realized by having precise and reproducible conditions; and these cannot be obtained in any two or more places where surroundings and atmospheric conditions have not uniformity.

The point is well illustrated by the condemnation by Mr. Abady of the "cosine" photometers, and of the methods of certain of the assertive electrical enthusiasts. We know something of those nocturnal illumination observers, the practices they adopt, and the inexact and unreproducible conditions under which they work. The conflicting effects of their work have been recorded in curves in the electrical papers. The observers wander the streets, and no matter whether a street be wide or narrow, no matter whether the reflecting surfaces be good or bad, no matter the conditions of the atmosphere, or of the lights of the firmament—the conditions existing between one set of lamps and another may be as wide asunder as the poles—but they direct their little illumination photometers to the source of illumination, and they say that it gives so many candle-feet, or a candle-foot, so many feet from the lamp. It suffices—for them. In those instruments with movable screens set at will at an angle, the personal factor comes in in this respect, as well as in the condition of the eyesight of the observer. We do not know that anything could be named in the way of measurement that is more subject to variation by surroundings, atmospheric conditions, and personal influences than illumination street tests. Mr. Abady pleads for the repression of all empiricism; and for the defence in these matters of light and illumination testing of complete accuracy. He says he can make a street photometer that is on irreproachable scientific lines, and that eliminates, as much as can possibly be the case, any error in result by the personal element; but there is one thing he cannot do, and that is to standardize the conditions under which the photometer is used. Without standard conditions, what reliance can be placed on the results of the street illumination tests? We are not opposed to street illumination tests from any fear of gaslight, on equal terms, coming out second best in any comparison, but purely in the interests of scientific accuracy and justice as between system and system and lamp and lamp.

Mr. Abady advocates in the illumination photometers employing a fixed screen with a standard surface the reflected light from which should be measured. But that only eliminates a single objection; and in distribution tests, we have no faith in results put forward for comparison that are not made under corresponding conditions, and these can only be obtained in a specially provided testing-place. Tests made under any other conditions are deceptive; and no lamp ought to be condemned on the judgments of inexactness and incomparability. Two lamps measured for distribution or illuminating effect under standard conditions, and this way having an approximate relationship, may, fixed in totally different situations, with surroundings that are dissimilar, or tested separately under a different condition of the atmosphere, give widely varying results in candle-feet. Yet it is upon such tests, hemmed in by all this inexactitude and arbitrariness, that some newly inspired and self-constituted "experts" would prefer that preferential award should be made. We are glad in the interests of scientific work and practice that Mr. Abady has spoken out in connection with the instruments employed in illumination measurement; and though he does not condemn street illumination tests, he asks for accuracy in photometry, he asks for scientific treatment, and he points to the many difficulties and pitfalls that surround street measurements, as well as to the confusion that exists on the subject.

Views and opinions have been stated here upon only one phase of the lecture. It embraces many other matters; but the one dealt with is of no small importance in these days when the rivalry of artificial lights has attained to such keenness. Commercial interests ought not in any way to be injured by any grotesque misrepresentation and misapplication, or non-observance, of any contributory and necessary scientific laws and conditions.

Coalite Hopes and Promises—Continued.

THERE is a liberal mixing of hopes and promises by the Directors of the British Coalite Company, Limited, in their annual report. Broken promises and directorial expressions of confidence are the only things that the shareholders have received in exchange for the hundreds of thousands of pounds of hard cash that have been sunk in this venture; and the outlook to anyone who is in touch with the several commercial spheres in which the Coalite Company must do their business if they are to succeed, is anything but that which the Directors, looking through rose-tinted glasses, present to the shareholders in the report now put before us. The confidence has such an unsubstantial backing that we shall be surprised if the shareholders do not, at their meeting to-day, speak very plainly as to the manner in which they have been unsuspectingly led into the barrenness that lies, in the opinion of most competent judges, before this concern. The Directors now state that they have "the fullest confidence in the immediate financial success of the undertaking." Those words will be remembered a year hence. But the immediate point to ascertain is on what ground this confidence is based. On the Board there is the originator of the scheme, Mr. Thomas Parker. Naturally he is hopeful of his child. But what particular qualifications in the technical matters of coal carbonization and tar distillation do the other Directors possess, and what intimate knowledge have they of the markets in which the Company must trade, that enables them to speak with the temerity shown in the quoted sentence? We should like to know. Their confidence is interesting. But it is nothing more than an instructive instance of intellectual credulity; and credulity like theirs is usually found to be of the most stubborn character.

Let us make a brief examination to see if trace can be discovered of the support for the confidence of the Directors. Dating from the time the Company was floated, the central parts of the plant have been undergoing repeated alteration, until now every vestige of its former self has been cleared away. These changes have been going on right up to the present time; but the Directors now believe, as they have believed on former occasions, that they have got an efficient standard type of plant for their purpose. Anyway, the shareholders must be able to assess to-day the value of that grandiloquent talk, through press and on platform, that preceded their investment in this speculative enterprise. The reiterated expressions of confidence followed by plant changes and further postponement of the predicted success, must have largely undermined reliance

in the Directors' confidence. If it has not, then we are bad judges of human nature. However, it is stated that, in the producing plant, new features of great importance to the Company—commercially and scientifically—have been developed, and that "the improvements in manufacture mentioned in our report of last year have shown highly economical results, which will add to the profits of the enterprise." This statement is rather a striking one. The improvements were known a year ago. Then their economical effect should be seen in the present accounts; but we actually find that the expenses that are directly attributable to manufacture and disposal of the products amount to more than twice as much—admittedly on a limited business—as the revenue earned. As a matter of fact, on the half-year's working, there is a balance to the bad of £21,895, notwithstanding that credit is taken for £1045 for coalite and bye-products used in the manufacture of coalite and in foundry, for £1830 stock of coalite and bye-products, and for £12,398 interest on calls in arrear, of which £6452 has been received and £5946 has accrued to date. Let us look at the matter from another standpoint. On the expenditure side of the account, there are the items of coal and coalite and bye-products £16,326; wages and salaries (amounting to almost as much as the raw material) £15,195; and distribution expenses—carriage, cartage, sacks, and packing cases—£2010. These three items alone amount to £31,531; and this sum does not include the fees of Consulting Engineer and Chemist, or Directors' fees, or any other charge attaching to works, plants, offices, and administration. To set against this £31,531, all we can find are the items of £11,576 received for coalite and bye-products, £1045 the value of coalite and bye-products used in manufacture (which is therefore a working expense, and has not produced anything in the nature of revenue), and £1830 representing the stock of coalite and bye-products. These total to £14,451, being the whole of the direct and indirect receipts from manufacture to place against £31,531 for material, wages, and distribution, without taking account of the other substantial—"very substantial" would be better—items of ordinary outlay. There is no honestly conducted gas undertaking in the country that, spending a much less sum on raw material, does not make from its gas and secondary products (and without any tar distillation whatever) a decent dividend for the shareholders.

We have before spoken of the inflated forms of expression used by the Directors in their communications to the shareholders. In this report, it is stated that "very extensive" plant is being erected at Barking, Wednesfield, Plymouth, and Hythe. We should be loth to append our signature to a statement describing the Plymouth and Hythe plants as "very extensive;" and there is doubt as to the applicability of the description to the Wednesfield plant. However that may be, no figures at all are given by the Directors as to the precise returns from the plants at the Plymouth and the Hythe Gas-Works; they merely, with unusual moderation, describe the returns as "steady." But the gas produced is said to be rich in illuminating power, the quality of which exceeds contract requirements. Gas rich in illuminating power has lost its usefulness; as a matter of fact, gas rich in illuminating power is absolutely not the best for incandescent gas-burners, as the evidence, in support of the lowering of illuminating power, of Professor Vivian B. Lewes in connection with Gas Bills in Parliament—the South Metropolitan Gas Bill in 1900, and since—assures all who take an interest in the matter. The shareholders of the Coalite Company will fail to see, in view of this, the point of the Directors' boast as to the gas being rich in illuminating power. As a matter of fact, the gas industry are talking of abandoning illuminating power as the standard of quality and adopting calorific power. Again we are told in the report that further contracts are being negotiated with other Gas Companies, which it is "hoped" will be brought to a—presumably successful—conclusion at an early date. Of course, it is "hoped;" there is a greater amount of this intangible quality than actuality about the whole venture. We have heard of such so-called "negotiations;" and in certain cases it would be better to say that, on behalf of the British Coalite Company (it matters not by whom), invitations have been issued to have installations of the plant on the gas-works concerned.

The fact of the matter is the Coalite Company cannot do without gas undertakings to buy the gas produced, and to supply centres from which to distribute the coalite. On the other hand, gas undertakings, for economic reasons,

cannot accept to-day low-temperature carbonization and the revolutionary proposals of the Coalite Company. From the buying of the coal and its carriage to the sale of the coalite and their other products, the margin between expenses and revenue, so far as they have been ascertained, bear a poor representation to the margin derived from gas manufacture on modern lines. As to the gas of 18-candle power, gas undertakings adopting plant on the terms at Plymouth would have to provide means, if not already existing, to dilute the gas made. How the Coalite Company are going to dispose of the gas at Barking is still a problem for solution; for gas companies do not appear at all eager to purchase, and manufacturers requiring gas for power purposes are not evincing any alacrity in erecting factories near the Barking plant, just to oblige the coalite people. As to the other products, their prices will not be ruled by any peculiar virtue, but by the competition they will have to meet. Such special merits, for example, as are attributed to coalite will not appeal to any but smoke abatement enthusiasts (and they are a limited class), so long as coalite is more expensive than coal and gas-works coke. It would therefore be idle to waste time upon commenting on the general statement of the Directors that "the demand for the fuel coalite increases daily." We do not detect the evidences of this; and the advertisements of coal merchants do not testify to the fact that they see any lucrative business in it. From our own point of observation, the whole coalite scheme is out of harmony with the spirit of progress and the requirements of the times in relation to gas supply. The Company have long been wandering through the preliminary stages of development; and the time when they will emerge from it is not within the sight of disinterested observers.

Refractory Materials Inquiry.

The recent correspondence in our columns on the subject of British *v.* German retorts has its interest accentuated by an announcement in another column that the Sub-Committee of the Institution of Gas Engineers on Refractory Materials are setting to work in a practical manner to secure data which may assist in arriving at the causes for the life variability shown by retorts and other fire-clay material. A letter (signed by the Chairman of the Committee and President of the Institution, Mr. James W. Helps) is being sent out by the Hon. Secretary, Mr. F. J. Bywater, to a limited number of works, together with forms containing several questions, affecting materials, temperatures, and other conditions, which it is desired shall be answered by the recipients. Mr. Bywater will be pleased to send copies of the forms to any engineer not receiving one who has, or is in a position to obtain, information that will be of service to the Committee. The data are required for information and general report, without specific mention of works; so that there need be no hesitancy in replying with freedom—always remembering that this is a matter in which not only the interests of the gas industry itself are concerned, but the reputation of a kindred British industry is at stake. Following the digestion by the Committee of the information supplied, there is to be a conference with the manufacturers, in order to see how far the requirements of the gas industry can be met. It may be thought by some that the information asked for by the Committee does not go quite far enough; but the Committee have no doubt given full consideration to the scope their inquiry should take at the outset. The point that Mr. Bywater asks us to emphasize chiefly is that there shall be as little delay as possible in replying to the inquiries, so as to facilitate the work of the Committee—work that is being carried out for the common behoof.

A Gas-Works Purchase Arbitration.

The relative largeness or smallness of the total amount of money at stake has, it will be admitted, nothing at all to do with influencing the extent of the interest attaching to a gas-works purchase arbitration. The questions that are of general importance are those of principle; and, of course, when they arise they do so altogether irrespective of the size of the works to be acquired. Therefore though in the transfer to the Prestatyn Urban District Council of the local gas undertaking, which is the property of Lady M'Laren, the capital sum involved cannot under any circumstances be any very heavy sum, probably just as many points of general applicability cropped up in the course of the arbitration as would have been the case had the amount at issue been ten

times as great. It is for this reason that the proceedings, extending over two days, are reported at considerable length in another part of to-day's issue. The duties of Arbitrator were undertaken by Mr. Corbet Woodall for Lady M'Laren and Mr. E. H. Stevenson for the Council; while Sir Hugh Owen, G.C.B., acted as Umpire. A point about this purchase is that it is being entered upon at a comparatively early stage in the history of the undertaking, which was started seventeen years ago by the present owner's father, who had considerable property in the district, and so was interested in the development of Prestatyn, which was then no more than a fishing village. It was, of course, from the advantage to the place of possessing a gas supply that he expected his only benefit for some years to come, as there was no chance whatever of the undertaking, as such, becoming immediately remunerative. For two years there was a loss, then for several years merely a nominal profit; and afterwards, during the last two years, the results became substantial, though even then not sufficient was earned to pay the maximum authorized dividend on the capital created under the Provisional Order. This at the outset provided material for a fundamental difference of opinion between the parties; for, whereas the Council sought to base the purchase-price on the profits for the last completed year before the date of the notice to treat, it was strenuously argued on behalf of Lady M'Laren that the proper course would be—the notice to treat being dated September, 1909—to take the completed three quarters of the present year and to estimate (on a moderate increase which would in every likelihood be under the mark) for the remaining quarter. Other important points of difference were as to the capitalization of future probable profits and of back-dividends; and the number of years' purchase that should be adopted for arriving at the capital value of the undertaking. There was also a good deal of argument with regard to the items for repair and maintenance, the capitalization of the fittings and hire-purchase stove business, and a contention of the Council that 75 per cent. of the mains needed relaying at a greater depth.

The Valuations.

On behalf of Lady M'Laren, Mr. Henry Woodall (of Messrs. Corbet Woodall and Son) put in a valuation which was subsequently revised with reference to the bearing of one item—the capitalization of future profits. This valuation, as already mentioned, was based on the estimated profits in the year 1909—the profits actually earned in the first nine months being £339, added to which was a calculated profit (based on a smaller increase than had been experienced earlier in the year) of £182 for the last quarter. This made the estimated profit for the year £521, which he multiplied by $28\frac{1}{2}$ years' purchase—making £14,848. In the revised figures, prospective profits were capitalized by multiplying £41 by $28\frac{1}{2}$ —deferred for one year—making £1,124. Deducting £625 capital necessary to put the works and mains in a condition to earn the dividend, brought out a figure of £15,347, to which he added £2477, the present value of back-dividends, and 10 per cent. (£1782) for compulsory purchase—thus arriving at a total value for the whole undertaking of £19,606. On the other hand, Mr. S. E. Stevenson, who gave evidence on behalf of the Council, put in a valuation based on the profit shown by the last issued balance-sheet—that for 1908—which was £418. From this he deducted the £5 profit on fittings; £78 11s. for deficiency in the amount put that year to repair and maintenance and depreciation of cookers; and £19 2s. for an additional amount which he contended should be charged to rates and taxes—leaving a maintainable profit of £315 7s. This he multiplied by 20 years' purchase, arriving at £6307, and added £5 profit on fittings multiplied by 3—giving £6322. From this a deduction was made for lowering about three-fourths of the mains (which it was urged for the Council was a necessary work) of £656, less £220 capitalized value of the saving in leakage which would result from this lowering. This gave a figure of £5886, from which Mr. Stevenson deducted seventeen years' purchase of rental of hire-purchase stoves—£140, which gave a total value for the undertaking of £5746, plus an amount (which was left open) to cover the cost incurred in the re-investment of the capital. Any amount for prospective profits was ruled out by Mr. Stevenson as not being a proper item for capitalization, but only to be taken into account when considering the multiplier to be applied to the basis figure. Even should 10 per cent. be added to the value, for re-investment, it will be seen that Mr. Stevenson's valuation would not exceed £6320, as against Mr. Henry Woodall's total figure of £19,606. In

fact, Mr. Stevenson admitted in cross-examination that the result of his valuation was to show that the works, after having been established seventeen years, and having now got into a paying condition, are not worth the money that has been expended upon them; his opinion being that they are heavily over capitalized. The Accountants who gave evidence were Mr. William Cash for Lady M'Laren, and Mr. W. B. Keen for the Council. In addition to the sum to be paid under the arbitration, the Council are to pay £250 towards the costs and expenses of Lady M'Laren in connection with the promotion of the 1909 Order and her opposition to the Council's Bill, so far as it related to the transfer.

The Eight-Hour Act in Court.

The interpretation to be placed on clause 3 of the Mines Eight-Hours Act, which has proved a contentious point, was last week the subject of an appeal to the Divisional Court—with a result which was the reverse of satisfactory from the men's point of view. This is what is known as the "Sixty Hour" clause, and provides that the time for which workmen may be below ground may be extended on not more than sixty days in any calendar year by not more than one hour per day. The employers regarded this clause as giving them power to request the men to work the extra hour; while the miners maintained that it placed no obligation upon them, but was merely an enabling clause permitting an extra hour to be worked during emergencies. Notices were posted up each week at the pit-heads requesting the men to work this extra hour; but they as consistently refused. It was understood a test case would be raised; and this was done, before the Pontypridd Stipendiary, who decided against a workman sued for damages. This decision has now been upheld by the Divisional Court. Counsel for the miners argued that, having regard to the fact that the scheme of the Act was an eight-hour day, it must be taken that it was to be eight hours a day, and not *plus* something else. In his judgment, the Lord Chief Justice remarked that *prima facie* the Act did contemplate that eight hours were to be spent underground, but for certain reasons an extra sixty hours a year were allowed. It could not be said that these sixty hours were not authorized by the Act. The men had been asked to work something which was sanctioned by the Act. The judgment of the Court was a unanimous one; and in view of this fact, the owners, at a subsequent meeting of the Conciliation Board, impressed upon the men's representatives that, in all fairness, they should now instruct the miners to comply with the demand of the collieries to work the extra hour per week. The leaders, however, declared that they could not advise the men to adopt this course, because the Miners' Federation of Great Britain had resolved that the whole of their constituency should not work the extra hour. Therefore South Wales could not adopt the course suggested without consulting the Federation of Britain; otherwise they would be violating the resolution unanimously agreed upon by that body. At first glance, this reads as though the Miners' Federation were to be regarded as absolutely above the law; but probably it is in reality only a question of procedure. Thus whether the Federation will consider the question as being definitely settled by the judgment of the Divisional Court, cannot at the moment be determined; but meanwhile the men's leaders have been reminded that damages for breaches of contract in this connection are accumulating.

Additional Water Powers for the Cardiff Corporation.—Owing to the late date (the 25th ult.) on which the Bill of the Cardiff Corporation received the Royal Assent, a copy was not available in time to be noticed in the articles dealing with the water legislation of the session which have appeared in the "JOURNAL." We have now, however, received a print of the Act from the Parliamentary Agents (Messrs. Dyson and Co.), and can give a brief indication of its contents. It authorizes the construction of an impounding reservoir in the valley of the River Taff Fawr, two conduits or pipe-lines, a new road, and several road diversions. A period of ten years from the passing of the Act is granted for the construction of the reservoir. From and after Jan. 1, 1919, the Corporation's Act of 1884 is to be amended in regard to the charge for water outside the city limits, by the substitution of $12\frac{1}{2}$ for 25 per cent.; and the charge for water supplied in bulk by the Corporation to the Llandaff and Dinas Powis Rural District Council is not to exceed 9d. per 1000 gallons. The Corporation may borrow for the purposes of their water-works undertaking, including the purchase of lands and easements, £272,000. The money raised for constructing works is to be repaid within fifty years; but sixty are allowed for that borrowed for the purchase of land.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 837.)

BUSINESS on the Stock Exchange last week was quite on a quiet scale, as, of course, might only be expected in the week before Christmas. Some days were almost apathetic, with hardly anything doing at all. There was not a symptom of any strongly marked tendency beyond a fair amount of strength in some of the speculative departments; while as for the rest, movements were slight and unimportant. On the opening day, a dull feeling was apparent, though it lightened a bit before the close. The gilt-edged division was weaker, and Consols dropped $\frac{1}{8}$. Railways were rather on the down line. On Tuesday, business fell very quiet, and the tone was irregular. Good points were made by a recovery in the weaker markets of the day before. Wednesday was just as idle a day; but the tendency was fairly firm for most of the chief departments, though Consols had an exceptional fall of $\frac{1}{8}$. Thursday was generally a counterpart of Wednesday, with the addition of a favourable turn in the speculative markets. Friday was not so bright, and some degree of dullness supervened. This mended to some extent before the close, but the choicest things were not strong. Saturday was quiet, and with nothing much to mark except that the general tone was pretty fair. Business in the Money Market was enlivened by a brisk demand all through the week, which sent rates up materially. Discount was firm. In the Gas Market there was quite an outbreak of activity, aided largely by extensive dealings in the three Argentine undertakings in view of their amalgamation. The favour with which this measure was regarded was pointed by an advance in their issues, which was most marked in their debentures. In Gaslight and Coke, the ordinary was active and firm. All transactions were within the same limits as the week before—from $102\frac{3}{4}$ to $103\frac{1}{2}$. In the secured issues, the maximum realized from $87\frac{1}{4}$ to $88\frac{1}{4}$, the preference 104 and 105, and the debenture 83. South Metropolitan was quiet and firm, changing hands at from $119\frac{3}{4}$ to $120\frac{5}{8}$. The debenture made from $82\frac{1}{4}$ special to 83—a rise of 1. In Commercials, the 4 per cent. was marked at 109 to 110, the $3\frac{1}{2}$ per cent. at $103\frac{1}{4}$ to 104, and the debenture at $82\frac{1}{4}$. Among the Suburban and Provincial group, Alliance and Dublin new was done at $11\frac{1}{8}$ and $12\frac{1}{8}$ (a fall of $\frac{3}{4}$), Brentford new at $100\frac{1}{4}$ (a fall of 1), British at $42\frac{7}{8}$ and 43, Hastings $3\frac{1}{2}$ per cent. at 94, Ilford "A" at $145\frac{1}{2}$, Lea Bridge at $120\frac{1}{2}$, Portsea "C" at $122\frac{3}{4}$, and South Suburban at $120\frac{1}{4}$. The Sheffield issues were put up 3. In the Continental companies, Imperial was more active at from $175\frac{1}{4}$ to $176\frac{3}{4}$, ditto debenture realized $95\frac{1}{2}$, Union $95\frac{3}{4}$, European fully-paid $24\frac{1}{4}$ and 25, ditto part-paid $18\frac{1}{4}$, and Malta $4\frac{1}{4}$. Among the undertakings of the remoter world, Buenos Ayres changed hands at from $14\frac{1}{8}$ to $14\frac{7}{8}$ (a rise of $\frac{1}{2}$), Monte Video at 13, Oriental at $137\frac{1}{2}$ and $138\frac{1}{2}$, Primitiva at from 7 to $7\frac{1}{4}$ (a rise of $\frac{1}{4}$), ditto preference at $5\frac{1}{8}$, ditto debenture at from $97\frac{1}{2}$ to $98\frac{1}{2}$ (a rise of 3), River Plate at from $16\frac{3}{4}$ to $17\frac{3}{4}$ (a rise of $\frac{1}{4}$), San Paulo at $14\frac{1}{2}$, ditto preference at $11\frac{3}{4}$, and ditto debenture at 51 and $51\frac{1}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

Blaming Parliament—A Small Amount of Projected Legislation—Electricity and Smoke Abatement—The Latest Verdict of the Metropolitan Asylums Board—Cost per Thousand Candle-Hours—Increasing Temperatures of Lamp Bulbs.

ELECTRICAL people are for ever laying the blame at the doors of Parliament for many of the difficulties from which the industry has suffered. This is not altogether fair. Parliament did not invent the incandescent gas-mantle; Parliament has not contributed much to the cheapening of gas supply; Parliament has not invented new gas-lamps, gas cooking and heating stoves, and so forth. Parliament has done nothing to cause the thermal value of electricity to be so low, nor the efficiency of electrical heating appliances to be so poor. Parliament has had nothing to do with the hundred-and-one peculiar tariff schemes that have been born, and many of which have been abandoned in despair. All these things, and others, in which Parliament has had no concern have stood in the way of the realization of those buoyant hopes of the electricians of some few years ago. As a matter of fact, Parliament has befriended the electrical industry by being stubbornly niggardly in the loosening of the rope which keeps the gas industry within close bounds. The restrictions as to illuminating power and other matters are unnecessarily great; and we have had no revision of the Gas-Works Clauses Act since 1871. An Act suitable to modern conditions has long been over-due. The General Acts of the electrical industry were passed in subsequent years. But the "Electrician" asserts that it is generally conceded that the Electric Lighting Acts should have been amended ten or twelve years ago. But what about the archaic General Acts of the gas industry? However, there has been, after many years' wandering in and out of St. Stephen's, an Act passed this year that has broadened the scope of the electrical industry. Still there is discontent. For while it is believed that the Act will be of "considerable advantage" to the industry as a whole, there is yet a lingering regret that the wiring and fittings clause had to fall before an inappeasable opposition on the part of private traders and municipal trading antagonists. But we shall see what we shall see. The withdrawal of the wiring

and fittings clause may be ultimately a handy excuse. If the industry does not make better progress in the future than in the past, it will be the simplest thing in the world to throw the blame upon the action that killed what is considered the one thing needful. Instead of perpetually complaining, better let the reviling of Parliament have a rest now, and see what actually turns up. Regarding the Private Electrical Bill legislation in the past session, it is said that it was uneventful as there were no electric lighting or traction schemes of first importance submitted to Parliament. If that is true of the past session, what of the coming one? There are fifteen or sixteen applications for Provisional Orders; and not one of them can be described as of first-rate magnitude. There are also about a dozen or so Bills containing electricity supply sections, four of which Bills are promotions by gas companies. These are the Chipping Norton Company, the Farnham Company, the Havant Company, and the projected Essex combination of the Bishop's Stortford, Harlow and Sawbridgeworth, and Epping Gas Companies. There is to be another attempt next session (the scheme in the past session failed through want of time) to carry a Bill to complete the project of constituting the London County Council the purchasing authority in respect of Electric Supply Companies' undertakings instead of the Borough Councils. The Companies concerned are the Westminster, the Kensington and Knightsbridge, Notting Hill, St. James' and Pall Mall, and the Central.

Our friends of the "Electrician" share the enthusiasm of the gas industry in desiring to abate smoke. The enthusiasm of the electricians is doubtless largely attributable as in the gas industry to the fact that its prime commodity can be used—though few choose electricity—for heating purposes. The subject is referred to in the "Industrial Supplement" of our contemporary; and the final words of the article are: "If anyone can prove to our satisfaction that this end [the abatement of smoke] can be attained better than by electrical means, we are quite willing to listen to reason." It is, up to the present, believed by the writer in our contemporary that electrical heating is "the best solution of the problem." We do not think it is; and as our friend is prepared to listen, we will give him as our main reasons for not seeing eye to eye with him the two of cost and inefficiency. We are, of course, sorry to have to say this, because with great magnanimity he confesses that "gas heating possesses the advantages of flexibility in adjustment and control, and can be satisfactorily used for cooking." But then the compliment is spoilt by what follows: "But it is expensive to employ this fuel for heating large quantities of water; and it is not quite so healthy as it might be. The unpleasant dryness mentioned in connection with steam heating is also a noticeable feature." Of course, electrical heating is proclaimed the superior; but there are those important aspects of cost and efficiency that are with wise discretion overlooked. Now when from a unit of electricity one can only obtain as many B.Th.U. as from 6 cubic feet of gas, what must be the result? We leave our friend to answer, and hope he will not subscribe to that piece of absurdity as to electrical appliances having some occult power of conserving and making better use of heat than gas appliances. These things have to be looked at from the practical and commercial points of view; for verily the householder will not consider much else. It is very curious, too, how pet notions, whether right or wrong, become with time magnified in some minds. There is that question of the supposed unhealthiness of gas, and the unpleasant dryness of the atmosphere. Our friends should study the latest gas appliances, and health and mortality statistics, to see whether the year-by-year progress in the consumption of gas is having any progressive dire effect. It ought to, according to electrical notions. Do let us deal with this subject in a practical way, and apply to it practical tests, and not always be taking a stand upon the thinnest assumption. As to the supposed expensiveness, too, of heating water by gas, we are quite at a loss to understand what is meant by this. Perhaps our friends will explain in some concrete form—for instance, by stating the cost of heating (say) 50 gallons of water to 110° Fahr., and the time occupied in doing so, starting cold, by a gas boiler and by the "Therol" electric heater; and after the 50 gallons have been drawn off, how long it will be before another 50 gallons have been heated up to that temperature ready for use. This curiosity on our part to have the matter definitely explained must be pardoned in view of dogmatic, if general, assertion. There is a little correction to be made in our contemporary's article. Gas-works are roped in with electricity stations as "smoke and fog producers." We should like to know the gas-works referred to; and whether our friends are aware that the furnaces in a gas-works are fed by coke. We come across some pretty little mysteries in our electrical contemporaries that would do credit to the fecund imaginations of a Rider Haggard or a Guy Boothby.

It was an oversight on our part in dealing with the "Electrical Bulletin" of the London Electricity Companies last week, not to point specially to a matter that somewhat takes the gilt off the electrical use made of the report—dating back to the year 1901—of a Committee of the Metropolitan Asylums Board, in which electricity was glorified at the expense of—mostly, if not entirely—antiquated lighting by flat-flame gas-burners. The Editor of the "Electrical Bulletin" in his search for material has unearthed this old document, and has made use of it again, together with the guarded subsequent statement of the Finance Committee of the Board, that "after careful consideration of the figures, we are satisfied that the substitution of electricity for gas has been

generally economical." There is no talk of hundreds of pounds of saving in this sentence. In fact, the Finance Committee only hint at justification in as general a manner as possible. The Local Government Board Committee who considered the question of the substitution of gas by electricity in public institutions did not find anything in what the Metropolitan Asylums Board were doing to affect the pronounced opinion formed from their investigation that there is nothing to justify conversion from modern gas lighting to electricity in such places. But after all the fuss that has been made of the 1901 report and of the guarded announcement of the Finance Committee, it must have caused a little flutter among the electricians to have learned that yet another Committee—the Works Committee—of the Metropolitan Asylums Board have had the Engineer-in-Chief experimenting with incandescent gas mantles. Darenth Asylum has been the scene of the experiments, and there wasteful and inefficient gas lighting by flat-flame burners has been the vogue. The average weekly consumption of gas during the darkest weeks of the year has been 364,749 cubic feet. Conversion to incandescent gas lighting will only claim an initial expense of £273 11s. 6d., exclusive of fixing. The annual expense of mantle and glass renewals is estimated, as the result of the Engineer-in-Chief's experiments, at £50; the consumption of gas will be reduced by at least one-half; and three times the light will be obtained. In this respect, he has under-estimated, rather than over-estimated, the result; seeing that 5 cubic feet of gas consumed by a flat-flame burner per hour will only give a light of about 10 to 12 candles, while the same quantity of gas will afford in an inverted lamp a light of about 100 candles. In the darkest weeks of the year, the saving will be about £18 per week, and proportionately in the remainder. What have the electrical folk to say to the resolution of the Metropolitan Asylums Board to carry out the conversion?

A paper that Mr. F. H. R. Lavender has read before the Birmingham Local Section of the Institution of Electrical Engineers, has as a secondary part the results of some tests made to determine, as far as possible, the cost of illumination with metallic filament lamps. It appears that in the investigations six lamps of six different makers were taken; and in the following table there is a comparison, and below are some figures for carbon lamps extracted from a paper read before the Institution some time since.

Lamp.	Initial Candle Power.	Volts per Cent.	Useful Life.	Mean Efficiency.	Candle Hours.	Cost per 1000 Candle-Hours.		
						Re-novals	Current.	Total.
			Hours.			d.	d.	d.
Set 1 . .	21'50	105'0	970	1'87	22,200	1'350	7'50	8'850
2 . .	24'20	105'0	1500	1'45	32,400	1'300	5'80	7'100
3 . .	30'00	107'5	2300	1'29	67,464	0'640	5'16	5'800
4 . .	28'50	102'5	2000	1'32	53,138	0'790	5'28	6'070
5 . .	31'20	107'5	1900	1'34	47,500	0'880	5'36	6'240
6 . .	26'50	105'0	2350	1'22	55,770	0'750	4'88	5'630
A { No. 1 .	18'90 (H.C.)	100'0	1000	3'95	18,200	0'660	15'80	16'460
No. 2 .	18'70 (H.C.)	100'0	1000	3'25	18,000	0'670	13'00	13'670
B { No. 1 .	15'10 (E.C.)	100'0	1000	4'94	14,560	0'619	19'75	20'369
No. 2 .	14'95 (E.C.)	100'0	1000	4'06	14,400	0'628	16'25	16'878

The cost of energy was taken at 4d. per unit. From the tests it appears that the cost of lighting with metallic filament lamps amounts to an average of about 6'2d. per 1000 candle-hours. If tantalum lamps are used, the cost is about 8'8d.; and with carbon lamps the cost is still greater. In the case of metallic filaments, 85 per cent. of the cost is paid for energy consumption, and 15 per cent. for the lamp itself; while with carbon lamps this latter item only amounts to 5 per cent. of the whole. The foregoing figures being laboratory ones, and not derived from ordinary use, may be regarded as the best obtainable; and, with the lamps running under these favourable conditions, it is seen that the cost of current alone is, in four out of the six sets of metallic filament lamps, per 1000 candle-hours, between 5d. and 6d.. In the case of the ordinary inverted gas-lamp, 1000 candle-hours are realizable on a consumption of 50 cubic feet of gas, which, at 2s. 6d. per 1000 cubic feet, would represent 1½d. The cost of renewals of the metallic filaments per 1000 candle-hours is interesting; but it will be remembered that the conditions are laboratory ones, and not ordinary.

Following these cost figures, more interest is found. Metallic filament lamps are often used for shop window lighting, and in close proximity to perishable goods; and so there was a desire to ascertain the outside temperature of the bulbs. For this purpose, the lamps were run at normal voltage and separately, so that there was no undue heating, owing to their proximity to one another. The following results (with a room temperature of 15° C.) were obtained:

Lamp No.	New.		After 1400 Hours.	
	Amp.	Temp.	Amp.	Temp.
1	0'390	68° C.	0'400	95° C.
2	0'298	48° C.	0'295	61° C.
3	0'327	53° C.	0'335	56° C.
4	—	—	0'337	79° C.
5	0'302	44° C.	—	—
6	0'281	40° C.	0'278	48° C.

It will be noted how the temperature of the bulbs increased with the life of the lamps; this probably being due to the presence of the black deposit. This black deposit also affects the illuminating power. The lamps were found to flicker more than carbon lamps when placed on an unsteady circuit, owing to the low terminal capacity of the filaments. Tests were also carried out to determine the spherical candle power, with the result that it was found this is about 22 per cent. less than the mean horizontal candle power, and the vertical candle power is only 18 per cent. of the horizontal.

PERSONAL.

Mr. J. W. C. PENNINGTON, the Gas Engineer and Manager to the Colwyn Bay Urban District Council, has resigned his position. In a letter which was read at the monthly meeting of the Council on Tuesday last, he stated that he had decided to take this step "in view of the friction which had existed between himself and certain members of the Committee."

The Sulphate of Ammonia Committee are making plans for extending their propaganda work; and, with this in view, they have just lately appointed Mr. W. POPPLEWELL BLOXAM, B.Sc. (Lond.), as Scientific Adviser to the Committee. Mr. Bloxam has had a large and varied experience in connection with scientific work—both instructional and research—in the chemical sphere. Immediately before his present appointment, he had been occupied with work for the Government of India on the chemistry of the manufacture of Indian indigo. Prior to that, he was Professor of Chemistry in the Presidency College of the Government of Madras. Over the past twenty years, time has also been devoted by him to the publication of much original work. Mr. Bloxam is a graduate of the London University, a fellow of the Institute of Chemistry and of the Chemical Society, and a member of the Society of Chemical Industry. As scientific adviser to the Sulphate of Ammonia Committee, one line of work along which he is going to direct his energies is the conducting of manual experiments through the various University Colleges and Agricultural Colleges of the country, as well as through farmers. Quite a new feature of the propaganda work is to be the delivery of lectures to farmers' clubs, on the advantages of modern intensive cultivation; and these lectures will be illustrated by some special lantern slides. At lecturing, Mr. Bloxam is an old hand; seeing that for about ten years he did a large share of the London University Extension work as a lecturer. We wish him success in his new sphere of labour.

OBITUARY.

The death occurred at Bournemouth on the 11th inst. of Sir SAMUEL GEORGE JOHNSON, the Consulting Solicitor to the Corporation of Nottingham. He obtained the appointment of Town Clerk in 1870, and in that office rendered the city 38 years' service during a period of great importance in its history. Owing to advancing years (deceased was born in 1832) he retired from the position in 1908, when he was appointed Consulting Solicitor, and was presented with the freedom of the city. In 1893, he received a knighthood in recognition of his work for the improvement of local government.

"Transactions" of the Institution of Gas Engineers.

We have received the "Transactions" of the Institution of Gas Engineers for the present year. The volume contains a full report of the proceedings at the annual meeting held in London in June, under the presidency of Mr. Thomas Glover, of Norwich, and an account of the excursion to that city, the visit to the gas-works, and the inspection of the high-pressure lighting. In connection with the technical matters which came before the members at the meeting, the volume includes the reply of Mr. E. W. Smith, on behalf of the Committee on Gas Heating Research, to the discussion on their report; and it is given in another part of the "JOURNAL" (see p. 813). There is likewise included, as an appendix bearing upon Mr. Forshaw's paper on the "Illuminating Efficiencies of Carbon Monoxide and Hydrogen Used in Conjunction with Incandescent Mantles," the translation of the early observations of M. Sainte-Claire Deville on the variations in the illuminating power of an incandescent mantle which appeared in the "JOURNAL" early in August last. There will also be found some correspondence on this paper. The contents of the volume include, as usual, abstracts of papers which appeared in various publications in the six months ending June 30; and also notices of the life-work of the members of the Institution who have died during the year. The other matter consists of lists of officers and Council, Committees, recipients of the Birmingham Medal, members, and officers and Committee of the Benevolent Fund. A list of the donors and subscribers to the fund is given, as well as the report and accounts. Following the rules of the fund are the Standard Clauses of Contract approved and recommended for adoption by the Institution in conjunction with the Society of British Gas Industries. The volume, which has for frontispiece a portrait of the President, has been produced under the editorship of Mr. Walter T. Dunn, the Secretary.

THE HAMBURG GASHOLDER DISASTER.*

By F. S. CRIPPS, Assoc.M.Inst.C.E.

ALL gas engineers will be intensely interested in the outcome of the inquiry as to the cause of the recent collapse of the large gasholder, with its vaulted tank, in Hamburg. As you rightly remark, any explanations founded on newspaper reports must be pure conjectures; and therefore the following observations are offered more with a view to pointing out the direction in which one must look for a solution, than any positive verdict on the cause of the catastrophe.

In the first place, let me endorse the opinion you express (*ante*, p. 725) of the risks attending these vaulted overground tanks, generally known as the Intze system of construction, and sometimes described as the "Continental system." The idea of constructing above-ground gasholder tanks, so as to utilize the interior for various purposes, although patented in Germany about the year 1883, was first patented in England by Mr. Frederick Gye in 1861. He suggested utilizing the interior of the tank for another gasholder. Strangely enough, this has been done on the Continent—the "Intze tank" being erected over the top of an existing gasholder, so as to enclose it. Although Mr. Gye may not have been an engineer, the credit of the invention is certainly due to him. Professor Intze, however, was the first to put the invention into practice, and he read a paper describing these structures before the Gas Institute in 1885. Later, Mr. W. T. Walker patented a modification of the system in 1890, which subsequently provoked correspondence between another engineer and myself (see "JOURNAL," April 7 to May 19, 1891). In this correspondence, I expressed an opinion strongly adverse to the system of overground vaulted gasholder tanks. Later, the correspondence between myself and Herr Du Chattel in the "JOURNAL" from Sept. 24 to Oct. 8, 1901, and with Herr Klönne in the "Gas World" of Dec. 21, 1901, and Jan. 4, 1902, and which followed the reading of Herr du Chattel's paper at Glasgow on the Amsterdam gasholder, brings out clearly that these Continental designs had been forstalled, in principle, by England many years ago. They have never met with favour, however, in this country, for the reason that the risk is too great; or, in other words, the game is not worth the candle. This brief statement relating to gasholders with vaulted tanks may not be uninteresting at the present time.

Now as to the disaster to the Hamburg gasholder, which was constructed on these principles. As you rightly remark, the reputation of a firm of such standing as the Berlin-Anhalt Engineering Company is sufficient guarantee that they would not knowingly neglect any and every precaution to avoid possible accident. At the same time, that there was an accident of some kind is obvious, although it may be difficult to fix the responsibility on any one. The most striking part of your account of the catastrophe (*ante*, p. 733) is contained in the following words, which are so graphic that I quote them in full:—

About a quarter past three in the afternoon of Tuesday last, many of the workmen engaged on the buildings round about the gasholder observed a sudden lifting of the bell, or of the uppermost lift of the bell, followed by an equally sudden fall, and that by another lift. Foreboding no good therefrom, many of them took to flight, climbing or jumping down from the roof framings on which they were engaged.

The holder meanwhile sank once more, and a quantity of the water in the cups was forced out. At the same time, from beneath the holder and above the concrete ring, a large flame issued on the side that was nearest the town. At the moment also, enormous tongues of flame sprang out from the vault of the under-structure of the tank, destroying everything round about which was combustible or susceptible of injury by fire. The whole sub-structure of the gasholder, which consisted of strong iron girders with radial ribs and lateral ties, covered with masonry (cement concrete) became penetrated, and everything contained in the vault, including the canteen and kitchens, was at once buried in its ruins. Above it, the large volume of about 3½ million cubic feet of gas streamed out, burning into the open, illuminating everything to a great distance with its glare, and producing enormous clouds of smoke. In the immediate vicinity, the "explosion" gave the impression of a small earthquake; but there was no violent concussion, as the outflowing burning gas was not mixed with air. The enormous tongues of hot flame that roared forth from the arch of the sub-structure stretched across the whole length and breadth of the space intervening between the retort-house and the new coal-stores to the buildings on the opposite side.

Now, it is impossible for a gasholder bell to rise "suddenly" except as the effect of some addition to the internal lifting pressure; and upon consideration it will be seen that the only means by which this pressure can be suddenly produced is by explosion. Further, this explosion must take place below the crown of the inner lift. An explosion cannot occur unless there be an explosive mixture. Therefore, if the account be true as to the sudden rising of the holder, it is evident that an explosive mixture of gas and air was contained either in or below the holder. Did such explosion occur inside the holder? Or, was it below the vaulted roof of the tank? To deal with each inquiry in turn.

In your report, you mention that the gasholder had been tested with air, and that the result was not very satisfactory. Nevertheless, gas was then put into the holder. Can it be possible that the air had not been sufficiently expelled from the crown of the inner lift when filling the holder with gas? Was it during the process of lifting the holder for the first time with gas that the accident happened? These are the first points to determine.

Assuming that the explosion occurred inside the holder by reason of the explosive gases issuing from some faulty place in the holder (whether it be in the cups or anywhere else is immaterial) coming in contact with a light, it does not mean of necessity that the explosion would be violent. The proportion of gas and air inside may have been only just over the borderland of safety, in which case the explosion may have been slight, compared with what it might have been. It may have been little more than a dull thud.

Any explosion, however, which was sufficient to suddenly raise a heavy gasholder a few feet, would cause a great rise in pressure, not only blowing the water out of the cups, but exerting temporarily considerable pressure all over the flat top or roof of the vaulted tank. In fact, it would be quite equivalent to the blow which would be caused by dropping an evenly distributed weight, equal to the weight of the inflated holder, from a height equal to that to which it was suddenly raised by the explosion. The flat top of the vault could not possibly resist such an addition to the normal load coming upon it, and which load in the ordinary way would not exceed the distributed gas pressure when the holder is fully inflated, *plus* the weight of the tank roof with (say) 3 inches of water all over it.

Now, the sudden addition of such an unexpected distributed pressure all over the flat top of the vault would at once cause it to collapse at the same instant as the holder was blown upwards. It might collapse bodily; or the weakest areas alone might burst downwards, leaving the more substantial framework standing. In any case, the shallow layer of water would be quickly released, and the gas would as quickly follow, being thrust down by the descending lifts of the holder. The gas pressure would at first force a body of air before it through the arched openings of the circular wall of the tank, and would then follow in "tongues of flame" as described.

As to the locality of the explosive gases and the manner in which they were ignited. It is, of course, well known that, in filling a gasholder for the first time, gas, being lighter than air, passes to the top of the crown, displacing the air, which latter, passing downward, floats, as it were, on the top of the water in the tank (unless a special vent-pipe, reaching to within an inch or two of the water, has been provided for its emission). The air then gradually diffuses with the gas and forms an explosive mixture, at any rate just above the water level. Now, if this comes in contact with a light, it is evident an explosion must follow, although, owing to the almost pure gas in the upper part of the holder acting as a buffer, it may not be very terrific when looked upon as an explosion pure and simple.

It is said that the disaster at Hamburg occurred just as the third lift was cupping or uncupping, and it is suggested that the cup may have "blown." When cupping or uncupping, the cup is at the water level. If, then, an explosive mixture were present on the top of the water inside the holder, in the manner indicated, it is evident that any escape of such gases coming into contact with a light might have been the cause of the internal explosion, and thus have caused the disaster.

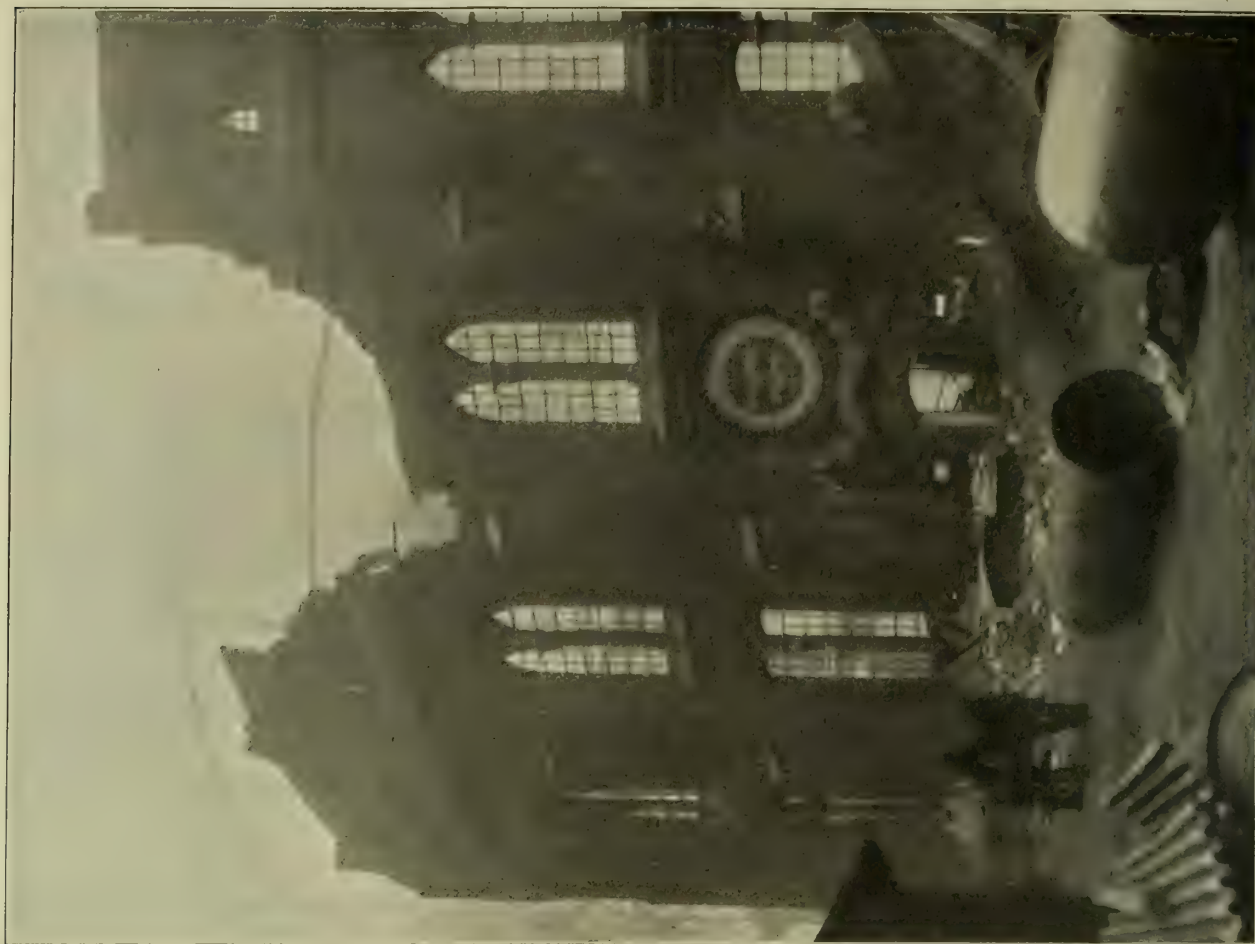
The only alternative to an explosion *inside the holder* causing it to rise suddenly is, that an explosion may have occurred *underneath the flat roof of the tank*—gas by some means having found access to the interior of the tank and mixed with the air. This would mean that the roof was not sound, that the water level was low enough to uncover the flat top, and that gas had penetrated it to a sufficient extent to form an explosive mixture of such strength that when it exploded it would not only burst and lift upwards the concrete roof of the tank, but lift the gasholder above it, as well. The explosion in this case would need to be much more violent than in the first case treated.

The questions which naturally arise are: Was the water level too low to cover the flat top of the tank inside? If so, was this due to faulty design as regards overflow level, faulty construction of the flat top causing leakage, or neglect in filling the tank to the overflow level, or in not maintaining the water at such a level as would ensure the tank roof always being covered with water? It would never be safe to depend upon the concrete roof alone for soundness; and therefore it is imperative it should always be sealed with water.

It is somewhat significant that in your account no mention is made of any water escaping from the tank. When the top fell in, water, although not great in quantity, must have followed it, unless the water level was too low.

The idea that the roof of the tank was too weak and succumbed to the ordinary load upon it, releasing the gas, which, mixing with the air in the vault, exploded, and thus raised the holder, may be dismissed as impracticable; because if the whole top had fallen in, there would have been a momentary falling of the holder, due to the released gas pressure, before the explosion occurred. But no such sudden drop in the holder appears to have been observed until after the explosion. Again, if the explosion occurred below the tank roof, it is practically certain a rush of air, and probably flame, would have taken place through

* This communication should be read in conjunction with the particulars received at a later date, as given in our editorial columns to-day, and in the article on p. 805.—ED. J.G.L.



THE WRECKED HOUSE OF THE SMALLER GASHOLDER.



THE CONFLAGRATION THROUGH THE ESCAPING GAS FROM THE LARGE HOLDER.

the arched openings around the tank, before the holder would have been observed to rise. But nothing of this kind appears to have been noted.

Hence, so far as the information yet to hand may be depended upon, it would seem to indicate that the disaster was possibly due to the presence of an explosive mixture inside the holder coming in contact with a light through an escape of gas in the neighbourhood of the cups.

Speaking of cups. Much misunderstanding exists as to their action. They are for the most part designed by mere "rule of thumb." It is not too much to say there are scores of gasholders which "blow" when uncupping, particularly where the pressures thrown by the different lifts are heavy and the cups shallow. This, besides being a danger, goes to swell the "unaccounted-for gas." It can, however, be remedied very simply; and in a further article the writer proposes to show how it may be determined whether a cup will "blow" or not, and if it does, or would, the remedy for it.

THE GASHOLDER DISASTER AT HAMBURG.

THERE is not yet to hand much more information of a definite character regarding the terrible catastrophe which occurred at the Hamburg Gas-Works on the 7th inst., and of which a full report was given in the "JOURNAL" last week (p. 733). The "Journal für Gasbeleuchtung" of the 18th inst., however, has a brief account of the disaster, differing in some details from the earlier statements which alone were available at the time of our last Tuesday's issue going to press. We will indicate the points where our German technical contemporary's later information differs from that given by us last week.

It is gratifying, in the first place, to note that the number of those killed and injured through the accident is put at a lower figure—viz., 18 killed and about 23 severely injured. The construction of the base or foundation of the new gasholder of 7,060,000 cubic feet capacity was not included in the contract for erecting the holder; and it was not carried out by either of the firms who jointly secured the contract. The gas-works' authorities entrusted this work to the firm of Wayss and Freytag, of Hamburg. For the rest, the bell or holder proper was, as stated last week, constructed by the Berlin-Anhalt Engineering Company ("Bamag"), and the tank—including the concrete ring and the roof, and the guide-framing—was the work of Messrs. F. A. Neuman, of Eschweiler.

The filling of the annular tank with water was finished on Oct. 19; and the raising of the gasholder by means of air was then started. The bell had been thus raised to its full height by Oct. 28. It was then partially emptied, and again filled completely with air. At its highest position, it threw a pressure of 12·4 inches of water, which would be reduced by about 16·10ths when the holder was filled with gas instead of air. Thus, with gas, the pressure thrown by the holder at full height would be about 10·8 inches. The raising and lowering of the holder were controlled by observation of two pressure-gauges, charged with water, and also by a self-recording pressure-indicator. The diagrams obtained showed no fault in the guiding of the bell; and the cupping and uncupping of the lifts was satisfactory. A violent storm prevailed at the time the holder was at its highest position; and this caused fluctuations in the pressure of 1·2 to 2·4 tenths of an inch. The bell was left completely filled with air for about eight days, and was then inspected by the Hamburg authorities, in company with representatives of the contracting firms. This inspection took place on Nov. 9; and as a result the gasholder was, according to the official records, taken over that day by the authorities, without any reservation whatsoever. In the following days the holder was filled with gas, under observance of all proper precautionary measures; and the supply of gas from it to the city was begun on Nov. 25. The accident happened on Dec. 7, when the holder had been in regular use for twelve days, and four weeks after it had been taken over.

The foregoing particulars, from the explicit statement in the "Journal für Gasbeleuchtung," dispose of the report, given *inter alia* in the "Hamburger Nachrichten" and quoted in last week's "JOURNAL," that the first test of the holder under air pressure had revealed unsoundness. As, moreover, our technical contemporary makes no mention of the escape of gas in the first instance from the outside of the gasholder, which seemed to be indicated by the reports in the Daily Press, we will give its account of the occurrence in a practically *verbatim* translation.

"Shortly before the catastrophe, the second lift of the holder had cupped with the third, so that the contents of the holder then amounted to about 3,500,000 cubic feet, and the pressure thrown by it was about 8·9 inches. By some circumstance which up to the present time has not been cleared up, the level ceiling of the tank—which separates the air space inside the tank from the gas space, and which, in order to ensure it being gas-tight, was covered with a layer of water about 6 inches deep—must have developed a crack, through which the gas contained in the bell could pass into the space below, and thence through the openings in the foundations of the base of the annular tank into the open. The gas then in some way, which also has not yet been ascertained, caught fire, and the whole contents of the holder were

completely consumed in large tongues of flame issuing from the openings in the annular base. The central flat ceiling of the tank and its sustaining framing fell in, while the annular tank itself and the guide-framing remained in position. The sides of the gasholder bell sank down into the annular chamber of the tank, and the crown buckled inwards; so that it now presents the reverse of its former shape. The ruins of the roof structure were piled up in chaos in the vault within the tank, throughout which fire-bricks and other fire-clay goods were stored. The neighbouring gasholder, of 1,765,000 cubic feet capacity, which is enclosed in a house, was involved by the outbreak of flames. The felt or fabric roof over this holder took fire, and the burning fragments of the roof fell in on to the bell of the holder and split its crown. The gas in this holder was wholly burnt out in a brief space of time, causing partial destruction of the brickwork and masonry."

Our comments on the fresh light which this account of the happenings throws on the cause of the disaster will be found on another page of to-day's "JOURNAL." For the rest, we learn that Herr Strack, the member of the Senate whose position appears to correspond to that of the Chairman of the Gas Committee of an English municipality, has reported that the Hamburg gas authorities are protected by insurance in so far as material loss and damage are concerned. Compensation for the victims of the catastrophe is provided for by their accident insurances; and if these should not be adequate, the authorities or the Municipality will give supplementary assistance.

After the accident, the contracting firms are reported to have gone over again in their own offices all the calculations for the construction; while they have retained for an expert investigation of the roof-construction the services of Privy Councillor Müller, Professor and Doctor of Engineering at Breslau, and Professor Boost, both of whom are of the Technical College at Charlottenburg. The Public Prosecutor's Office has called on Mr. Körting, the General Manager of the Imperial Continental Gas Association's works at Berlin, to act as technical adviser in the matter. Until the opinions of these authorities have been given, the "Journal für Gasbeleuchtung" considers that any expression of views as to the possible cause of the disaster would be premature, and that, in the meantime, judgment should be entirely suspended in regard to it. It promises to give in an early issue drawings and photographs of the large holder, with a detailed description of it by a technical man. It states that the work of reinstating the holder will be carried out in a few months. On the other hand, the "Hamburger Nachrichten" mentioned last week that the repair of the old holder and its containing house would be put in hand at once, and was expected to be finished in six months.

The "Hamburger Nachrichten" of the 11th inst. contained a report of the views of a technical man on the cause of the disaster, which gives a few details not included in the reports already given in the "JOURNAL." The new gasholder is stated not only to have been the largest on the Continent, but the first constructed in Germany with as many as four lifts. The outer walls of the tank are of steel plate 43 mm. (1·7 inches) thick; while the inner wall of the tank is of masonry (cement concrete). The roof of the interior chamber is said to consist of steel sheets carried by a T-girder structure resting on the inner wall of the tank. The roof is arched, and in the middle is covered with water to a depth of about 27½ inches. In order to test the soundness of the holder, it was completely filled with air, and the riveted joints were painted with soapy water with a view to discovering leaks. The air remaining in the crown was first displaced by gas before the holder was brought into use. At the time of the accident, the holder was filled to the second lift with gas, and in some manner, so far inexplicable, a hole was made in the steel sheets forming the roof of the interior chamber in which was the canteen. The water resting on this roof to a depth of 27½ inches was expelled by the gas, which thereupon passed, under the pressure of the holder, into the interior chamber of the tank. It escaped from the doors and the windows of this chamber, and ignited at the adjacent carbonizing-chamber settings. The gas then burned in the manner which has already been described. There was no explosion, but only a rapid combustion of the extremely large volume of gas, and the flames produced set fire to the woodwork of the roof of the adjoining gasholder. When the gas in this holder fired, there was again no explosion. In neither case was there any report or detonation, but only a violent hissing, such as occurs to a small extent when any quantity of gas is burnt.

The "Berliner Tageblatt" of Dec. 11 gives a report of a Berlin technical man who had visited the scene of the accident. He describes how the holder stands on a circular wall which rests on concrete piles. The openings in the wall have a clear height of 16 ft. 6 in., to admit of the passage through them of railway waggons. The roof of the interior chamber is of iron, and is carried by numerous lattice girders which run radially to a concrete column in the centre of the chamber. The chamber has a clear height of nearly 59 feet. From some unexplained cause, the roof of the chamber suddenly gave way. The lattice girders and the central masonry column were destroyed, and the whole of the gas in the holder passed into the chamber, and thence into the open, where it was ignited. The gas burning outside the holder developed enormous heat; but there was no explosion. The gasholder sheets were being painted at the time, and several painters were therefore on the galleries of the guide-framing. A few were able to clamber down the ladders or ironwork of the framing in time to save themselves, but others were burnt while on the framing. Several workmen engaged on the coal-store 40 to

60 feet away were also enveloped in the flames. The other gas-holder, the roof of the house of which was fired, was only about 33 feet distant from the first in another direction. The roof of this holder was constructed of wood and fibre. The height of the gasholder roof was about 165 feet, and was not accessible with the appliances of the fire brigade; while there was only one entrance into the interior space between the brickwork of the house and the gasholder. This explanation is given of the inability of the fire brigade to quench the flames of the roof so as to save the second holder. The Berlin report also agrees that there was no explosion in the case of either holder.

AN IMPROVED FORM OF AERORTHOMETER.

By A. G. VERNON HARCOURT, F.R.S.,

One of the Metropolitan Gas Referees.

THE aerorthometer was originally designed for the use of chemists who collect and measure gases over water. It is placed with its bulb by the side of the graduated tube which holds the gas. When the volume of the gas has been read off, the water level inside and outside the tube being the same, and the aerorthometer has been read, the reading of the volume is divided by the reading of the aerorthometer. The quotient is the volume which the gas would occupy if the barometer stood at 760 mm. and the thermometer at 0°C . The same method of correction to standard conditions was made applicable to gas measured by passing through an experimental meter, by adjusting the scale of the aerorthometer, to give what the volume of the gas would be when measured over water with the barometer standing at 30 inches and the thermometer at 60°Fahr .

In testing-places provided with a system of heating by gas governed by a thermostat, there was little difference between the temperature of the air of the room and that of the water in the meter. Accurate measurements can only be made under these conditions. If the room has been cold through the night and is then warmed, the temperature of the water in the meter will rise much more slowly than that of the upper part of the meter-case and, to a less extent, of the gas within it. Consequently the temperature shown by a thermometer whose bulb is in the gas will be higher than was that of the gas when measured in the quarters of the meter-wheel. But since the gas on its way out is under a roof of higher temperature, but over a floor and in contact with a wheel of the temperature at which it was measured, and this for a very short time, the error is not likely to be great, and is certainly less than if the gas were assumed to be of the same temperature as the air of the room.

For this reason, it would be better for the bulb of the aerorthometer to be within the meter; and when it was first brought into use to simplify the correction to a standard of the measurements of coal gas, several attempts were made, with the help of the late Mr. Sugg, to give it such a form that its bulb might be placed within the meter. But in these the instrument was liable to be deranged when the meter was moved, and so the attempt was abandoned.

About three years ago, it occurred to the writer that an aerorthometer might be made with the advantage, for the end in view, of having its bulb at the bottom. Since then this form of the instrument has had a prolonged trial both at this office and at Messrs. Griffin's in the Kingsway, to whom the making of it has been entrusted. The readings agree very accurately with those inferred

from simultaneous readings of the barometer and thermometer and a reference to the tabular numbers given in the "Notifications" of the Gas Referees.

In the "Notification" for the coming year, this instrument is described and figured; and I enclose herewith a copy of the description and figures. While we think the new form of aerorthometer better suited to its purpose than the present form, we intend to sanction the use of either, for the present, by the gas examiners; hoping that many of those who are interested in the measurement of gas may make a trial of the new instrument and may report their results.

The reason for the use of hydrogen rather than air as the gas whose changes of volume the instrument shows, is that hydrogen is less soluble in water, and that it shares with common salt the curious property of being equally soluble in water of different temperatures.

Office of the Metropolitan Gas Referees,
66, Victoria Street, S.W., Dec. 18, 1909.

The extracts from the "Notification" of the Metropolitan Gas Referees referred to by Professor Vernon Harcourt point out that "a second form of aerorthometer, which has the advantage of being attached to the meter and of having its bulb inside the meter case, is proposed as a substitute for that now in use. For the present year the Gas Referees, while thinking the new form more suitable for use with a meter, are prepared to sanction the use of either form."

A description and illustration of the new form of aerorthometer, and its place in the meter has been added to the "Notification," and is said to give a more exact correction-figure whenever the water in the meter and the air near it differ in temperature.

The bulb of the instrument, having the form shown in section (fig. 1), is filled about three-quarters with hydrogen, and one-quarter with a dark liquid. Water blackened with ink has been found suitable for the purpose. The stem, which descends to the bottom of the bulb, is graduated above, over the range through which the liquid will rise with a low barometer in summer, and will fall with a high barometer in cold weather. For safe transport, and to check evaporation, the stem ends in a stopcock which is opened for two or three seconds only before each reading. Since, whenever the conditions have changed, air will enter or leave the stem on opening the stopcock, and the air passing out will generally be more nearly saturated with moisture than that which enters, if the tube opens directly into the air, a gradual evaporation will take place. This evaporation, being chiefly from the sides of the tube left wet by the fall of the liquid, would in course of time leave a stain upon the glass as well as diminishing the volume of liquid. The small bulb holding water at the top of the stem is for the purpose of saturating the air which enters.

The second illustration (fig. 2) shows a meter with the aerorthometer attached.

The Physical Society's Exhibition.

As mentioned in the "JOURNAL" a fortnight ago, arrangements were made for the fifth annual exhibition of the Physical Society, held at the Imperial College of Science last Tuesday, to be open in both the afternoon and evening, instead of as hitherto, in the evening only. The change was apparently greatly appreciated, for there were large attendances on each occasion. Most of the exhibits of special interest to "JOURNAL" readers were noticed last week (p. 742); but reference may be again made to the stand of Messrs. John J. Griffin and Sons, Limited, upon which were a Mahler-Cook bomb calorimeter, for determining the calorific value of coals, coke, oils, &c., and a Boys calorimeter, as used for testing the calorific value of London gas. Special interest attached to the last-named instrument, not only on account of the possible extension of its use in the near future, but because its designer (Professor C. Vernon Boys, F.R.S., one of the Metropolitan Gas Referees) was announced to give two demonstrations on "Soap Bubbles"—a subject which he invests with an interest that one would scarcely believe to be possible. It may also be mentioned that Messrs. Everett, Edgcombe, and Co., Limited, showed a portable direct-reading lamp photometer for rapidly testing metal filament and carbon glow lamps. It is entirely self-contained in a portable case, and is so arranged as to be perfectly direct-reading in candle power. It has a wide range, and can be used in broad daylight. The Cambridge Scientific Instrument Company, Limited, in addition to the exhibits mentioned last week, showed some of Hohmann and Maurer's thermometers, which are specially designed for use in engine or boiler rooms for obtaining the temperature of superheated steam, feed water, flue gases, &c. Professor Boys' evening demonstration was followed by one on "Combinations of Mica and Selenite Crystals," by Professor Silvanus P. Thompson, F.R.S.

Institution of Municipal Engineers.—A general meeting of the Institution was held last Saturday week at Caxton Hall, Westminster, under the presidency of Mr. J. T. Pegge, of Durham. The following papers were discussed: "Superannuation and Security of Tenure," by the President; "Sludge Disposal," by Mr. W. C. Easdale; and "Short Methods of Calculation for Checking Reinforced Concrete Work," by Mr. E. F. Etchells. A dinner took place in the evening at the Gaiety Restaurant.



Fig. 1.

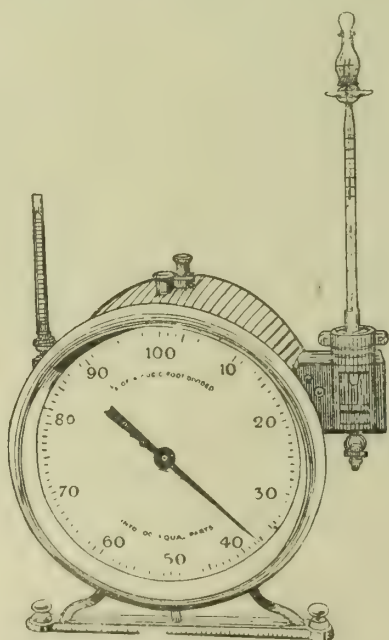


Fig. 2.

LUNGE'S "COAL TAR AND AMMONIA."

REVISED EDITION.

It is about nine years since the third English edition of Professor Lunge's standard work on coal tar and ammonia was issued. That edition of the work was in one large and somewhat cumbersome volume of 930 pages. The fourth and enlarged edition, of which a copy has just reached us, is in two volumes, extending to 1178 pages. There has been a general rearrangement of the whole work, and somewhat larger and clearer type is used in the new edition. It would appear, however, there is an actual increase in the amount of matter contained in the book of over 200 pages.

Professor Lunge's treatise on coal tar and ammonia has, since its first appearance in 1882, attained the position of the standard work on the coal tar and ammonia industries. It is an essential part of the library equipment of every technical man engaged or concerned in these industries. The present new edition can not be dispensed with by those technical men who wish to have ready to hand the latest compendium of the practices and the processes followed in tar and ammonia works, both here and abroad. Nevertheless, we think that those who have been continuously engaged in either or both the tar or ammonia industries since the publication of the first or the second edition of Professor Lunge's work will consider the latest edition a far less meritorious work than its predecessors. It is true that a certain amount of matter contained in the earlier editions which has now become quite obsolete is excluded from the new edition; but, in our view, a great deal too much of semi-obsolete and out-of-date information has been retained, and serves to make the present volumes cumbersome and unwieldy. There is no more serious defect in a technical treatise than the over-laying of the important and essential information which it contains with an enormous mass of material which has lost its early significance and merely serves to hamper the reader in his search for what is of present utility.

The disinclination of the author of a technical work, when he is faced with the preparation of a new edition of what has proved a successful and valuable handbook, to scrap a large part of his earlier text, is naturally very great. It is easier, and generally more in consonance with the views of his publishers, that he should allow the early text to remain and let his revision of it consist essentially in the addition of new matter in appropriate places, rather than in a re-writing of the text in order to incorporate the new material with what remains of real value of the old in the form which it would probably have taken had the same author been writing his book for the first time at the later date. It is too generally noticeable that the later editions of standard technical treatises have become encumbered with a great mass of matter which was once, but is no longer, relevant to the conditions of the art or industry with which the treatise deals. The custom of preparing new editions in this evil manner is further disastrous in that absolutely incorrect statements constantly survive in the later issues—such statements having been true only when the work was originally published. In the course of our review of the contents of the present edition of "Coal Tar and Ammonia," we shall have occasion to draw attention to many instances of these defects in it. Notwithstanding, however, its many blemishes, there is no work extant at the present time which deals with the technology of coal tar and ammonia in the same exhaustive and authoritative manner as this treatise by the distinguished Emeritus Professor of Zurich.

The first chapter is of an introductory character, and is comparatively little altered since the preceding edition was published. Professor Lunge has forgotten that since then we have passed into the Twentieth Century, for he still refers to the discovery of coal gas by Lebon and Murdoch as having occurred "towards the end of the last century." A diagrammatic comparison of the output of coal in the different coal-producing countries of the world from 1840 to 1897, which appeared in the last edition, appears again without having been extended to a later date, as might reasonably have been expected in view of the fact that the statistics for some nine more years are now available. In regard to the estimates of the production of coal tar in the United Kingdom, the latest figures given refer to the year 1902. So far as gas-works are concerned, it would have been easy to have carried on the estimates to a much later time. Russig's estimates, which are quoted, of the amount of coal-gas tar produced in the United Kingdom were 692,000 tons for the year 1900 and 755,000 tons for 1902.

An estimate made on practically the same basis as Russig's would give the production of coal tar in the authorized gas undertakings of the United Kingdom as approximately 770,000 tons in the year 1908. It would have been easy for Professor Lunge to have given such an estimate for the years 1903 to 1907, if not also for 1908. No estimate is given of the amount of carburetted water-gas tar produced in the United Kingdom, though the production of such tar in the United States in 1905 is estimated as being approximately 260,000 tons. In regard to Germany, more

recent estimates are given; and it is stated, on the authority of Dr. Spilker, that 900,000 tons of coal tar were used in Germany in 1908, of which 700,000 tons were produced west of the Elbe. Apparently the amount of tar recovered from coke-ovens plant in Germany is considerably in excess of the production of gas-works tar; whereas in the United Kingdom the coke-oven tar still constitutes only a small proportion of the total make of tar.

The second chapter of the book treats of processes for obtaining coal tar and, in so far as it refers to the production of coal tar at gas-works, there is comparatively little change as compared with the former edition. An analysis, however, is now included of the tar produced by Dessau vertical retorts. Some comparative figures obtained by Dr. Bunte in 1886 regarding the products of distillation of different classes of German and Austrian coal are in part reproduced in tables printed only two pages apart. The second of these tables is palpably redundant. Another table showing the yields of different products on the distillation of a large number of English cannel and one or two ordinary coals is now of little value, as the cannel to which it mainly refers have almost gone out of use on English gas-works. A similar table dealing with the more important gas coals in use at the present day in this country would have been most valuable; but it is not provided.

A good deal of space is given up to projects for the recovery of benzol from coal gas, most of which projects had their origin at a time when benzols were worth three or four times their present value. So far as the gas produced on gas-works is concerned, these projects have lost whatever interest they once may have had. But their retention in Professor Lunge's book, and the supplementing of them by details of a few more modern processes, is justified by their bearing on the extraction of benzol from coke-oven gas. Nevertheless, we think the matter might have been better co-ordinated so as to show more clearly and succinctly the principles of the processes now followed in recovery coke-ovens. There is in this chapter a new sub-section, dealing with the estimation of benzene and its congeners in coal gas, which is compiled from recent sources. There is also a good deal of new matter relating to processes for the recovery of coal tar from coke-ovens. Here, as elsewhere throughout the work, we come across curious and rather confusing expressions, such as a statement that the gas produced in a certain coke-oven plant has a "heat value of 4300 to 4500 metrical calories." It would be almost as good sense to speak of lineal British thermal units! Of course, what the author means is calories per cubic metre. A fault which is especially conspicuous in this chapter, though it prevails pretty generally throughout the volumes, is that references to authorities and to patents relating to processes are not given even approximately in chronological order, nor, so far as we can see, according to any other systematic arrangement.

The tar from blast-furnaces, in which splint coal is used, is next dealt with, and while a good deal is said about the methods available for the recovery of tar and other bye-products from blast-furnace gases, the information in regard to the tar itself is inadequate and at times misleading. The particulars quoted of analyses and observations of blast-furnace tars indicate that, generally speaking, they have a specific gravity lower than unity; whereas, as a fact, a normal sample of Scotch blast-furnace tar may have a specific gravity as high as 1.10. It is obvious from the statements of the author in regard to blast-furnace tar that he can have had no personal knowledge of it in recent years, and that his sources of information are not reliable. Much the same may be said of the information contained in the book in regard to the tar produced in carburetted water-gas plants. This information is mostly taken from ancient sources, and is of no value at the present day.

The production of tar and tar products by the superheating of oils and vapours of oils is next dealt with, mostly from the standpoint of the production of benzols from crude or partially-refined petroleum products. Having regard to the small value of benzols at the present time, and the many alternative sources of them, these schemes have now no practical application. The somewhat similar, but more modern, processes for the production of a motor fuel by the cracking or distillation of crude petroleum, shales, and coal, do not appear to be dealt with in the book—perhaps because they have been regarded by the author as falling outside its scope.

The third chapter relates to the properties of coal tar and its constituents. The chapter opens with the following statement: "Coal tar is a black, more or less viscid, fluid of peculiar smell, of specific gravity of 1.1 to 1.2, usually between 1.12 and 1.15; London tar averages 1.2, and sometimes amounts to 1.215; country tars are lighter; cannel-coal tars still more so." Those who have practical knowledge of the tars produced at London and other English gas-works at the present time, as well as in the past, will know that these generalizations in regard to the specific gravity of coal tar are applicable only to the product of gas-works which still maintain the ordinary working heats of twenty years ago. The specific gravity of London tar has advanced to about 1.28; while the mean specific gravity of a dozen tars, selected—as representing the product from as many different gas-works in the South of England—from samples of tar which have recently been examined by the writer of this review, is 1.21. It is clear that Professor Lunge's acquaintance with tar as produced on English gas-works does not extend to recent years. And since the relative proportions of the different constituents of tar change with a change in its specific gravity, it is obvious that, in

* "Coal Tar and Ammonia," by George Lunge, Ph.D., Professor Emeritus of Technical Chemistry in the Federal Polytechnicum, Zurich, Honorary and Foreign Member of the Chemical Society, London, and of the American Chemical Society. Dr. Ing. (H.C.), of Karlsruhe, &c., &c. Fourth Edition, in two parts. London: Gurney and Jackson; 1909.

this important matter, the chapter is seriously defective; but for the rest we may say that it is generally well written and informative. One point which we think is not dealt with here, or in any other text-book with which we are acquainted, is the state of combination in which most of the ingredients of coal tar subsist in it. Are the so-called tar acids combined with the tar bases, or are they merely in mechanical admixture with the oils and other constituents of the tar? This question has an important bearing on the action of tar as a paint and preservative of wood and metal work.

The fourth chapter deals with the applications of coal tar without distillation, of which the first referred to is the employment of coal tar for the manufacture of gas. This portion of the book may be regarded mainly as an obituary notice of the Dinsmore process. There is no mention of the methane-hydrogen gas process as used at the Truro and other gas-works. Several pages are devoted to the use of coal tar as fuel, and the various appliances which have been employed or suggested for the consumption of coal tar in furnaces. We then come to the employment of tar for preserving timber, stone, iron, &c., for which purposes, naturally, a refined tar made from pitch and tar oil is preferred to a crude tar containing ammoniacal liquor and volatile oils. Contradictory views are quoted as to the preservative action of coal tar when used as a coating on wood work; and it may be remarked that one of the drawbacks of coal tar for this purpose which is mentioned—viz., the presence of naphthalene in it—is scarcely tenable in view of the fact that the naphthalene in creosote oil is now held to be a valuable constituent of the latter for the creosoting of timber. If naphthalene is harmful in the one case, it must be so in the other.

The use of coal tar in the manufacture of roofing felt is dealt with fairly well, but, of course, not so exhaustively as in special treatises. The employment of tar as a cementitious material in the formation of patent fuel and of blocks for special constructional purposes, is briefly dealt with; and another short section, which also appears for the first time in the present edition, relates to the use of coal tar for making and improving roads. Very little definite information, however, is given on the subject; and the adoption of tar painting on a large scale for roads in this country is not mentioned, nor its success indicated. The latest reference to English procedure is to Mr. J. George-Powell's report as given in the "JOURNAL" in 1905 (Vol. XCI., p. 554). Much progress has been made since the date of that report, as readers of the "JOURNAL" are aware. The next section of this chapter is on the production of asphalt and pitch from tar without distilling it. The processes referred to consist for the most part in the addition of various materials to the tar. Sulphuric acid is used by Coulson, Wendriner, and G. von Wirkner for the treatment of tar or tar oils with a view to forming therefrom a pitch or pitch-like substance; but it does not appear what measure of success has been achieved by such processes. After some subsidiary uses, such as the employment of coal tar, or of simple preparations of it, for antiseptic and medicinal purposes, the author passes on to the manufacture of lamp-black and soot, for which a prepared tar or creosote oil or pitch is preferable to crude tar. The furnaces in use for such manufacture are described, and some processes are mentioned for the more direct production of printers' ink from coal tar.

With the fifth chapter, which treats of the first distillation of coal tar, we enter on the portion of the work which deals with the working-up of tar to its various products. The processes of distillation employed, and the methods of treating and purifying the first products, have not been varied to any considerable extent with the change which has taken place in the character and quality of the crude tar in consequence of the changes in methods and heats of carbonization of the coal at gas-works. Therefore, this part of Professor Lunge's work, even where no alterations have been introduced since the publication of the previous edition, remains trustworthy as a guide to the procedure which is actually followed at large tar-works in this country and abroad. In some respects, however, the information given must be accepted with caution. Generally speaking, it applies only to gas-works tar and not to the tar from coke-ovens, carburetted water-gas plant, blast-furnaces, &c. For instance, cement concrete tanks for the storage of tar are, as stated, cheap and fairly trustworthy so far as coal tar is concerned. But they are readily pervious to water-gas tar; and it would have been well if Professor Lunge had included a warning on this point in his comments on the storage of tar. The problem of the dehydration of tar prior to distillation has become a more important one with the increase in the viscosity and density of the tar, as the modern high temperature tars retain in intimate admixture a much larger proportion of ammoniacal liquor than the tars produced at the low temperatures of carbonization which formerly prevailed. The references, however, to the modern methods of dehydration are rather brief and inconclusive, consisting mainly in quotations from patent specifications, without reference to results obtained in the practical application of the processes where they have been tried on a working scale. Nothing is said of centrifugal separators later than a quotation from a report by Herr Menzel in the year 1902. The remainder of the fifth chapter relates to the construction of tar-stills and the procedure for the first distillation of tar, and is, on the whole, satisfactory.

The reference to Köhler's determination of the relation between the specific gravity of tar and the percentage of free carbon which it contains, and which was quoted from Professor Lunge's work

by Mr. G. M. Gill in last week's "JOURNAL" (p. 740), dates from the year 1888, and badly needs bringing up to date. The percentage of free carbon in many modern gas tars reaches 30 per cent., whereas the highest figure given by Professor Lunge (*i.e.*, from Köhler's researches) is 23.75 per cent., though, elsewhere, in the book it is stated that the carbon found in German coal tar by a particular method of estimation varies from 7 per cent. to 33 per cent. This method of estimation, however, is known to give results which are higher than the correct value.

The sixth chapter relates to pitch, and contains a good deal of matter which was not in the last edition, especially in regard to the manufacture of patent fuel or briquettes. The chapter is, on the whole, well written and more up to date than some of its predecessors.

In regard to anthracene oil, which is dealt with in the seventh chapter, and to creosote oil, with which the eighth chapter treats, there is not very much fresh matter introduced; but what there is is satisfactory, and these two chapters may be consulted with confidence. The chapter on creosote oil concludes the first volume of the new edition.

Chapter IX., with which the second volume opens, refers to carbolic acid and naphthalene. The treatment of these subjects is a good deal fuller than in the last edition of the book. The production of the various grades of carbolic acid, cresols, &c., and preparations of same, is exhaustively handled; but as only a comparatively small section of readers of the "JOURNAL" will be directly interested in the manufacture of these products of coal tar, we need not refer to this portion of Professor Lunge's work in detail. Naphthalene is a heading which will appeal to a wider circle; but, naturally, the information given in the book is chiefly in regard to the recovery of naphthalene from tar oils and its purification. Among the uses of naphthalene, the carbureting of gas therewith on the albo-carbon principle is fully dealt with, and appears to be regarded by the author as still of practical importance. Subsequently, however, the more modern use of naphthalene alone, or in association with liquid fuels, for driving internal-combustion motors is referred to, as well as a number of minor, but interesting, applications of naphthalene, quite apart from its use in the synthesis of artificial dyes.

The tenth chapter treats of light oil and crude naphtha, and, with the eleventh chapter, on working-up the light naphtha into final products, forms one of the most valuable sections of the whole work. A great deal of new and useful matter has been incorporated in these two chapters since the issue of the last edition of the book; and the result is very gratifying. A synopsis of the products obtainable from coal tar and a reprint of the official rules issued by the Home Office in 1903 for the prevention of accidents in tar-works, conclude the portion of the handbook which relates to coal tar, though a few pages of addenda at the end of the volume also refer solely to tar products. Including these, there are 815 pages devoted to tar; while the remaining 336 pages of text deal with ammonia. As we propose to defer notice of the author's treatment of the latter subject until next week, we may fitly at this stage sum up our views on his work in so far as it treats of coal tar and its products.

The level of excellence attained in the present edition is not so high as in the first two editions of the treatise, perhaps because the author is now less closely in touch with gas-works and tar-works, especially those of Great Britain, than formerly. There are numerous palpable defects in most of the chapters; but the faults of commission and omission are most conspicuous in those directly concerned with the raw material. Nevertheless, the work is indispensable to every technical officer on tar works; and most engineers and chemists of gas-works will profit by having it at hand for ready reference.

Extraction of Ammonia from Liquor.—According to a French Patent taken out by M. Herry, the specification of which is abstracted in the current issue of the "Journal of the Society of Chemical Industry," ammoniacal liquor, separated from tar, is treated with a current of carbon dioxide in order to convert ammonium sulphides into carbonate. Sodium carbonate is then added to decompose cyanides, thiocyanides, &c., and the liquor is concentrated. This liquor can be used for the production of ammonium-carbonate crystals, or the ammoniacal vapours can be mixed with the crude gas from the retorts to form ammonium sulphide, carbonate, thiocyanate, &c., which can be removed by washing; thus purifying the gas without using iron oxide.

A Gas-Engine Indicator.—We learn from a paragraph in the Engineering Supplement to "The Times" that Professor N. M. Hopkins, of the George Washington University, has, by an ingenious application of the principle of the electric pyrometer, developed an instrument to indicate the performance of an internal combustion engine. Instead of reading in degrees of temperature, it is graduated in arbitrary units which are proportional to the power developed and the speed attained. The thermo-couples are made of metals able to withstand the high temperatures existing in the cylinders of gas and gasoline engines, and are arranged to form part of the sparking plugs. Having a switch to connect the instrument to any one or all of the engine cylinders, the driver may ascertain exactly what each is doing, or if one is not firing. It shows the power of the engine, and indicates what conditions produce the highest efficiency; or it may be read to give the speed of the machine or the revolutions per minute of the driving-shaft.

PUBLIC WATER SUPPLY FOR PURPOSES OF FIRE EXTINGUISHING.

By C. W. S. OLDHAM,

Borough Water Engineer, of Ipswich.

[From a Paper read before the Association of Water Engineers.]

The great loss annually incurred through destruction of property by fire, together with the part that water takes in extinguishing fires, render the question of public water supply for fire-extinguishing purposes an important consideration. The law enacts that the undertakers of a public water supply shall provide water for fire purposes through public fire-hydrants free of charge; and that the pressure, unless otherwise stated in Private Acts, shall be sufficient to reach the top storey of the highest house within the limits of supply. The undertakers of a public water supply are also bound, at the request of the local authority, to fix and maintain in good order, hydrants for fire purposes; the cost of providing, fixing, and maintaining such hydrants to be at the expense of the local authority or town commissioners. The water undertakers are also bound to supply and fix, at the request and expense of the owners of any works or manufactory situated in any street in which there shall be a pipe of the undertakers, fire-plugs (to be used only in case of fire), as near as conveniently may be to such works or manufactory. Section 66 of the Public Health Act, 1875, states that every urban authority shall cause fire-plugs and all necessary machinery and assistance for securing an efficient supply of water in case of fire, to be provided and maintained.

Thus, although provision is made for public hydrants, and the water authority is bound to supply water through such public hydrants free of charge, no mention is made as to the quantity of water to be delivered in a given time; and the only reference to this point is the expression "efficient supply" in the section quoted above. This puts the responsibility for securing an efficient supply on the local authority and not the water undertakers. In fact, it is held, on a case stated, that "there is nothing in the Water-Works Clauses Act, 1847, to compel a water authority to provide at their own expense a pipe of sufficient size for an effective fire-plug."* Consequently, many mains have been laid that are of an insufficient diameter to give an adequate supply for fire purposes; and although in many towns much money has been spent in enlarging the size of mains to provide for fire, many small mains are still in use. In up-to-date practice, it is usual, when considering the size of new distributing and service mains, to give premier consideration to the question of fire supply. In order to allow for fire, no service-main should be laid less than 4 inches diameter, unless it be a very short length. The extra expense of providing pipes of larger diameter than are necessary for the ordinary domestic and trade requirements is, however, very generally borne by the water undertakers.

While considering the question of mains for fire supply, mention might be made of the large amount of money now being expended in some of the American cities. Brooklyn (New York) has lately put in 20 miles of mains of from 8 inches to 20 inches diameter for fire supply only, with special pumps capable of delivering 24,000 gallons per minute at a pressure of 300 lbs. per square inch. San Francisco has also decided to spend over a million pounds sterling on fire-mains only.

PRIVATE FIRE-HYDRANTS.

The undertakers are not bound to supply water free of charge through hydrants placed on private property. In most towns it is customary to make an annual charge for each private hydrant, and to supply water for fire purposes free of charge—such hydrants being kept shut and sealed by the water authority. It is, of course, advisable to place such private hydrants on separate mains for fire purposes only; but in many cases hydrants are supplied through meters—being served by mains which supply water for trade purposes. In all such cases it is advisable to have a bye-pass of the full size of the main round the meter; a sealed sluice-valve being provided on the bye-pass. The necessity for such a bye-pass will be recognized when it is remembered that meters are liable, in case of heavy draught, to break down and stop the supply. Should a fire occur, the bye-pass valve is opened, the full pressure and flow of water

is obtained at the hydrants, and any chance of damage to the meter, or stoppage of the supply of water to the hydrants through breakdown or centreing of the meter, is obviated. In connection with the undertaking of which the author has charge, an instance of complete stoppage of the water supply occurred at a recent fire; the failure was occasioned by the vulcanite piston of a 4-inch "Uniform" meter being smashed as a result of the heavy draught from several hydrants. Fortunately, a steam fire-engine was available, together with water from a neighbouring ditch; otherwise the consequences would have been very serious. Since this occurrence, all private mains in the town which are metered and supply fire-hydrants have been bye-passed; the cost of the bye-passes being charged to the consumers, and the valves commanding the bye-passes kept sealed by the water authority.

AUTOMATIC SPRINKLER INSTALLATIONS.

It is not intended in this paper to describe in detail the construction of sprinkler installations; but it will be sufficient to say that, to all intents and purposes, they are fusible plugs placed on lines of pipes inside a building. The solder on the plugs melts as soon as the temperature generated by a fire is sufficient, the plugs are released, and water is poured on the fire. Sprinkler installations are officially recognized by all the Fire Insurance Companies, and are admitted to be a most reliable protection against fire. Many installations of automatic sprinklers have in recent years been fixed in mills, factories, warehouses, and shops; and the number is likely to largely increase owing to the fact that such installations have proved themselves of very great use in dealing with fires in their earlier stages, and also that the Insurance Companies make a substantial allowance (in some cases even 50 per cent.) off the premiums charged on such premises when not protected by sprinklers. The saving in premium in many cases covers the cost of the installation in a few years. The new State regulations in France stipulate that all theatre and opera stages must be protected by automatic sprinklers or drenchers.

Sprinkler installations are of interest to water authorities, inasmuch as they extinguish a fire in its incipient stage, and thus prevent a conflagration which might necessitate the use of many thousands of gallons of water for which no charge could be made. During the year 1908, 59 fires were extinguished by Grinnel sprinklers in the United Kingdom; the number of sprinkler heads opened in these cases averaged under ten for each fire. During the same year, the number of Continental and Colonial fires extinguished in the same manner totalled 137, the average number of sprinkler heads opened being also under ten for each fire. The ordinary average, however, is three; and it is estimated that the average time the sprinklers pass water is only 20 minutes—the consumption being less than 1000 gallons per fire.

All sprinkler installations have an automatic alarm valve and bell, which instantly come into operation in case of any water flowing through the pipes; thus a leak is revealed as promptly as a fire. That leakages are of rare occurrence, is proved by the fact that they can be insured against at the low rate of 1s. per £100 for damage done by water alone. To insure sprinkler systems against damage from frost, the "dry system" is employed. In this, the pipes are filled with air under pressure, which keeps closed a patent equilibrium valve shutting-back the water; the releasing of the air automatically opens the valve, which admits water to the pipes. The installation can be arranged so that both wet and dry systems can be used according to the season of the year. In some cases water for sprinkler installations is supplied by meter only; but considering that no water can pass without immediate notification on the alarm bell, and that the average quantity of water used is small, the author is of opinion that the supply of water for sprinkler installations is better met by a special lump-sum charge than by a meter supply. This view is supported by the fact that meters are liable to break down or get centred in working, and so interfere with the supply of water.

The author is aware that the meters which supply sprinklers usually supply the ordinary trade requirements as well. But although this as far as possible ensures the meter being always in working order, there is still the liability of the meter stopping the flow just when water was required for extinguishing a fire. Another point is that a much larger meter is necessary to meet the two requirements than would be needed for the trade supply only. In general, a 4-inch or 6-inch meter is required for a sprinkler

* *Rex v. Wells Water Company*, 1886. See "Michael and Will's Gas and Water," 5th edition, p. 321.

installation. In the case of the eight sprinkler installations and four drencher installations supplied by the author, the capital outlay for meters would have been over £500.

DRENCHER INSTALLATIONS.

Drencher installations may be described as a means of protecting property against fires spreading from adjoining buildings to the protected building. They consist of a system of pipes erected on the external walls of a building; the pipes being kept empty, and fitted with open drencher heads over each window and doorway on the outside of the external walls. In case of a threatened attack from fire on the surrounding property, water is turned on to the system by means of a valve on the ground floor outside the building, and which valve is sealed by the water authority. Cornice sprinklers or drenchers are used in a similar manner.

Another means of protection from fire, which has been found reliable and thoroughly practicable, is the May-Oatway system, which has been approved by the Insurance Companies and Fire Brigade experts, and operates by the action of heat, gravitation, and electricity. Water is only required after these natural forces have been utilized in giving the alarm of fire. Other automatic means of giving an alarm of fire, employing the melting of solder or a thermometer which closes an electric circuit, may be mentioned; but these and the May-Oatway system only affect the water authority in that they give an early indication of fire, and so save water.

A tabulated statement accompanied the paper showing the charges now in force for private fire-hydrants, sprinkler installations, and drencher installations in 31 important cities and towns. The charges for private fire-hydrants vary from 42s. to 4s. a year for each hydrant. In some towns no charge is made; while in others the supply is afforded by meter only. For sprinkler installations, some authorities supply these by meter only, some charge on the number of sprinkler heads, some on the superficial floor area of the buildings protected, some on the installation without respect to size, while others charge on the size of the connection to the public main. Again, in some cases no charge is made; and in one town a charge is made only when the installation is used for fire.

The table also shows the charges made by water authorities for drencher installations in twelve important cities and towns. Two of these authorities supply drenchers by meter only; one, the Metropolitan Water Board, bases the charge on the superficial area of the buildings protected; seven make annual charges of various amounts; and two—viz., Liverpool and Wigan—supply water free of charge.

The great variety of the charges adopted proves the desirability of deciding as to the most equitable basis upon which such charges should be fixed. In view of the moral, if not legal, responsibility of water authorities to, as far as possible, provide an ample and adequate supply of water for fire purposes, the author would urge that no obstructions should be placed in the way of property owners in the form of exorbitant charges for the privilege of having fittings for fire extinction connected to the water-mains; but that, where possible, such charges should be nominal in amount.

In conclusion, the author would suggest that, in order to ensure an adequate supply of water in case of fire, it is generally advisable to have the water-works offices in electrical communication with the fire stations, and that the Fire Brigade should also have similar means of communication with at least two water-works turncocks, who could assist by pointing out the position of the most suitable hydrants in each particular case, and, where both high and low pressure systems are in use, by turning on the high-pressure supply if necessary.

Discussion.

Mr. OLDHAM, in view of the paper having been taken as read at the summer meeting, was asked by the President to open the discussion by indicating its chief features. The author said the essential point was the very great discrepancy in the charges for fire extinguishing. Some towns were rather oppressive in their dealings with the private consumer who wanted a supply for fire purposes to his premises. From the table given in the paper, it was seen that the charges varied considerably for fire hydrants. The figures for automatic sprinklers and drenchers also varied very much. He had some eight installations in the town of which he had charge; but many of the manufacturers who had these installations—such as a big corset factory—did not like to pay £5 a year, though they got a 50 per cent. reduction on their

insurance premiums. Some towns let private owners have these protective conveniences very cheaply; while some charged them, in his opinion, too much. The question was what ought to be fairly charged. A good deal, of course, depended upon the financial state of the water undertaking. If a water undertaking made a big profit for the corporation or company, they could afford to give the private fire hydrant supply for nothing. If, however, there was a rate-in-aid required, or a small profit made, they had to make a charge. He had suggested that the great variety of charges proved the desirability of deciding the most equitable basis upon which such charges should be fixed.

Mr. HERBERT HALL (Montrose) wrote: "I have read with much interest Mr. Oldham's paper. The importance of a public water supply for fire extinguishing purposes is often overlooked when planning the distributing arrangements of a water service, or when making renewals of mains. When reconstructing and relaying the distributing arrangements in Montrose, some twelve or fourteen years since, it was decided to adopt 6 inch mains as the minimum size. From a number of tests made of the delivery of hydrants, it was found that a 4-inch main was practically useless if more than one hydrant was opened, whereas a 6-inch main would serve three or (in some cases) more without any serious diminution of supply or pressure. There are several practical points in connection with this subject upon which it would be useful to have further information, such as the best form of hydrant, the average distance between each hydrant, and the proper form of jet nozzle."

Mr. R. O. WYNNE-ROBERTS (Westminster) said that, when he was at Cape Town, one difficulty they had was in assisting a neighbouring town in the matter of extinguishing fire, through the threads adopted in the hydrants of one district not corresponding with those in another. The Railway Department and other Government departments also had threads which did not correspond with the Corporation threads. With regard to the installation of drenchers, sprinklers, and hydrants, he should like to draw attention to one thing in connection with these appliances—that was, the contingency of complication of connections to various buildings. There were high-pressure supplies, low-pressure supplies, and often salt-water supplies in the same buildings. Under these circumstances, as would be well understood, there was some difficulty in preventing mistakes being made between one connection and another. To obviate this, he had letters cast in brass and inserted them in the pavement; so that the different supplies could be distinguished. This removed the tendency to mistakes.

Mr. W. G. PEIRCE (Richmond) remarked that, with reference to sprinklers, he had not had any experience in the Borough of Richmond; but he found great difficulty in providing a sufficient supply of water for the large fire-engines now in use, for extinguishing fires. In his borough they had a powerful engine capable of pumping 360 gallons of water per minute; but, unfortunately, the mains that were available over a great part of the borough were only 3 and 4 inches in diameter. It was impossible to supply sufficient water in the borough with 4-inch mains. These pipes had been laid down a good many years; and there was great objection to opening up the streets to substitute larger mains. This would prove an expensive matter. The discussion had come at the right time for those engineers who were contemplating laying new mains to take advice, and consider the question of recommending larger mains in future. The Metropolitan Water Board had been laying 6 and 7 inch mains where 4-inch used to be considered large enough.

Mr. WYNNE-ROBERTS desired to add to his former remarks that a peculiar position they were placed in, in Cape Town, was in having the serious fire risks all located in a small radius— $\frac{1}{2}$ mile square. There they had tremendous conflagrations; some premises costing as much as a quarter-of-a-million to re-establish. In consequence of these extraordinary risks, he induced the Corporation to instal a fire-main, 8 miles long; and it ranged in diameter from 12 to 24 inches. By this means, they were able to deal with any conflagration that arose. It was sufficient to supply water under great pressure in every instance in that radius, without the aid of fire-engines.

Mr. PEIRCE further remarked that at Richmond they had a dual supply—river water—with independent pumps, for supplying water for flushing sewers, street watering, and trade purposes. These mains did not extend through every street in the borough; but with branches through side-roads

they practically covered the roads sufficiently to satisfy the requirements for this source of supply. With the dual system of supply, pumping direct into a dead-main (no reservoir), and keeping up pressure to 125 lbs. per square inch, had proved a great success in extinguishing fires.

Mr. R. B. RIGBY (Bury, Lancs.) agreed with the author that no service-pipe should ever be laid of less than 4 inches diameter for fire purposes, as it was essential a good flow of water should be available at the commencement of a fire. With respect to private fire hydrants being supplied through meter, his Board had had cases where the meters had totally stopped, and thereby cut off the supply of water. They had had several meters removed which were in use for fire purposes, and the supply connected direct to the main to hydrants. In a number of cases, they had hydrants supplied with bye-passes round the meters as mentioned by the author. In his district, they had about 70 mills and workshops fitted with automatic sprinklers in consequence of the liberal allowance made by the Fire Insurance Companies; and in Lancashire as much as 70 per cent. discount was allowed off the premium where the pressure was 25 lbs. on the highest sprinkler, when the 2-inch wash-out valve was opened to the full—this valve being equal to eighteen sprinklers running. Under similar conditions, 65 per cent. discount was allowed for a pressure of 12 lbs. and 60 per cent. discount for a pressure of 10 lbs. He should like to point out that the Insurance Companies insisted on a tank being erected where there was only one main in proximity, but where there were two mains supplied from separate reservoirs, then the tank could be dispensed with. All the sprinkler installations in his supply area were connected direct to the main, and charged at the rate of £4 per annum for each installation. He was of opinion that it would be very detrimental indeed to have the supply afforded through a meter. The largest number of sprinklers supplied from one installation was 6483, and the smallest 57. In September, 1905, he recommended the Board to dispense with fifteen inferential meters which supplied sprinklers and trade purposes, and charge through rental for the sprinklers, and put smaller meters to supply the mills for trade purposes, with the result that there had been an increased revenue of £89 9s. 6d. per annum for the last four years.

Mr. PEIRCE asked whether the tanks were fixed on the buildings. At Richmond he suggested large tanks in the main roads, under the footpaths, to provide a supply of water to allow the fire brigade to have a good start with the large steamer.

Mr. RIGBY said they had at present twelve tanks which were fed by a 6-inch main. They held 700 gallons; and, by their aid, the fire brigade could cope with their work. Under his arrangement, they could deliver 600 gallons per minute.

Mr. T. MOLYNEUX (Stockport) remarked that there was one point about sprinkler installations that had caused trouble, which was that when sprinklers were attached to a main, with fire hydrants, immediately the fire brigade began to work on the main in the street, the sprinklers ceased. This was a difficulty which could only be overcome by having two mains. As to street tanks for the fire-engines, he had several in his town. The Watch Committee paid for them; and he put in a 6-inch main to feed them. They invariably did this where the pressure was low. As soon as the valve was opened to supply the tank, the water was gone from the hydrants. It was therefore where there was only a low pressure per square inch that these tanks were put in. A 6-inch valve would deliver a large quantity of water per minute, which would keep two, and even three, fire-engines going. Their charges for sprinkler installations were the same as in Manchester. It was a simple basis, depending upon the size of the main entering the building; and there was no trouble as to whether a man added or disconnected a few hundred sprinklers.

Mr. E. ANTONY LEES (Birmingham) said there was one point with regard to duplicate supplies to sprinkler installations. He should like to know whether any of the members had had experience of being asked for supplies from mains under different heads; the two being united in the same installation of sprinklers, and controlled by an automatic valve. The idea was that the normal supply should be from the high pressure; but if for any reason that should be off or reduced at any time, the lower pressure would automatically come into operation. The suggestion was made with the view of avoiding the provision of a high-level tank on the summit of the building itself. In Birmingham, they had declined to permit connections communicating within their

system; and they required that, if they were provided, there should be a tank, and that there should be complete cut-off by means of the tank of communication between the two. As there seemed to be considerable experience of sprinkler installations—particularly in the towns in the cotton districts—one would be interested to know whether the point had arisen, and how it had been dealt with.

Mr. MOLYNEUX said that, in their case, they had a back-pressure valve fitted with an automatic alarm; and as soon as the water commenced to move from any cause, it set the alarm off. If the water were passing from the high-pressure into the low-pressure main, the alarm would ring. The automatic valve he had only known a few years; it was quite a recent thing. They were insisting upon it in every sprinkler installation.

Mr. ANTONY LEES said he might say they had this valve. He had no doubt it was the same one. They had had it in operation at their works; and their engineer reported that it was not sufficiently reliable to justify him in permitting its installation. His view was that there was a danger of its being opened to such an extent as to reduce the pressure by frequently running to waste on sudden fluctuations of pressure, and without giving the necessary alarm.

The PRESIDENT: There was an alarm?

Mr. ANTONY LEES: Yes.

Mr. WYNNE-ROBERTS said that, at Cape Town, they put in duplicate mains because of the reduction of the annual insurance premium, which the applicants saved by incurring the initial expense of these installations. Automatic back-pressure valves were fixed in every installation; and only in two instances had they any trouble, due to grit or dirt getting under the valve seating. But this did not interfere with the supply or pressure from the water-mains.

Mr. MOLYNEUX remarked that the reason that in his town the Insurance Companies had insisted upon these duplicate supplies from mains or elsewhere was that when buildings—such as mills—were old, they would not stand the weight of the tank. The tank supply was taken by the Insurance Companies as a second supply.

Mr. ARTHUR ANDREW (Oldham) said in their case they did not allow two connections from different mains having different pressures. They had had many applications for such duplicate connections; but in every case they declined to allow them. A high sprinkler tank must be put in for one supply; and they did not allow a connection direct to the sprinklers from their mains along with any connection from a donkey pump. They must be separate and distinct from different pipes. Regarding what was said as to the laying of pipes of larger diameter for fire purposes at the expense of the water undertakers, in their own case they insisted on the consumer bearing the expense of any enlargement of the pipe desired by the consumer, who got an additional discount allowed by the fire insurance companies.

Mr. J. S. PICKERING (Cheltenham) said, as to protection from fire, he would like to refer to the relations existing between water authorities and fire insurance companies. The obligation, as the author had pointed out, was thrown upon the water authority of laying down supply-mains, and providing a sufficient supply of water for fire-extinguishing purposes. It was found, as a rule, that water companies provided smaller fire-mains than local authorities who owned water undertakings. That was because the companies had only the financial aspect to look to, whereas the local authority had to consider the good of the community at large, including protection against fire; and therefore fire protection was better carried out by a local authority than a water company. What he wanted to suggest was that where a local authority owned the water undertaking, better protection still would be afforded if, instead of property being insured with the different insurance companies, it could be insured with the local authority; thus making the water authority directly responsible for protection against fire. As the authority were compelled to provide larger mains, and an efficient supply of water for fire purposes, the public should get what benefit there might be from insurance premiums. The public body had to maintain not only the mains and supply water, but had to provide an efficient fire brigade; the latter being generally almost entirely for the benefit of the fire insurance companies. Occasionally, there might be risk of life in the case of fire; but in ninety-nine cases out of every hundred, there was no such risk. It was merely a question of the destruction of property; and it amounted to a commercial interest, instead of a question of life and death. The suggestion might be looked upon as somewhat socialistic

for municipalities to undertake fire insurance; but when it came to be thought out, it would be seen that it was to the advantage of the community as a whole, especially when one came to realize the amount of public money which local authorities were spending year by year for fire protection, and getting from it no direct benefit.

Mr. H. ASHTON HILL (South Staffordshire Water Company) did not know why a question of water for fire supply should be made the ground for a comparison between company and corporation working. Mr. Pickering seemed to think that companies had only to make dividends, and corporations had only to spend money, and it did not matter which committee did it. But in the table they had before them in the paper, there was a large number of corporations who charged for fire hydrants. The Company with which he was connected did not make any charge at all, so that was a direct answer to Mr. Pickering's contention. He also seemed to be under the impression that authority undertakings were bound to lay mains for fire purposes. It would be found, as a matter of fact, although corporations did often lay mains specially for fire purposes, it was not the water department that did it. One of the speakers had told them it was the Watch Committee that gave the Water Committee the order to do the work.

Mr. C. CLEMESHA SMITH (Wakefield) said, regarding the point of the laying of larger mains for the prevention of fire, by having a larger main a fire might be put out more quickly, and the whole or a considerable portion of the building saved. Thus not only was the money of the fire insurance company saved, but the money of the ratepayers as well; since, if the building were destroyed, no rates could be collected on it. Further, if a mill were enabled to go on working, all the operatives would be earning their money, instead of being idle, and becoming a burden on the rates. Also, by laying a larger main, they were, in a sense, safeguarding the lives of the workmen. These were arguments in favour of larger mains.

Mr. C. H. PRIESTLEY (Cardiff) pointed out that the question of the provision of water for fire extinction was more a matter of the Act of Parliament under which water authorities were working than anything else. He knew of places where the water authorities were bound to provide fire service, and special provision was made for it. In many other towns, he did not think they were called upon to provide it. Mr. Hill made a point of a case in which the Watch Committee had to pay for the provision. That might be so in some towns; but it was not so in his own case. The water authority had to pay for it, and were bound to put the hydrants at a certain distance apart free of cost.

Mr. FREDERICK GRIFFITH (Leicester) said as one of those who had supplied some of the material to the author to enable him to compile the details of the paper he had submitted, he would like to point out the discrepancy that existed in various towns as to the charges for water for installations for fire-extinction purposes. They made no charge for water used for extinguishing fire. They did not meter the installations. The installations were off 6-inch mains. Mr. Lees had mentioned the question of duplicate connections. They had one case in which there was a supply from a high-pressure main, carrying 140 lbs. to the square inch, and another connection to the same installation carrying about 80 lbs. to the square inch. It was only within the last ten years they had introduced these installations. He was pleased to say they had had no experience yet of their efficiency, because they had had no disastrous fire; and he hoped they would not have one. Other people, especially in the Lancashire districts, where they had had fires, and so had had experience, spoke very highly of the efficiency of the installations; and no doubt there was more to learn upon the subject.

Mr. J. F. CULLEN (Deal) understood that at Leicester they required certain notice as to the seal on the hydrant having been broken. What was the usual time that was allowed to elapse before the notice was given?

Mr. GRIFFITH: As soon as possible afterwards. Next day, if it is in the night that the seal is broken.

Mr. G. O. H. KLOPP (London) remarked that Mr. Oldham cited the case of the failure of a mechanical meter. It was the usual practice of his firm when mechanical meters were installed on fire supplies to advise the engineer to instal it on a bye-pass with a sealed valve on the main. They did so in this case; but, seemingly, their advice was not taken.

Mr. C. CLEMESHA SMITH observed that he believed, under

the Water-Works Clauses Act, the hydrants must be 100 yards apart. There was no alternative. Section 38 of the Act of 1847 said:

The undertakers, at the request of the town commissioners, shall fix proper fire-plugs in the main and other pipes belonging to them, at such convenient distances, not being more than the prescribed distance; or if no distance be prescribed, not more than one hundred yards from each other, and at such places as may be most proper and convenient for the supply of water for extinguishing any fire which may break out within the limits of the Special Act.

The PRESIDENT said the 1847 Water-Works Clauses Act enacted that the distance between fire-plugs fixed by a water company at the cost of the town commissioners should be not more than 100 yards apart. The Act was passed before water-works came much under the management of municipal authorities; and it was to compel water companies to put in a sufficient number of fire-hydrants. They had heard very little about the difference between the public and the private fire-plug. It had been touched upon because of the sprinklers; and the idea seemed broadly to be that, because these sprinklers were on private property, they came under the heading of private fire-plugs. The question of the enlargement of water-mains, so that there might be a sufficiency of water to put out fires, had also been touched upon; and a comparison had been drawn between a water company and an authority carrying out a water supply. Fire was a common enemy; and it seemed only fair the cost of fighting a common enemy should be met by the common purse. Water companies could not be expected to put in larger pipes than those required to meet their obligations to uphold a domestic supply in order to cope with any size of fire; and it seemed to him quite reasonable that water companies should say to public authorities: "If you are prepared to pay some proportion of the cost of enlarging these pipes in order that they may be successfully used for fire extinguishing, we are ready to enlarge them." They could not expect the purse of a water company to bear the cost of the larger pipes, which were *pro bono publico*. Sprinklers were quite modern things; and in fixing the charge there had been nothing to go upon in the past. They had now a list of the charges made and experience gained in other places; and he hoped they would now—whether company or corporation—try to arrive at a uniform charge.

Mr. OLDHAM, replying to the discussion, said in regard to Mr. Klopp's advice, it was not given to him, but to his predecessor. This was one of at least fourteen connections with mechanical meters on the fire-main; and he had since had bye-passes put round them. The argument put forward by users of the sprinklers or private hydrants was this: "You are bound to supply water free of charge through the public hydrants. If sprinklers are used inside the building, a fire will be put out so much quicker. Consequently, so much less water will be used, and so money will be saved." There was something in this argument. The average quantity of water used per fire through sprinkler installations was about 1000 gallons; while if there were no sprinklers inside the building, a couple of million gallons might be taken through the public hydrants for which no charge could be made. They argued that water was saved by installing these things in their premises; so that they ought not to be charged a high rent for the privilege of connecting to the public mains. As to the question of the two connections—the high and low pressure—so as to be able to do without an overhead tank, he thought the automatic valve that was put in on the installation, and a non-return valve on the low-pressure supply, ought to make it quite safe, so that the two waters would not be mixed, and especially was this the case if they had an alarm bell as well. Birmingham would not allow it; but he thought that was putting a big obstacle in the way of people who wanted to protect themselves from fire. He had intended to convey this idea towards the end of the paper, where he urged that, "no obstructions should be placed in the way of property owners in the form of exorbitant charges for the privilege of having fittings for fire extinction connected to the water-mains; but that, where possible, such charges should be nominal in amount." If a man was willing to pay a higher charge, but if he was told he should not have two connections, when his building was not strong enough to take an overhead tank, then the only alternative was for him to go to the heavy cost of building a tower. And, as before stated, with an automatic valve on the high-pressure, and a non-return valve on the low-pressure, there was little danger of the mixing of the two waters, and, in his opinion, separate

connections should be allowed. It was hard on the people who came for a supply for protection purposes to place unfair obstacles in their way. They were the people who paid the rates, and in the case of municipal undertakings owned a big share of the water-works. The question had been introduced as to breaking the seals. In the agreement that was signed, a clause was usually embodied to the effect that, if the seals were broken for anything but a case of fire, twelve hours' notice must be given. The seals might, of course, be broken accidentally. He had had trouble with private hydrants in mills where sacks were carried up and down. The hydrants were sealed with a type (they had done away with copper wire) and a lead seal; and the excuse was made that the man carrying the sacks broke the seal. There were many accidental breakings of seals in this way. They could not say much about these. He made it a rule to have a quarterly inspection of every private hydrant in the town. There was one interesting point that might be mentioned. Where in the City of London sprinklers and drenchers were fixed, and the pressure was not sufficient to cover the guarantee the Insurance Companies wanted, the supply was augmented by connection to the hydraulic power mains; and the arrangement, as worked, was very efficient.

MR. E. W. SMITH'S GAS INSTITUTION PAPER.

It may be remembered that it was arranged, at the last June meeting of the Institution of Gas Engineers, that the various points raised in the discussion that took place on the Gas Heating Research Committee's report and on Mr. E. W. Smith's paper, on "Open Gas-Fires," should be replied to in writing by Mr. Smith. The issue (last week) of the volume of "Transactions" of the Institution during Mr. Thomas Glover's presidency enables us to complete our report of the proceedings, by reprinting the reply made, as he says, on behalf of the Committee.

Mr. Smith writes: The criticisms on the Gas Heating Research Committee's report, when summarized, are:

- (1) That the experimenting room was abnormally small, and that more useful results might have been obtained had its dimensions approximated to the ordinary living room.
- (2) That the method adopted for the estimation of the percentage humidity of the air of the experimenting room—by means of the wet and dry bulb hygrometers—is inaccurate, and makes the humidity values unreliable.
- (3) That it is extremely unlikely that a gas containing such a high percentage of nitrogen should give the calorific value stated in the report.
- (4) That there was a third of the heat given off from the stove unaccounted for in Table I. of the report.
- (5) That by using reflectors in front of the stove, the heat usually radiated towards the feet of occupants in the room would be directed objectionably towards their faces.

In reply to these criticisms, it may be stated:

(1) The experimenting room is decidedly small for general experimental work with gas-stoves; but it is highly satisfactory as a room in which the heat-balance of stoves may be determined. This was the primary purpose of the room. The size of the room does not materially affect heat-balance determinations; and with a small room the varying factors to be coped with are more completely under control than with a larger room. The size of the room was, as a matter of fact, determined by the resources the Committee had at their disposal.

(2) The relative humidities of the air inside and outside the room were obtained by means of wet and dry bulb hygrometers. These have been most carefully and accurately compared with those obtained by means of the Regnault hygrometer.

At 60° Fahr. there was no difference.

" 68° " the hygrometers read 1 per cent. low.

" 77° " " " " 1.5 " " "

" 86° " " " " 2.0 " " "

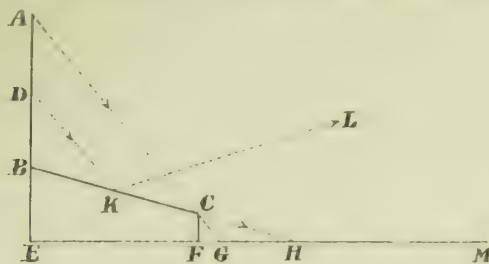
compared with the Regnault hygrometer. The average error in the internal humidities was consequently 1.5 per cent., which is hardly sufficient to vitiate the results submitted in the report to the extent suggested by the critic. As the volume of air passing through the room during most of the experiments was fairly large, the hygrometers were tolerably well ventilated.

(3) The analysis of the gas used averaged for nitrogen the figure stated in the report. The calorific values were also as stated in the report. Probably the fact was overlooked that all gas volumes had been reduced to "0°C. and 760 m.m. dry," and the figures in Column D of Table I. were erroneously taken to be the calorific values of 1 cubic foot of gas at 60° Fahr. and 30 inches wet. The factor for the conversion of gas volumes at 0°C. and 760 m.m. dry to 60° Fahr. and 30 inches wet is 1.073, and from 60° Fahr. and 30 inches wet to 0°C. and 760 m.m. dry is 0.9324.*

* The figures in Columns C and D of Table I. appended, have been converted to 60° Fahr. and 30 inches wet, and are added at the side.

(4) A column for the "missing third" has been added to the table at the end of the report. This is the heat of convection originating directly from the stove. The total heat of convection produced by means of the stove, and found in the room, is higher than the figures given in this Column H₂, owing to a large part of the heat of radiation being converted ultimately into the heat of convection.

(5) The accompanying diagram will show that with the reflector (B C) that was used, only the radiations that would have struck the floor within 10 inches (E to H) of the foot of the stove (E) would be reflected, and not those rays that extend as far as the



feet of occupants in the room. A B is the front of the heater "fuel" surface (6 inches); D is its centre; B C is the reflector at an angle with the horizontal at 15°; D K L is the course of a ray emitted from the centre of a stove on to the centre of the reflector. This will approximately be the mean course of all the radiations reflected.

STANDARDIZATION OF GAS-MANTLES.

Writing on this subject in the pages of our American contemporary "Illuminating Engineer," the Editor (Mr. E. Leavenworth Elliott) refers to a paper, "Practical Applications of Illuminating Engineering," presented at the recent meeting of the American Gas Institute by Mr. Norman Macbeth, the Illuminating Engineer of the Welsbach Company of America, and again bringing up forcibly the question of standard specifications for gas-mantles. On this particular subject, Mr. Macbeth said:

A Standardizing Committee of the Association, acting with the manufacturers of gas-lighting accessories, would seem to be a necessity. Mantles can then be required to meet specifications which have been determined by thorough tests to be satisfactory—standardized for size, colour, cerium and thorium content, strength, weight, and other points of importance. Mantles which show a depreciation of 10 per cent. in 1000 hours are certainly entitled to a different classification than the kind which will show a drop of 10 per cent. in 250 hours, and as much as 30 per cent. or (in lower grades) 60 per cent. in 1000 hours.

Mr. Elliott writes: The statements as to the variations in the quality of mantles will certainly be startling to the user, and probably also to a considerable number of illuminating engineers, and those concerned with the sale of gas. The condition is one which might be expected in a trade in which competition has been allowed to run on the question of price alone. Wherever such a condition exists, it inevitably follows that the efforts which should be devoted to the improvement of quality as well as the reduction of manufacturing cost are devoted wholly to the latter, with the result that goods are produced whose inferiority is limited only by the carelessness of the buying public.

The conditions in the mantle industry are in striking contrast with those in the incandescent electric lamp industry. In the former case there is no standard and little general knowledge as to quality. Result: A market flooded with goods that are expensive at any price. In the latter case, the most rigid standardization and specifications exist. Result: Lamps that are practically uniform in quality, no matter of what make, and at a price that is neither burdensome to the user nor profitless to the manufacturer. An electric lamp that gave comparatively as poor results in use as a gas-mantle whose efficiency runs off 60 per cent. in the course of its life, could not be marketed at any price. The subject is one which the Institute may well take into serious consideration. Poor mantles are a serious menace to the progress of gas lighting; and a gas company should no more countenance their use than would a central station the use of a worthless lamp.

There is no federal regulation at present requiring the chemical constitution and strength of a mantle to be stated upon the package, as in the case of prepared foods; and there is no prospect of any such law being enacted. The gas companies themselves, however, through their Associations, have ample power to enforce whatever specifications they may agree upon. They are in continual personal touch with every user of gas; and their facilities for educating the public in this respect are such as to completely dominate the situation if they choose. Or, the mantle makers themselves might accomplish the purpose still more quickly by agreeing upon a system of specifications, as the electric lamp makers have. Whatever way it may be most effectively accomplished, there is no doubt that the present practice of absolute irresponsibility on the part of the manufacturers as to the reliability of their product is prejudicial to the best interests of the gas industry, and means should be taken to remove the cause.

THE REFRACTORY MATERIALS COMMITTEE.

Forms of Inquiry.

THE Committee who were some time ago appointed by the Council of the Institution of Gas Engineers to investigate the question of the supply and use of refractory materials in the gas industry are arranging to circulate the following letter, signed by the Chairman (Mr. J. W. Helps, of Croydon), together with the necessary forms of inquiry. These inquiries are only being sent to a small proportion of the total number of gas-works in Great Britain and Ireland; but if any engineer who is interested in the subject does not receive copies, the Committee will be very glad if he will apply to the Hon. Secretary (Mr. F. J. Bywater, Saltley Gas-Works, Birmingham), when they shall be forwarded:

You are probably aware that some time ago the Council of the Institution appointed a Committee to investigate the question of the supply and use of refractory materials in the gas industry.

To assist further discussion on this matter, it is thought desirable to obtain comparative statements from a number of representative gas-works, with regard to the temperatures at which the plant is worked, the materials employed, &c. I shall therefore be glad if you will be good enough to fill in and forward to the Hon. Secretary the enclosed forms, together with any other information you may be able to place at the disposal of the Committee on the subject.

It is recommended that, where possible, the estimation of temperatures should be carried out by means of the Féry spiral pyrometer; and arrangements have been made with the Cambridge Scientific Instrument Company for the hire of these instruments where desired.

When the necessary information with regard to present practice is available, it is proposed to review the whole position, and confer with representatives of the manufacturers on the subject, to see how far the requirements of the industry can be met; and later to discuss the matter with the strong Joint Committee which has been formed this year, consisting of representatives from all the industries concerned in the manufacture and use of refractory materials.

It is hoped by these means to arrive at a better understanding between users and manufacturers, and thereby bring about a considerable improvement in the quality of, and the results obtained from, fire-clay material generally. The Committee have therefore every confidence in appealing to you for assistance in this matter.

Any further information required may be obtained from the Hon. Secretary of the Committee, Mr. F. J. Bywater, Saltley Gas-Works, Birmingham, to whom the inquiry forms should be returned when completed.

There are in all three forms to be filled in. The first of them asks for the following information: (1) Remarks and criticisms on material now available. (2) Sizes of ordinary bricks employed. (3) Sketch of cross section of retort giving radii of curves. (4) Would you object to the adoption of a standard pattern if a certain No. based on average in use were recommended for adoption? (5) Do you favour the drawing up of a standard specification for the manufacture of fire-clay and retort material in conjunction with representatives of the makers? (6) What method of testing refractory material do you employ? (7) Do you favour the foundation of an independent testing laboratory for the testing of refractory material?

The particulars required to complete the remaining two forms will be gathered from the headings, which are as under.

Coal Gas—Retort Settings.—(1) Works. (2) Maximum capacity per diem. (3) Number of beds of retorts. (4) Number of retorts per bed, type of setting, and disposition of retorts. (5) Angle of retorts. (6) Size, length, and thickness of retorts. (7) Highest and lowest observed working temperatures—(a) Retorts. (b) Combustion chamber. (c) Producer. (d) Regenerator. (8) Method of estimating temperatures. (9) Material used (moulded or segmented), and analysis if possible. (10) Usual life of retorts without patching other than pointing. (11) Total life with patching. (12) Total coal carbonized per setting. (13) Combustion chamber.—(a) Usual life. (b) Kind of material used, and analysis if possible. "Life" in all cases is understood to mean "total actual working days."

Water Gas (or Plants of a Similar Nature).—(1) Works. (2) Maximum capacity per diem. (3) Makers of plant. (4) Number of sets installed. (5) Highest and lowest observed working temperatures and time between same—(a) Generator. (b) Carburettor. (c) Superheater. (6) Method of estimating temperatures. (7) Life of generator lining without repairs, and usual repairs executed. (8) Total life of generator lining, and analysis of material if possible. (9) Life of carburettor without repairs, and usual repairs executed—(a) Lining. (b) Chequerwork. (10) Total life of carburettor, and analysis of material if possible—(a) Lining. (b) Chequerwork. (11) Life of superheater without repairs, and usual repairs executed—(a) Lining. (b) Chequerwork. (12) Total life of superheater, and analysis of material if possible—(a) Lining. (b) Chequerwork. "Life" in all cases is understood to mean "total actual working days."

Of course, any particulars given will be kept private, and be only used for the information of the Committee.

It is to be feared that the collection of all this material may take some considerable time, unless expedition is shown at the various works in obtaining the information required; and so it is to be hoped that there will be no unnecessary delay in the filling up of the forms.

MUNICIPAL TRADING IN GAS SUPPLY.

A SMALL treatise by the Right. Hon. Lord Avebury, P.C., on "Municipal and National Trading," was noticed in the "JOURNAL" about the time of its publication nearly three years ago.* The work appears to have been translated into German recently, and certain portions of it are reviewed very exhaustively, and data brought forward to controvert Lord Avebury's main contentions, by Herr Emil Schiff, of Grunewald, Berlin, in recent numbers of a monthly review "Technik und Wirtschaft," which is issued as a supplement to the "Zeitschrift des Vereines Deutscher Ingenieure." It is unnecessary in these columns to refer to Herr Schiff's statistics relating to railway and telegraph administration and some other branches of trading which are very generally national enterprises. In regard, however, to gas undertakings, which are in some countries almost wholly under municipal management and in others mainly or partially in the hands of private companies, it is interesting to notice what data Herr Schiff brings forward to show that Lord Avebury's conclusion that "in places supplied by companies gas is substantially cheaper than where it is in the hands of the municipality" is not justified except within a limited sphere of application.

It will be remembered that Lord Avebury quoted from "Field's Analysis" the prices charged per 1000 cubic feet of gas by eight corporations of places all situated near coalfields, and of eight companies supplying gas in places, four of which were near coalfields, and four far distant from coalfields. These figures are quoted by Herr Schiff, who then proceeds to give corresponding figures for a number of German towns in some of which the gas supplied is in the hands of the municipality and in others in private hands. It is worth while reproducing Lord Avebury's figures along with those of Herr Schiff. The latter are paired according to the size of the towns, and are taken from a German statistical annual for the year 1908.

Comparison of Prices of Gas by Municipal and Privately-Owned Gas-Works in England and Germany.

[The figures in brackets are prices for gas for power and heating purposes only.]

Municipal Gas-Works.				Gas Companies.			
		Per 1000 Cub. Ft.				Per 1000 Cub. Ft.	
Nottingham (near coalfields)		2	6	Bristol (near coalfields)		2	0
Bolton "		2	6	Bath "		2	1
Manchester "		2	4	Newcastle "		1	9
Leicester "		2	4	Sheffield "		1	4½
Carlisle "		2	3	Plymouth (far from coalfields)		1	9
Oldham "	2s. to	2	3	Portsea "		2	4
Salford "	1s. 11d. to	2	3	Rochester "		2	9
Bradford "		2	1	Brighton "		2	10
Barmen . . .	(2 6½)	..	4 6½	Aix-la-Chapelle (3 4½)	..	3 11½	
Schöneberg . .	(3 7½)	..	3 7½				
Lübeck . . .	(3 4½)	..	4 7	Augsburg . . .	(3 9½)	..	5 11
Görlitz . . .	(3 4½)	..	4 9½	Dortmund . . .	(2 10)	..	3 9½
Mayence . . .	(3 4½)	..	5 1½	Erfurt . . .	(3 4½)	..	5 1½
Elberfeld . . .	(2 10)*	..	3 6½	Frankfort-on-the-Oder . . .	(3 10½)	..	4 6½
Carlsruhe . . .	(3 4½)	..	3 11½	Potsdam . . .	(3 4½)	..	3 9½
Darmstadt . .	(3 11½)	..	3 11½	Kiel (Gaarden) .	(3 10½)	..	5 1½
Liegnitz . . .	(3 10½)	..	4 4½	Strassburg . . .	(3 4½)	..	4 6½
Zwickau . . .	(3 4½)	..	4 5				
Dantzig . . .	(3 4½)	..	4 9½				
Mannheim . .	(3 4½)	..	4 6½				
Halle . . .	(2 10)	..	4 2½				
Rixdorf . . .	(2 10)	..	4 6½				

* Including one burner for lighting.

Herr Schiff points out that, taking the price of gas for power and heating purposes into consideration as well as the price for lighting, there is only one privately-owned gas-works—viz., Potsdam—in the list which he gives which supplies gas at a lower price than the municipal gas-works of about the same size with which each is compared. Consequently, he considers that Lord Avebury's view, that gas-works owned by companies generally supply gas at a lower price than similarly situated works owned by corporations, is broadly incorrect in so far as Germany is concerned. He then proceeds to refer to the profits claimed on behalf of a number of the municipal gas undertakings of Germany of which the gross profits for a few of the more important cities for the year 1905-6 are as follows: Berlin, £534,300; Hamburg, £250,000; Breslau, £171,600; Dresden, £127,450; Cologne, £112,750; Charlottenburg, £112,750. He then passes on to refer to the electricity works in Germany of which a larger proportion—viz., about one-third of the total—remain in the hands of companies.

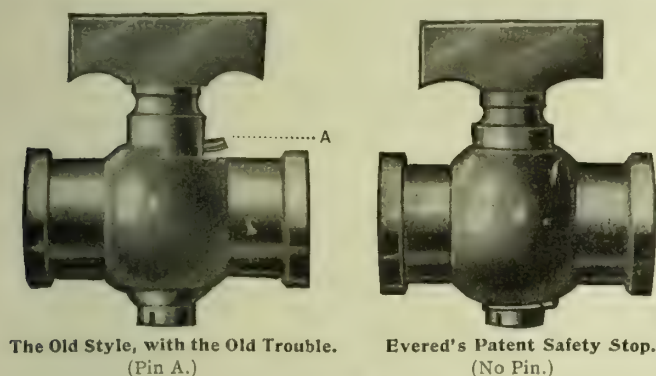
One important point which does not appear to have been dealt with by Herr Schiff, however, is that, in the majority of cases where a gas undertaking on the Continent is owned by a company, a large sum is paid by the company to the municipality for the right to supply gas in its district. These sums, whether they comprise an annual fixed payment for a term of years, or payment

* See "JOURNAL," Vol. XCVII., p. 22.

of a lump sum when the concession is granted or the contract settled, or of a percentage of the gross receipts of the undertaking, or a fixed sum per cubic metre of gas sold, constitute in reality the equivalent of the so-called profits on the working of a municipal gas-works. Whenever the concession to a company involves the payment of any such sums to the municipality or the State, it is evident that the prices charged for the gas by the company must be such that this "profit" for the municipality may be earned by the gas-works. Hence, unless the amount of such payments by the gas company to the municipality or State is stated and allowed for, it is impossible to institute a fair comparison of the prices charged for gas by municipal and privately-owned gas-works where such an arrangement obtains in regard to the latter. Consequently, Herr Schiff's interesting figures are not so informative as to the real advantages of the municipal ownership of gas undertakings as they might be, though doubtless they will be widely quoted by those interested in furthering municipal trading.

EVERED'S PATENT "SAFETY-STOP" TAP.

ONE of those small improvements that bring in their train considerable advantage has been made in gas-taps. The little stop-pin of common use in such taps has a large responsibility resting upon it. At the best, however, it can only be said to have



Underside, showing "Safety Stop" B, in Lieu of Pin.

performed its service with indifferent success, through the ever-present liability to becoming bent or broken, or dropping out, and thus allowing the tap, when the gas-light is being extinguished, to be over-turned, and thus produce the danger of an escape of gas. There is no saying what an amount of mischief has been caused by the defective or missing stops of the pin type. But absolutely permanent safety has now been ensured by the new "safety stop" which Messrs. Evered and Co., Limited, recently

patented. The improvement consists in fitting a patent washer with a lug, which works in a recess in the body of the tap, and this recess rigidly defines the limit to which the tap can be turned. The lug is flush with the washer, and not above it; and there is nothing that can possibly wear away, nor is there any scope for damage, in the way of displacement or breakage. The illustrations are sufficiently explanatory. The patent safety-stop is at present only being applied to fittings when specifically ordered. As, however, the firm's present stocks of fittings are replaced, the new patent stop-taps will be applied; so that in time all their fittings will be supplied with it. Safety in a gas-tap is an important thing to secure.

A DOUBLE-COIN SLOT-METER.

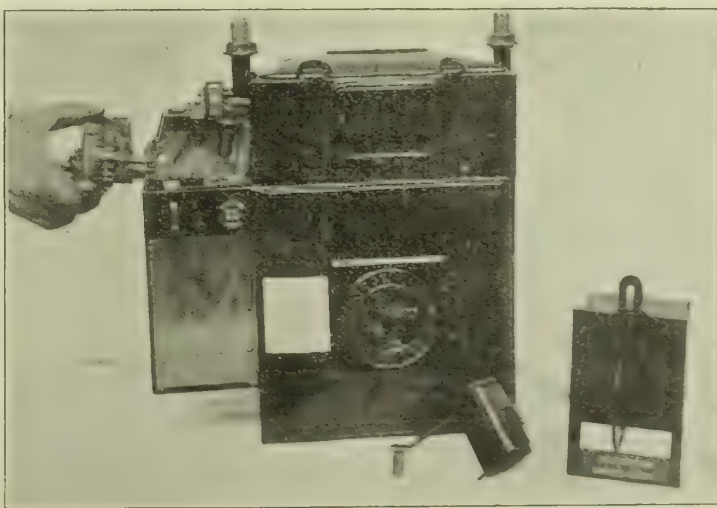
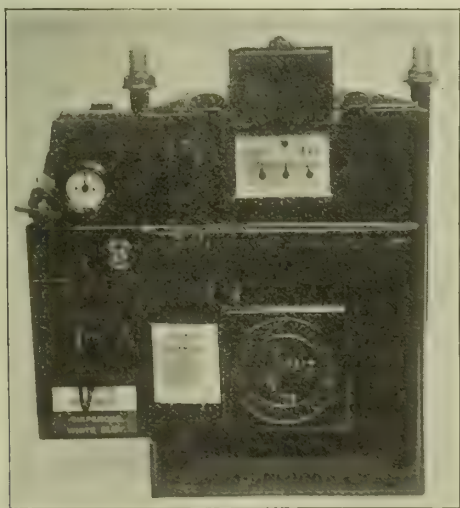
Mr. George Wilson's Patent.

THE prepayment gas-meter attachment of Mr. George Wilson, of Coventry, is, of course, very well known in the gas industry, and has secured its full share of favour; the special features of it being the simplicity and strength of the working parts, and the free access of the coin, which permits of a badly bent penny being inserted without choking of the mechanism or stoppage in working. The strong shut-off valve is part of the outside attachment, and (like the attachment-cover and case) is of special non-corrosive white metal, not liable, like cast iron, to fracture, or to damage like tinplate.

Until recently the mechanism referred to has been for single coins only; but a demand has recently sprung up for a double-coin attachment, and the Wilson slot-meter lends itself readily to such adaptation. To meet this demand, therefore, Mr. Wilson has devised a double-coin mechanism which, though it has been only a short time on the market, has been received with much favour, and has been adopted in a number of works. The invention is the subject of a patent which was abstracted and illustrated in the issue of the "JOURNAL" for Aug. 17 last (p. 457).

The double slot may be for 1s. and 6d., 1s. and 1d., or 6d. and 1d.; the latter being generally preferred. The usual T handle is employed; the smaller slot being immediately behind the grip. Taking the 6d. and 1d. double-slot as an example, the action is simplicity itself. The money-dial takes from one to eighteen pence, which may be paid in either or both coins. The travel is the same for a penny or a sixpence; but in the latter case the handle, on being turned after inserting the coin, gives six distinct "clicks" before the coin falls into the money-box, while if by mistake the sixpence be put into the penny slot, it drops outside the attachment into a receiver, without actuating the mechanism, and the consumer can use the coin again. If, however, a sixpence and a penny be placed at one time one in each slot, the attachment does not fail to act; but in that case only sixpenny worth of gas is paid for, though both coins drop into the box. If anything over thirteen pence worth of gas is indicated as "paid for," no consumer is likely at that stage to insert sixpence; but, if he does so, all that happens is that fewer clicks will follow—the sixpence being held in suspense until some gas has been burned, when one or more click will send the coin home.

If for any reason it is desired to use one coin only, either slot can be permanently closed up. The change-wheel is fixed on a strong bracket, and can be altered at any time by the removal of a single screw. The attachment-cover is easily removable for price changing.



Wilson's Double-Coin Slot-Meter

The South Metropolitan Gas Company have placed a further order with Sir William Arrol and Co., Limited, for two Arrol-Foulis patent hydraulic charging-machines and two Hunter-Barnett patent hydraulic coke-pushers for their East Greenwich

station. This makes a total of twenty-two of these high-capacity machines, some particulars of which were given in the "JOURNAL" for the 12th of October last (p. 120), ordered by the Company during this year.

TECHNICAL GAS CALORIMETRY.

By J. H. COSTE, F.I.C.

[From a Paper read before the Society of Chemical Industry.*]

When a fuel containing unoxidized or partially oxidized carbon and hydrogen, in any form, is burnt under suitable conditions, the carbon is burnt to carbon dioxide and the hydrogen to water. It depends on the conditions under which combustion takes place whether or not the water vapour formed is condensed. If it is condensed, the latent heat of vaporization of the whole of the water formed is included in the heating value of the fuel. When this happens, the calorific value thus obtained is called the "gross" calorific value. It is only in such appliances as geysers that the heat given out from the water vapour in this way is utilized. In most cases the "net" calorific power—i.e., the heat evolved by combustion when all the water is kept in the form of vapour—is all that can be utilized in heating appliances. The difference gross and net calorific power is, therefore, a measure of the total amount of hydrogen present in a fuel.

It is obviously convenient to state the calorific power of gases in units of heat per unit volume. On the Continent, the cubic metre is usually employed in conjunction with the (great) calorie. In this country, illuminating gas is bought and sold, under various Acts governing the gas industry, by the cubic foot; and all the results of statutory testings are corrected to a cubic foot at 60° Fahr., and 30 inches barometer. The official testings of illuminating gas in the Metropolis are returned in calories per cubic foot; and the only parliamentary standard for the calorific power of illuminating gas is expressed in this manner. In all figures given in this paper, the calorific power is expressed according to this official usage. The number of calories multiplied by 3·968 gives British thermal units.

I.—CALORIMETRY.

Any calorimetric method should give a means of determining, with such accuracy as may be possible, both gross and net calorific power. This object may be attained by either an indirect or a direct method.

The Indirect Method of Determining Calorific Power.—The researches of Julius Thomsen and of Berthelot have placed at our disposal values for the heat of combustion of hydrocarbons and other combustible gases and vapours which are sufficiently reliable for most purposes. By means of these, it is possible, if the composition of a gaseous mixture is known, to calculate its total calorific power.

In the case of coal gas and similar mixtures, a difficulty arises in connection with the unsaturated hydrocarbons. It is difficult, and in most cases impossible, to decide their actual nature; and as the various hydrocarbons which may enter into their constitution have very different calorific values, the matter is of importance, as will be seen from the following table (calculated from Julius Thomsen's figures) giving the calorific values in great calories per cubic foot of various gases (A) measured at 0° C. and 760 mm., and (B) at 15·5° C. (60° Fahr.) and 762 mm. (= 30 in.); the products in each case being cooled to 18° C.

	(A)		(B)	
	Gross.	Net.	Gross.	Net.
Methane	268·0	240·5	254·3	228·2
Ethane	468·0	427·0	444·0	405·2
Ethylene	421·0	394·0	399·5	373·0
Propylene	622·0	581·0	590·2	551·3
Acetylene	392·0	378·0	371·9	358·7
Benzene	1010·0	969·0	958·3	919·4
Hydrogen	86·4	72·8	82·0	69·1
Carbon monoxide	85·9	85·9	81·5	81·5

It will be noticed that the difference between gross and net calorific power for each molecule of water formed by the combustion of a molecule of gas is in (A) 14 calories, in (B) 13 calories per cubic foot. In other words, the difference between gross and net calorific power multiplied by $\frac{100}{14}$ or by $\frac{100}{13}$, as the case may be, will give the total percentage of hydrogen in the gas.

A gas, the calorific power of which had been found by direct means to be 150·3 calories gross and 133·2 calories net, was found to have the composition indicated in the next table. The unsaturated hydrocarbons were assumed to be (1) ethylene, (2) propylene, (3) butylene.

It will be seen that the assumption that the unsaturated hydrocarbon is propylene gives results closely approaching those found experimentally. It is, in fact, found to be a good working convention for general purposes that the average calorific value of the

Composition.	Calorific Power (Calculated).			
		(1) Gross.	(2) Gross.	(3) Gross.
Carbon dioxide	nil	..	..	..
Oxygen	0·27	..	..	..
Unsaturated hydrocarbons .	5·38	21·52	31·74	41·96
Carbon monoxide	13·09	10·73	10·73	10·73
Hydrogen	42·45	34·85	34·85	34·85
Methane	27·71	70·43	70·43	70·43
Nitrogen	11·10	..	..	..
	100·00	137·53 cal.	147·75 cal.	157·97 cal.
Per cent. total hydrogen . .	..	108·63	114·01	119·39
Deduction for latent heat . .	..	14·10 cal.	14·82 cal.	15·51 cal.
Net calorific power . . . . .	..	123·43 „	132·95 „	142·46 „

unsaturated hydrocarbons is equal to that of propylene. The following table serves to illustrate the agreement between results calculated in this way and those obtained directly:—

Experimental.		Calculated.	
Gross.	Net.	Gross.	Net.
166·6*	149·3	167·4	150·0
150·3	133·2	148·2	132·8
143·0	127·7	143·2	128·2
148·0	130·3	143·5	128·5
143·5	127·9	143·6	128·6
145·7	129·3	143·9	128·8
145·8	131·0	147·3	131·8
143·3	128·3	144·7	129·2
143·1	126·2	140·0	125·6
152·6	134·2	152·3	134·9
143·5*	127·7	142·5	128·5
145·7*	129·3	143·8	128·3
144·5*	129·5	146·3	130·5

* Pure coal gas.

Direct Methods of Determining Calorific Power.—Various forms of calorimeter have been devised for determining the calorific power of gases. They all depend on a known amount of water being heated to a measured extent by a known volume of gas. Two principal types of calorimeter have been proposed—(a) those in which a small, and usually a fixed, amount of gas is allowed to burn out and to heat a small and fixed amount of still water; (b) those in which gas burnt at a measured rate is allowed to heat to an observed temperature a constant stream of water, a definite amount of which is collected during the period of observation. In the former class, the highest temperature of a rise—transient equilibrium—is noted; and in the latter the temperature which is reached as the result of a continuous equilibrium. The flow calorimeters are to all intents "geysers" in which special care is taken to ensure complete combustion of the gas and complete absorption of the heat evolved. In either case, it is obviously desirable that the proportions of gas burnt and water heated should be so adjusted that the rise of temperature may always be sufficiently great to ensure reasonable sensitiveness of reading, and not high enough to render loss by radiation a serious consideration. This optimum range of rise will vary in different instruments according to the efficiency of the measures taken to prevent radiation.

For the determination of the calorific value of a gas supply of any kind which can be burnt in practically unlimited quantities, no doubt the flow type of calorimeter is better, as the apparatus can be adjusted to remain in a state of thermal equilibrium for a considerable time, during which a relatively large volume of gas can be burnt and measured, and a correspondingly large volume of water heated and measured. Several readings of the temperature of the water at the inlet and outlet can be taken, and average temperatures computed for both the inlet and outlet with a high degree of accuracy. The amount of water condensed in the abstraction of heat from the products of combustion can also be arranged to be sufficiently great to secure a good determination of net calorific power.

On the other hand, the classical work of both Thomsen and Berthelot was carried out in calorimeters of the burn-out and fixed water type,* and for technical purposes both Hempel's and Simmance and Abady's portable calorimeters, which are of this type, give, if carefully adjusted and used, results of a fair degree of accuracy. Only the gross calorific power is determined in the two latter instruments. Calorimeters of the still-water type have been devised by Berthelot (bomb), Thomsen, Fischer, Hempel, and Simmance and Abady; and of the flow type by Hartley, Junkers, Boys, and others. [The author summarized the principal features of some of the more important of these instruments.]

Sources of Error Affecting the Results Obtained from Flow Calorimeters.—The following sources of error, for the effects of which due allowance may be made, are likely to affect the results of calorimeters of the Junkers or Boys type. (1) Heat lost or gained in the exit gases according as they are hotter or cooler than the inlet air. (2) Heat lost or gained by condensation or evaporation of water during the passage of the air through the calorimeter.

* The difficulty of preparing large quantities of pure gases no doubt helped to determine this choice.—J. H. C.

* An abstract of the paper, which was read at the meeting of the London Section of the Society on the 1st ult., was given in the "JOURNAL" for the 9th ult. (p. 407), with a report of the discussion upon it. The full text of the paper appears in the current number of the Society's "Journal," from which it is reproduced.—ED. J.G.L.

(3) Losses by radiation from body of calorimeter. (4) Errors due to assumption that a litre of water weighs one kilogramme. The values of these errors and the proper assignment of corrections to gross or net calorific power have been worked out in the case of the Boys instrument.

(1) The volume of exit gas compared with that of gas burnt has been determined by analysis of both the gases. [See table] The heat capacity of the products from 1 cubic foot of gas, on the assumption that 7 cubic feet are obtained, is about 0.06 cal. Experiments under varying conditions have led Boys to adopt the empirical correction of 1/6 cal. for a difference of 1° between the inlet and outlet air, indicating that other influences are included in this correction which under any conditions is small.

	I.	II.
Rate of burning, feet per hour	4.6	4.6
Carbon dioxide formed on explosion of gas, per cent.	56.0	57.1
Composition of exit gas—		
Carbon dioxide	8.76	8.52
Oxygen	6.17	4.47
Ratio—gas : air	1 : 6.9	1 : 7.2
gas : exit gases.	1 : 6.4	1 : 6.7

(2) If the temperature of the exit gases is above the dew-point of the atmosphere of the laboratory, the exit gases, which are fully saturated, will rob the system of an amount of heat equal to the latent heat of vaporization of the additional water contained in them; and, further, the amount of condensed water will be reduced to a corresponding extent. On the other hand, if the exit gases are cooler than the temperature at which dew is deposited in the laboratory, the calorimeter will gain an amount of heat and of water corresponding to the reduced water-holding capacity of the air.

The extreme magnitude of this error can be illustrated by an example. Suppose the temperature of the laboratory to be 21° C. and the air fully saturated with aqueous vapour, the temperature of the water supply being low, and the exit gases having a temperature of only 10° C. If during the burning of 1 cubic foot 7 cubic feet of these gases pass through the instrument, corresponding to 7½ cubic feet of air entering, the total amount of water vapour entering will be 4.3 grammes (0.5 in gas, + 3.8 in air). The total amount of water leaving will be 1.8 grammes, and the excess water condensed (4.3 - 1.8) = 2.5 grammes.

The Junkers and Boys calorimeters may be considered as the two most in use for practical purposes; and it may be well to discuss at length their respective advantages and disadvantages, and the necessity for applying certain corrections to the results obtained with them.

Although both instruments are fairly portable, the Junkers certainly has the advantage in this respect. Its simplicity and the fixed arrangement for obtaining a proper head of water render it particularly suitable for fitting up in any locality. The flow of water can be easily regulated by means of the quadrant tap; and for gases of very varying calorific power, the use of a bunsen flame enables perfect combustion to be attained at any reasonable rate of consumption. The rise of temperature attained by the exit water can be kept constant by altering the amount of water passing through the instrument. The Boys instrument is easier to read, owing to both thermometers being on the same level. It is more sensitive to rough handling. The temperature of the exit water is more constant in the Boys than in the Junkers instrument.

The agreement of the results (calorific power) obtained by the simultaneous working of two Boys calorimeters with the same gas is shown below:—

	No. 1.		No. 26.	
	Gross.	Net.	Gross.	Net.
I.	146.0	129.4	146.0	129.5
II.	145.8	129.0	145.0	129.2
III.	146.7	126.9	147.0	128.5
IV.	147.9	130.9	145.9	129.9
V.	146.1	129.0	146.3	129.9
VI.	146.8	130.1	145.8*	130.2

* Gas burning at 2½ cubic feet per hour; all others at 4 to 5 feet.

A similar series has been carried out with the Boys and Junkers instruments.

	Boys No. 26.		Junkers.	
	Gross.	Net.	Gross.	Net.
I.	144.9	130.1	145.8	130.8
II.	145.1	130.2	146.1	131.4
III.	147.3	132.9	146.7	132.0
IV.	145.9	131.0	144.4	130.9
V.	144.6	130.6	145.0	130.2
VI.	143.8	129.3	144.7	130.1
VII.	143.9	129.8	144.6	129.8
Average . . .	145.1	130.6	145.3	130.7

The behaviour of both instruments with gas burning at different

rates, the water flow being maintained at a constant rate, is satisfactory, as shown in the following series of experiments:—

Consumption of Gas per Hour.	Boys.		Junkers.		
	Cub. Ft.	Gross.	Net.	Gross.	Net.
5		146.3	130.9	146.0	131.6
4		145.1	130.1	145.1	129.8
3		146.5	130.4	—	—
2		144.2	128.7	146.8	131.9

It has been suggested that combustion is not perfect in the Boys instrument, owing to the use of flat-flame instead of atmospheric burners. To test this point, a tube was inserted in one of the holes in the top of the calorimeter, and the exit gases slowly aspirated (1) over pumice saturated with caustic potash solution, (2) sulphuric acid, (3) a weighed soda-lime tube, (4) a column of about 12 inches of heated copper oxide, (5) a weighed sulphuric acid tube, and (6) a weighed soda-lime tube. Eight litres of carbon dioxide free products, corresponding to nearly 9 litres of exit gases, were first collected. Tubes (3) and (6) had not altered in weight, and tube (5) had gained 0.008 gramme (= 0.0009 gramme hydrogen). Any unburnt carbon should have been oxidized by the copper oxide and weighed as carbon dioxide in (6). The gas (ordinary house gas, having a gross calorific power of 147 calories, was used for the experiment) was burning in the calorimeter at the rate of 5.3 cubic feet per hour—that is, above the maximum rate allowed in official testings. The error due to imperfect combustion is therefore negligible.

Both instruments may be expected to give the best results when working under the conditions which should prevail in a physical laboratory, and both give very good results under conditions much less satisfactory.

II.—CALORIFIC POWER OF GAS CONSIDERED IN RELATION TO METHODS OF MANUFACTURE AND TO ILLUMINATING POWER.

The calorific power of gas depends—as undoubtedly does the illuminating power—on its composition. The relation between calorific power and composition is, however, much more direct than in the case of illuminating power. It is, as has been shown, easy to calculate with considerable accuracy the calorific power from the results of analysis of a gas. In the case of illuminating power, it is at present impossible. A consideration of the calorific power of the three principal constituents of coal gas—carbon monoxide, 81.5 gross 81.5 net; hydrogen, 82 gross 69.1 net; methane, 254.3 gross 228.2 net—indicates very clearly that a gas which has been made under conditions favouring the formation or survival of a large proportion of methane should have a higher calorific power than one where the temperature of carbonization tends to the production of a large amount of hydrogen, and the use of an exhaust leads to the formation of large quantities of carbon monoxide. Blue water gas lowers the calorific power of coalgas with which it is mixed, for similar reasons. The effect of the addition of carburetted water gas varies according to its composition. Its general effect is to lower the calorific power, or at any rate not to increase it even in cases where its use has the effect of increasing the illuminating power. In the case of a pure coal gas, more than half of the net calorific power appears to be due to the methane; whereas in mixed gases the methane seldom accounts for more than 46 per cent.—the usually somewhat increased amount of unsaturated hydrocarbons more or less making up the deficit due to the lower proportion of methane.

It was formerly believed that some direct relationship between calorific and illuminating power existed; but an examination of thousands of tests shows that, though the general tendency is for gas of a high illuminating power to have a relatively high calorific power, such numerous exceptions and anomalies are observed, even with pure coal gas, that no formula usefully connecting these two properties can be found.

The following table shows what a wide divergence occurs between observed calorific power and the figure obtained by multiplying individual results of illuminating power by the average number of calories per candle. The results at five places supplied with pure coal gas were examined; and the figures represent averages of daily testings for two succeeding months.

	Average.			Greatest Difference between Observed Calorific Power and Product of Observed Illuminating Power and the Figure in Column (C).	
	(A) Illuminating Power.	(B) Gross Calorific Power.	(C) Calories Per Candle. $\frac{B}{A}$	Calories.	Per Cent.
I.	16.88	151.0	8.95	8.9	5.9
	16.97	151.3	8.97	14.1	9.5
II.	17.11	150.6	8.87	10.1	7.2
	17.03	150.2	8.85	0.7	6.4
III.	16.77	146.4	8.83	4.5	3.1
	17.07	146.7	8.60	9.8	6.7
IV.	15.75	151.0	9.62	5.2	3.5
	16.01	152.7	9.57	0.7	4.4
V.	16.36	148.3	9.04	8.4	5.8
	17.17	150.4	8.76	5.2	3.4

Although the average ratio from month to month agrees fairly, showing that considerable regularity of manufacture is attained, it is clearly impossible to assign to gas of known candle power a definite calorific power on mere *à priori* grounds. Standards can only be fixed as the result of careful examination of long series of results; and no means have been devised for determining the calorific power of a gas except by analysis or calorimetry. It can be safely stated that, for the same candle power, pure coal gas will in most cases have a somewhat higher calorific power than mixed gas.

This will be, perhaps, more apparent in the case of low-grade gas. The average calorific power of coal gas of from 14 to 15 candles illuminating power is about 130 calories net, while mixed gas of the same illuminating power has an average calorific power (net) of about 125 calories; 16-candle coal gas, on the other hand, has an average calorific power of not more than 2 or 3 calories above 16-candle mixed gas.

The difference between gross and net calorific power is greater as the calorific power increases. An examination of three sets of results—two (A and C) mixed gas of 16 and 14 candles nominal illuminating power respectively, and the other (B) pure coal gas—shows that the difference is proportionately greater in the case of coal gas than for mixed gases. These figures agree with the results for total hydrogen in the gas, deduced from analysis. As to the actual differences between gross and net calorific power, it appears unlikely that this should ever exceed 20 calories in the richest coal gas, or fall below 12 calories in the poorest mixed gas now supplied.

Difference between Gross and Net Calorific Power expressed as Percentage of Gross.

Periods of Four Weeks (Daily Testings).	(A)	(B)	(C)
I.	10.64	11.25	10.92
II.	10.80	11.40	10.87
Averages	10.72	11.35	10.90

In the following table, the composition, calorific power, and illuminating power of (A) coal gas made in small works using clay retorts but no exhauster, (B) coal gas supplied by one of the Metropolitan Companies, (C) mixed gas supplied in the Metropolis, and (D) gas from Glover-West vertical retorts analyzed by Dr. H. G. Colman, are shown. The calculated calorific power for (D) was 142.6 gross and 126.9 net. It will be noticed that though the 21-candle gas (A) shows a marked superiority in heating value, the nominal 14 to 16 candle gases do not, with one exception, which in composition closely approaches the 21-candle gas, differ greatly in calorific power among themselves.

—	(A)			(B)			
Carbon dioxide . .	0.38	nil	nil	1.48	1.75	2.11	2.85
Oxygen	nil	nil	nil	0.26	0.52	1.05	0.20
Unsat. hydrocarb..	6.17	5.57	6.00	3.39	4.73	2.98	3.60
Carbon monoxide .	4.86	6.03	9.24	8.17	7.18	10.00	7.43
Hydrogen	41.72	39.83	40.00	49.21	40.50	48.41	46.66
Methane	40.67	41.78	40.48	31.22	39.50	30.80	31.54
Nitrogen	6.20	6.79	4.28	6.27	5.82	4.65	7.66
Calorific power—							
Gross	175.8	179.6	176.0	144.5	166.6	145.7	143.4
Net	160.5	161.4	157.5	129.5	149.3	129.3	128.9
Illuminating power by "Metropolitan" argand No.2 at 5 cubic feet per hour	21.39	21.77	21.10	18.60	18.21	14.48	14.65

—	(C)							(D)
Carbon dioxide . .	1.45	1.74	2.13	5.00	1.51	3.83	1.00	
Oxygen	0.73	0.37	0.28	nil	0.53	0.29	0.05	
Unsat. hydrocarb..	4.91	4.59	5.39	5.50	5.07	5.45	2.85	
Carbon monoxide .	14.46	13.22	16.15	16.00	13.31	15.02	8.70	
Hydrogen	46.73	50.76	39.24	39.30	43.62	42.10	54.70	
Methane	24.57	26.08	24.79	24.00	26.17	23.45	29.05	
Nitrogen	7.15	3.24	12.02	10.20	9.79	9.86	3.20	
Calorific power—							99.55	
Gross	144.8	145.1	145.2	141.4	143.5	143.2	144.3	
Net	129.2	129.1	128.5	124.5	127.9	126.3	129.6	
Illuminating power by "Metropoli- tan" argand No.2 at 5 cubic feet per hour	16.65	16.58	16.21	15.80	17.29	16.81	15.56	

In conclusion, it is most desirable that gas authorities should follow the example which has recently been set in the Metropolis by instituting regular testings for calorific power, in order that a standard which will meet local conditions may be fairly settled when a suitable occasion arises.

CHARGING MACHINE FOR SMALL WORKS.

At the gas-works of Udine, in North Italy, a manual machine on the system of Carl Francke, of Bremen, has been adopted for charging the horizontal retorts. The system was described in a recent number of "Il Gaz."

In the article referred to, it is pointed out that in large gas-works, economy in labour and reduction of staff may be effected, and may be due, not only to the adoption of mechanical means of charging and drawing retorts, but rather to the building of new types of settings. In small works, on the other hand, where practically all the retorts are of the horizontal kind, the reduction of labour is able to be effected only by the adoption of some machine for the service of the retorts. Many such machines have been installed in small works in recent years for the purpose of facilitating the onerous work of the stokers.

The particular machine referred to above was designed with a view both of reducing carbonizing costs and at the same time of securing a larger make of gas from the same number of retorts. It consists of a charging scoop divided into two parts, the back or guiding head of which is hung on the vertical pillars of a crane which travels on two wheels in front of the retort-bench. The overhead cross beams of the crane run on rails fixed on the walls of the house and along the face of the ascension pipes. The crane-pillar enables the scoop to be swung either to the right or the left as may be desired for filling the scoop with coal from the adjacent store. The special advantage claimed for this scoop is

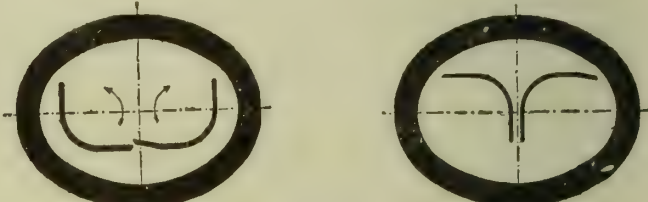


Fig. 1. Fig. 2.

that the two parts of it turn from the centre outwardly, as indicated in figs. 1 and 2, with the result that the charge of coal falls uniformly on to the opposite sides of the retort, as shown in fig. 3. No further levelling of the charge is required; and no other rake for such purpose is necessary. The yield of a retort-bed thus charged is said to be greater than if charged ordinarily by hand, as the regular layer of the coal facilitates, as is well known, the make of gas. If the two parts of the scoop were made to turn from outwards to the centre, the heap of coal would fall as appears in fig. 4, when a rake would be required to level or spread out the charge.

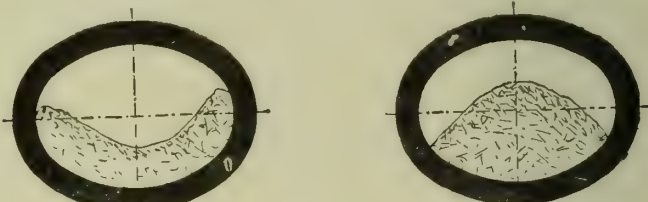


Fig. 3. Fig. 4.

The Francke scoop is of a large pattern and is U-shaped, one section of which slightly overlaps the other. It is stoutly made of sheet steel, without any supplementary strengthening bars, which have the disadvantage, when such a scoop is withdrawn, of bringing out with them pieces of coal. One divided scoop is better than two separate ones, as with the latter (as can be seen in fig. 5) there is an unutilized space at the bottom in between them.

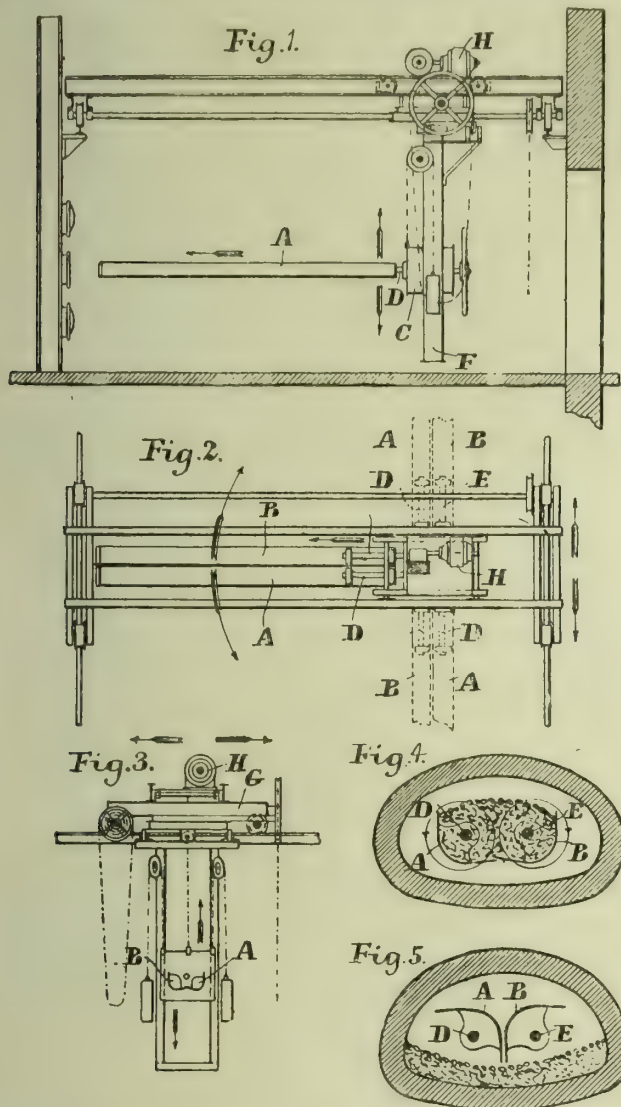


Fig. 5.

With the Francke scoop described, a 3-metre (10-feet) retort can be conveniently charged with 200 kilos.—say, 4 cwt.—of coal; the resulting coke being also of greater value by reason of the better gasification of the coal. One man is enough to work the apparatus; and the time taken for the complete charging of a retort is about 20 seconds. The working of it is of the lightest character, and the wear of the moving parts is guarded against. It can be worked electrically; but this is hardly necessary. It is said that good results have been obtained with the machine at Udine and several other places where it has been adopted.

DUNKEL'S RETORT-CHARGING SYSTEM.

A French patent has been taken out by M. Richard Dunkel for a machine for charging gas-retorts by means of a scoop of semicircular or similar shape. The object of the inventor is to render unnecessary the spreading of the coal in the retort, and by this means to reduce the time required for charging, prevent loss of heat, and allow of heavy charges being employed. The arrangement is shown in the accompanying illustrations, in which fig. 1 is an elevation, fig. 2 a plan, and fig. 3 a side view; figs. 4 and 5 being sections of a retort showing a scoop in two positions.



The appliance consists of a scoop divided lengthwise, the two halves of which A B turn outwards when the scoop opens; the middle edges rising first. The coal is thus thrown from the scoop so as to glide downwards on each side of the retort, and consequently cover a wide area. It is claimed that the appliance is favourable to a large production of gas, and that the coke obtained is of good quality. Moreover, the way in which the coal is emptied into the retort leaves sufficient room in the centre of the heap to introduce the rake, so that the coke can be easily drawn. The machine is so constructed that the scoop is secured to a head C by means of two shafts D E, which rotate at different rates of speed, so that one half of the scoop is a little in advance of the other. This is necessary in order that the two halves may be able to pass each other.

The scoop can be brought to any position in front of the setting; and to allow of this being done, it is so arranged that it can ascend and descend in a frame F, which turns on a truck G. The latter moves in the direction of the axes of the retorts on a travelling crane running along the front of the setting. In order that the scoop may be raised and lowered more easily, the machine can be furnished with counterweights. Electric motors can be utilized to work the plant. The raising and lowering of the entire scoop, as well as its introduction into the retorts and movement of the crane, can be done with the electric motor. With through retorts, the machine can be arranged so as to be simultaneously utilized to remove the coke. The scoop is then provided with plates on its end, which push the coke out on the side opposite to that on which the charging is done.

At St. George's Church, Gateshead, on the 11th inst., the marriage was solemnized of Mr. Herbert Gillies Penney, second son of Mr. and Mrs. J. H. Penney, of South Shields, and Miss Lottie Affleck, only daughter of Alderman Robert Affleck, J.P., and Mrs. Affleck, of "Bloomfield," Gateshead.

DEPTH OF LAYING WATER-PIPES.

At the Annual Meeting of the New England Water-Works Association last year, a Committee was appointed to collect statistics in regard to the depth at which water-pipes are laid, and the resulting experience in freezing. The report of the Committee was presented for discussion at the recent meeting of the Association; and the following extracts from it are taken from "Engineering Record."

The Committee received 90 replies to a circular-letter, 320 copies of which were sent to water-works engineers in the United States and Canada. An average of the replies received indicates that freezing extends 1 foot deeper in streets than in fields; also that in streets frost will reach 1 ft. 5 in. deeper in gravel than in clay, with sand half-way between. In fields it would appear that frost will extend 1 foot farther in gravel than in clay, with sand again intermediate in effect. It is obvious that the character of the soil is a factor of such relative importance as to demand consideration in determining the economical depth.

There were 53 places which reported actual experience in the freezing of pipes. All these cases were in distribution systems—none in the leading mains. Fifty per cent. were on dead-ends; and all were in pipes where there was little or no velocity. All but three of the cases of freezing were in pipes smaller than 10 inches diameter; and only seven in pipes as large as 8 inches. In all cases the ground was frozen below the axis of the pipe; and the ground water level was also below the pipe. In 80 per cent. of the cases the ground was bare of snow at the time of freezing. All the stoppages were total. There were 35 places which reported the character of the soil in which the pipes were laid; and of these, 40 per cent. were in clay, 48.6 per cent. in gravel, 5.7 per cent. in sand, and 5.7 per cent. in rock.

The data upon the depth of pipe beneath the ground surface are presented in the report in the form of a diagram. The variation in the relation of depth to temperature of the coldest month is due in some cases, according to the report, to local conditions, and in others, perhaps, to an illogical adaptation of depth to the requirements. In two cities having practically the same mean temperature for the coldest month, the depth of pipe was 3 ft. 6 in. in one case and 6 ft. 6 in. in the other. Obviously, the local conditions other than temperature, and including depth of snow covering, must furnish, in great part, the explanation. The lesser depths employed in the places which appear below the average line in the diagram are not explained by the use of ground water supplies, as there are as many of these above the average line as there are below. Users of shallow depths report practically no trouble; and the question remains whether this immunity results from peculiar local conditions or whether the general practice is unduly conservative. It would seem that, where there is any velocity of current, depths somewhat less than those indicated by the average line generally prove sufficient to prevent freezing.

While all cases of freezing reported are stated to have resulted in total stoppage of the pipes, there are records of ice formation in concentric rings in pipes as large as 24 inches diameter; the occurrences not being evidenced by stoppage of the large main, but only by loss of head through increased friction, or, in some cases, by stoppage of gates or smaller pipe connections by the ice loosening and breaking up in a thaw and forming an ice-jam at some point of obstruction. Such formation of lumps of ice in a layer adjoining the metal of the pipe has occurred in instances of extreme low temperature in the eastern Canadian Provinces in conduits where there was a considerable velocity. As the ring of ice forms, the velocity of the water increases, and a total stoppage does not result. In other cases of freezing, particularly in smaller pipes, the ice formation is not solid, nor does it start from the outside, but is rather in the form of "slush" uniformly distributed throughout the cross section of the pipe. This has been noted, the report states, in a 4-inch pipe, in which there was considerable velocity, laid at a depth of 6 feet in a salt marsh in New Brunswick.

When the velocity in a pipe exceeds about 3 inches per second, and particularly in the case of ground water supplies, it is stated that depths somewhat less than those now used would generally be safe. In main feeders, and in those portions of the distribution system where there will be an assured circulation, the question of minimum depths should receive careful consideration. It is not in the mains but in the services that most of the trouble from freezing occurs; and in the services such trouble usually results, according to the report, from skimping by plumbers or contractors, resulting in the actual laying of the services at depths considerably less than the mains.

There were 28 places which reported the tapping of service connections on the top of the main, 39 on the side, 12 on the quarter, and 7 in various ways. Freezing of services, it is stated, generally starts at the house and backs out into the main; and it is believed that if services were tapped on the side of the main, and then dropped to the depth required to meet local conditions, the lessening of the depth at which the main is laid to that justified by the velocity of the water in the main will not result in any increased freezing of services.

According to the report, there is a belief or tradition in the minds of many plumbers and water-works superintendents that most stoppages by ice formation occur in a thaw which follows a period of very severe cold weather; and the reason generally

advanced for this alleged phenomenon is that evaporation from the surface during the early stages of the thaw produces additional refrigeration or reduction of temperature at the depth of the water-main sufficient to cause freezing. No indication of the existence of such conditions has appeared in the reports received of frozen pipes.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

The Annual Dinner of the Western District of the Scottish Junior Gas Association was held in Sloan's Café, in the Argyle Arcade, Glasgow, on Saturday evening. There was a good company, over which Mr. D. CURRIE, of Stirling, presided.

Mr. A. SMITH (Tradeston) proposed the toast of "The Scottish Junior Gas Association—Western District." He said that the Association was now five years old; and they would agree with him that much profit had come to the members through it. The papers and lectures, together with the discussions, had been most interesting, and no less instructive. Quite a feature of the work of the Association was the visits to gas and allied works, which gave them all an opportunity of becoming acquainted with the advancement and progress that was taking place in their industry. He was certain benefit would come to the members if they would attend the meetings, and endeavour as far as possible to take part in the discussions. He sometimes wondered whether it was the presence of the honorary members, or of the representatives of the Press—he thought it was the latter—which was the cause of so many members being backward. Might he suggest that these two classes of "bogey men" be excluded for one night, and let the members have the meeting to themselves. The result would be awaited with interest. If he might offer a word of advice to the juniors, it was that they should endeavour to read the technical journals carefully, for there they would find full accounts of what was taking place in the industry in which they were interested. They were all aware that a Gas Exhibition had been proposed for Glasgow. It had been postponed till next autumn; but he was sure that when it was held it would do good work for the city and the industry.

The PRESIDENT expressed thanks, on behalf of the Association, to Mr. Smith for his kind remarks and words of advice and encouragement. As an Association, they had reason to congratulate themselves on having so many eminent honorary members taking such an interest in their work; and they were also indebted to those honorary members who had shown such practical interest in their work as to provide medals for the best papers read. He desired to thank the managers of various undertakings for allowing them to inspect their works. On the subject of the members taking part in discussions, he thought they would be better prepared to discuss the papers if they had an opportunity of reading them previous to the meetings.

Mr. G. R. HISLOP (Paisley) proposed "Kindred Associations." He said that while they all believed in the general fulfilment of the Burns' prophecy that the time would come when "man to man the world o'er would brithers be an' a' that," he thought that the gas engineers of this country were entitled to the credit of giving the first example of the fulfilment of the grand idea of that prophecy, because they could all see with what heartiness they extended the right hand of fellowship to all their brethren in the gas industry. He could not well express the gratification which he had in reading the papers and discussions which they had from time to time. They were exceedingly creditable, and were most edifying, not only to the members themselves, but he thought that the gas companies and corporations could not shut their eyes to the fact that the papers and discussions must be of great financial value to them. He felt sure that gas had a sphere of usefulness to mankind which no other rival would ever extinguish. This was a great satisfaction to them. No doubt, it could not be denied that electric light had done a very great deal for gas. It had roused them up to the highest endeavour possible, to produce gas cheaper and more suitable for all the purposes of life. They were in the midst of new developments, and scarcely knew where they were to end; but it was for all of them to apply themselves diligently to the task of finding out what was best for each. No one thing would suit everyone alike. He asked them to join with him in expressing their best wishes for the success and prosperity of kindred Associations, which now, he understood, had reached their majority in number—21.

Mr. A. WILSON (Glasgow) said he felt honoured in being asked to reply to a toast which had been so ably proposed by Mr. Hislop. The name of Hislop was one to conjure with in the gas world. It had a reputation second to none. They were honoured in having the toast proposed by one who was almost the father of the gas industry. Mr. Hislop had told him for 62 years he had been a Gas Manager. Mr. Hislop had spoken of the value of the Associations; and he, as Vice-President of the Institution of Gas Engineers, could heartily re-echo what he said on this point. Every one of the Associations ought to be an advertising medium for gas. They had the best article to sell, the most economical and the most efficient; and they should let the public know it. There was a great field for gas yet. There was, in Glasgow, an immense field unworked, in the matter of warming and cooking,

and in the methods of heating water. It was most wonderful what revival was taking place in gas business through the Associations. There seemed to be a new spirit abroad—a desire to get the gas industry placed on a sure and certain foundation, so that it might the better fulfil its destiny.

Mr. D. VASS (Airdrie) presented the gold medal for the best paper read during last session, to Mr. G. H. M'Cowat, whose paper was entitled "Distribution of Gas and Main-Laying." The papers read before the Junior Associations were, he said, all of a very high standard; and they must remember that, while the presentation of the medal marked out what was considered to be the best paper, there were others which were so excellent that it was a matter of difficulty sometimes for those who were adjudicating upon them to arrive at a conclusion as to the best.

Mr. M'Cowat returned thanks.

During the evening, an excellent programme of music was gone through.

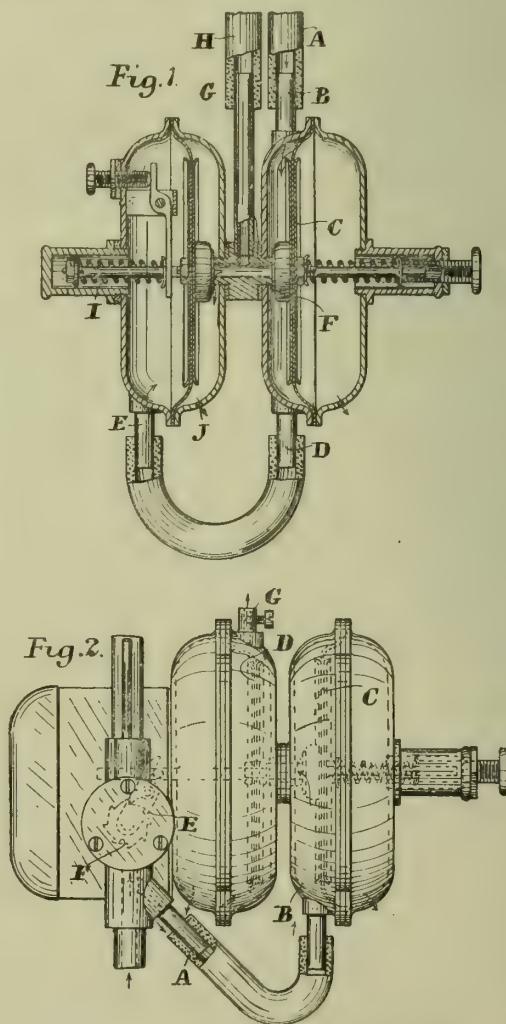
REGISTER OF PATENTS.

Controller for Gas Lighting and Extinguishing.

TOURTEL, J. M., of Chiswell Street, E.C., and MEALING, W. R., of Twickenham, S.W.

No. 24,849; Nov. 18, 1908.

This invention relates to apparatus for lighting and extinguishing gas-lamps from a distance by varying the pressure in the mains—particularly that class of apparatus in which a diaphragm or liquid sealed bell (provided with means for turning on and off the supply of gas to the burner) is connected to the gas supply and is subjected to substantially the full pressure of the gas when a predetermined maximum pressure is reached. The invention relates to the means of controlling the admission of gas to the diaphragm at the predetermined maximum pressure. For this purpose, the inventors employ a throttled passage (as described in patent No. 7197 of 1907), or else a valve or the like is arranged to effect the discharge at a predetermined minimum pressure (as described in patent No. 21,185 of 1908).



Tourtrel and Mealing's Gas Lighting Controller.

Fig. 1 shows the invention working in conjunction with a discharge controlling diaphragm. Fig. 2 shows a form applied to a tap-operating diaphragm like that described in the first patent already referred to.

In fig. 1, the gas-supply pipe A is connected to the diaphragm case formed of two equal parts; the connection of the gas being through the inlet pipe B between the diaphragm C and the left side of the case.

An outlet pipe D is connected by the tube to the inlet pipe E attached to the outlet controlling valve case formed of two parts, with a diaphragm between. There is a constant pressure of gas from the pipe A; and the arrangement of the diaphragms and their parts is such that, when the gas is under a predetermined maximum pressure, the spring arranged round the rod of the diaphragm C is sufficiently strong to keep the valve F closely on to its seat, and thus close the passage of a connecting piece which is shown joining the two valve cases together, and from which connecting piece an outlet pipe G, leading to the tap-operating diaphragm or bell by the pipe, is connected. The pressure of gas conveyed through the pipes to the diaphragm in the left-hand case tends to press with its valve against the end of the passage in the connecting piece, and thus seal it. When the pressure of the gas falls below the power of the tension spring I, which is regulable by means of a pivoted lever and finger screw, the spring withdraws the diaphragm, with its valve, and opens the end of the passage.

Thus, while the gas is below the predetermined maximum pressure and greater than the predetermined minimum pressure, the valves will be held closely on to their seats and the inlet, and escape from the pipe G are sealed. Immediately, however, the gas rises to the maximum pressure, it overcomes the spring and presses back the diaphragm C with the valve F, and passes through the tubes G H to the tap-operating diaphragm or bell, and causes it to move the tap in the required manner. As soon as the pressure is reduced, the valve F again closes the passage and the tap-operating diaphragm cannot be reoperated until the pressure has fallen sufficiently low for the spring I to withdraw the left diaphragm, with its valve, from the passage, and allow the gas to return into the case, from which it escapes through the outlet J.

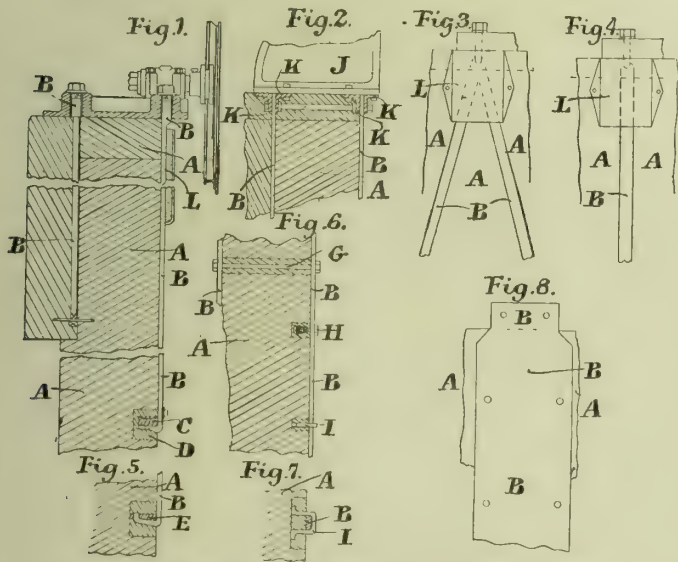
In fig. 2, a very similar inlet-controlling diaphragm is employed; but in this case the gas from the main passes through the pipe A connecting the space between the side B and the diaphragm C; its action on the diaphragm being the same as in the previous figure. But in this case, after the tap-operating diaphragm D has, by means of the rod, moved the tap through the lever E carrying a ratchet which engages with the wheel F, the gas is allowed to slowly escape through the passage G provided with a throttling screw.

Gasholder Tank Attachments.

BEARD, G. F. H., and R. & J. DEMPSTER, LIMITED, of Manchester.

No. 235; Jan. 5, 1909.

This invention relates to attachments, or holding-down bolts or plates for the standards of ordinary gasholders, or for the base-plates of the carriages for spirally-guided holders; and it is more particularly applicable in cases where it is desirable to introduce new or additional holding-down means without largely disturbing the existing tank—such as when a holder of increased capacity is to be adapted to the existing tank.



Beard and Dempster's Gasholder Tank Attachments.

Fig. 1 shows the roller carriage base-plate of a spirally-guided holder attached to the tank wall by one form of the improved holding-down bolts or plates. Fig. 2 shows an adaptation of the bolts or plates to the standard of an ordinary column gasholder. Figs. 3 and 4 are portions of the tank face, chiefly illustrating two forms of holding-down bolts or plates for attachment thereto. Fig. 5 is a detail of a holding-down bolt or plate adapted for attachment to, or abutment with, the tank wall. Fig. 6 shows other connecting means. Fig. 7 is a detail of fig. 6. Fig. 8 is a front elevation of a form of holding-down plate suitable for use with ordinary column holders (as fig. 2).

In fig. 1, a bolt B on the inner face of the tank wall is provided with a bent portion or projection passing into the wall A, and above which projection is a metal anchor block C; the whole being firmly embedded in cement at D. The holding bolt at the outer face of the tank is provided with a projecting portion in the form of a plate, which, after fixture, is built in with cement or the like. In fig. 5, the extremity of the bolt B is provided with a projection turned up at the end so as to enter, or pass through, an aperture in a plate E.

Different means for attachment of the bolts or plates, and suitable for application at any part of the tank wall, are shown in fig. 6, in which G is a cross bolt, H is a rag bolt, and I is a clip. A plan of this clip, embracing the bolt B, is indicated in fig. 7; the projecting ends of the clip being embedded in cement, filling up a cavity in the wall at that part.

In fig. 2, the bottom plate of the standard J of a column gasholder

is shown provided with angle irons K for the purpose of attachment to the holding-down bolts or plates B; a cross bolt being passed through from the inside to the outside, and the whole embedded in cement or the like.

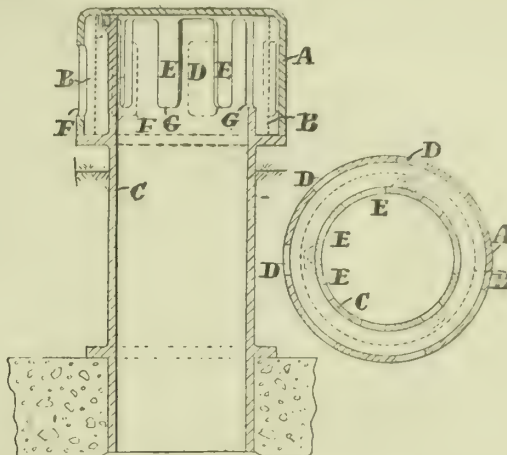
In figs. 1, 3, and 4, a plate or one form of casing L is shown in the neighbourhood of the water-line within the tank, so as to prevent corrosion of the holding-down bolts or plates; the cavity formed by such casing being, in this example, also filled with cement or like material for the same purpose. But if desired, the face of the tank wall may be grooved to receive any part, or the whole, of the holding-down bolt or plate; the same being covered over with, or embedded in, cement or like material.

Air-Vents for Water Reservoirs.

CRIPPS, F. S., of King William Street, E.C.

No. 4717; Feb. 26, 1909.

The patentee proposes to construct three concentric cylinders to be placed over the air-pipes inserted in the tops of covered water reservoirs, so as to exclude all foreign matter (living or dead) from finding access to the interior through the vents.



Cripps' Reservoir Air-Vent Cover.

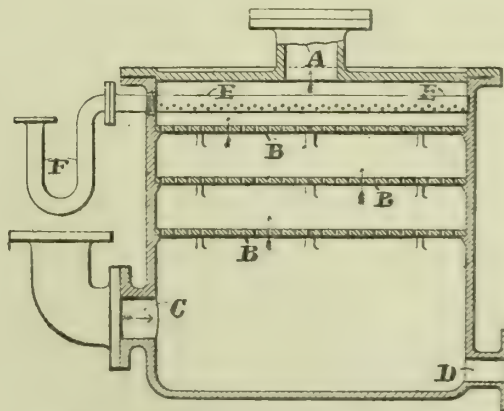
It consists, substantially, of three concentric metal cylinders or pipes. The outer one A forms a hood closing the tops and enveloping the other two, B and C. The outer and inner cylinders have slot holes D E, which baffle one another—that is, a hole in one is midway between two holes in the other, and the sill of any hole F in the outer cylinder is lower than the sill or bottom of any hole G in the inner one, so that rain water driving into the outer cylinder drains out again, instead of passing into the reservoir through the holes in the inner cylinder. The cylinder B is constructed of wire gauze, which acts as a baffle to the wind or rain beating in, and also excludes dust and other objects from being passed into the reservoir.

Suction or Pressure Producer-Gas Plants.

OSWALD, T. H., SEN. and JUN., of Fenchurch Street, E.C.

No. 11,639; May 17, 1909.

This invention relates to suction or pressure producer-gas plants, when fitted with means for dealing with the waste water discharged from the scrubbers; and the claim is to provide "means for purifying or ridding the waste water from noxious and poisonous gases—mainly sulphuretted hydrogen."



Oswald's Suction-Gas Waste-Water Purifier.

For suction-gas plant, the chamber is made of suitable proportions and capacity and of any convenient form in transverse section. It is fitted with a cover furnished at its upper part with a flanged extension to which is attached a pipe connecting with the generator (not shown). Transversely of the chamber are arranged any number of perforated plates or partitions B, of suitable thickness and mesh, and preferably divided diametrically into two equal portions, supported on projecting lugs, so as to provide for their easy fitment in place and ready removal for cleaning purposes. C is the air inlet to the chamber, attached to an upward turning elbow-pipe. D is the outlet or discharge from the chamber for carrying away the purified waste water. Transversely across the upper portion of the chamber are pipes E, held in position

by a screwed collar and a recess in the inner wall of the vessel. To the outer flanged end of the pipe is connected a U-shaped pipe F, which is joined on to the waste-water pipe leading from the scrubbers (not shown).

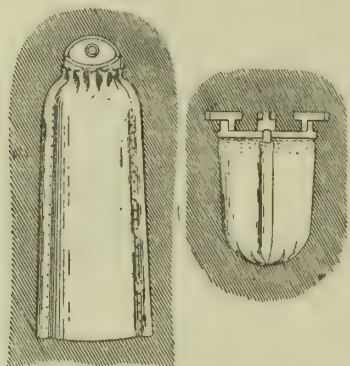
When the plant is in operation, the waste water discharging from the scrubbers flows through the pipes F and E into the chamber, where it is broken up into fine streams by the perforations in the said pipe E and the perforated plates B, and in its downward flow is brought into contact with the air coming in at C and passing upwards through the vessel. The diffused and purified water, falling to the bottom, discharges at D to any convenient waste. The U-shaped pipe F is employed to constitute a water seal.

Incandescent Gas-Mantles.

FISK, J. W., of Cardiff.

No. 11,315; May 13, 1909.

This invention consists in providing the solid rings of incandescent gas-mantles with dependent lugs to engage a mantle specially adapted thereto, and in gathering the fabric of the mantles (both upright and inverted) in such a manner as to form external vertical tubular frills, into the upper ends of which the dependent lugs are inserted as into sleeves.



Fisk's Incandescent Mantles.

The annular solid crown-piece for the upright mantle has attached to it the mantle by a cord or thread tightened around a peripheral groove in the crown, which is provided with a bridge having a hole by means of which the mantle is supported by external wire holders. From the crown depend lugs, which enter the upper ends of tubular vertical frills formed externally on the mantle by gathering the fabric by vertical seams, as shown.

The dependent lugs and frills are also applied to inverted mantles as represented.

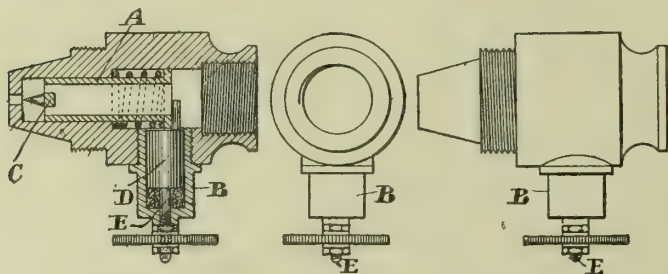
Regulator for Atmospheric Gas-Burners.

BLAND, C. W., of Little Trinity Lane, and GLOVER, T., of

Queen Victoria Street, E.C.

No. 11,826; May 19, 1909.

The object of this invention is to construct a device for regulating the inflow of gas to atmospheric burners (especially those used for inverted incandescent lighting) in such a manner that the needle valve is always kept central in its hole, and is easily manipulated and held in the desired position.



Bland and Glover's Atmospheric Burner Regulator.

The inventors form a socket piece with a hole through it of four different diameters—one provided with a screw thread for attachment to the gas-pipe; two others for receiving the valve A; the other being the needle hole, near the outside of which is a screw thread for attachment of the gas and air mixing chamber and the burner. At right angles to the hole in the socket is a screw thread hole, to which is connected a spindle casing B having an end provided with a small hole.

The valve A, which fits in two diameters of the hole in the socket, is hollow; and its body is made to fit nicely and smoothly in the smaller diameter hole with a flange at top fitting nicely the larger diameter hole. The base of the valve is provided with a bridge C, from which projects a needle, which finds a position in or near to the needle hole in the socket; and by reason of the length of the hollow valve A, and its nicety and ease of fit in the socket, the valve moves always in a straight line without any side movement, and the needle is always in proper position with regard to the needle hole.

Surrounding the hollow valve is a helical spring, which normally tends to keep the valve upward and the needle in such position that the needle hole is clear for the maximum passage of gas.

Inside the spindle casing B is fitted a spindle having one portion D fitting nicely and with a certain amount of grip with the spindle casing; the other portion E being of a smaller diameter and screw-

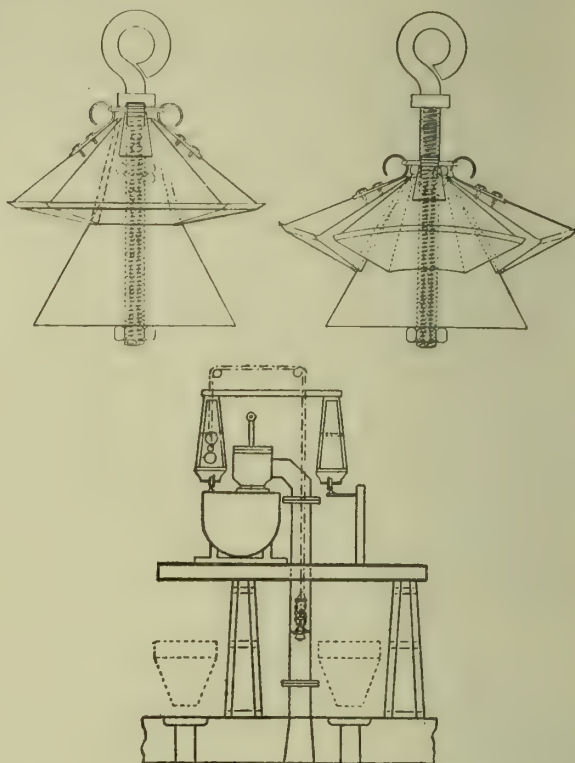
threaded, and passing out through the hole in the end of the casing, where it is provided with a thumb button held by a lock-nut. Should the heat of the gas cause shrinkage of the packing, and, in consequence, leakage of gas, by turning the lock-nuts the packing is readily tightened in the casing and the leakage stopped.

Removing Carbon from Ascension Pipes in Coke and Gas Works.

THAU, A., of Spennymoor, Durham.

No. 19,382; Aug. 23, 1909.

This invention consists in the provision of a series of scrapers loosely arranged on a screw-threaded bolt having on its lower portion a cone which, when the bolt is pulled, spreads the scrapers out against the walls of the pipe; the device being operated by two rope pulls arranged in a travelling crane, and connected, one to the scrapers and the other to the bolt.



Thau's Ascension-Pipe Scraper.

As shown, the scrapers are suspended round a cone mounted on the lower part of a bolt, so that, when the device is connected to the scrapers, the latter are held in inoperative position, and when it is pulled through the pipe by means of a rope connected to the bolt, the scrapers are spread out by the cone so as to engage the walls of the pipe and clean the latter. The hollow cone has a cutting edge round its base; and a nut (with lock-nut) arranged on the bolt underneath the ring allows the spreading-out of the scrapers to be regulated.

A crane is provided adapted to travel over and along a set of ascension pipes, with drums mounted on rotatable shafts in the crane. One of the drums is connected by means of a chain to the scrapers of the cleaning device, and the other by means of a rope to the bolt on which the scrapers are arranged. A pinion slidably feathered on a shaft, so as to be capable of being brought in and out of engagement with spur-wheels, is mounted on the shaft of the drums; and a crank handle, adapted to fit on any of the shafts, allows the cleaning device to be lowered through the ascension pipe into its inoperative position, and raised through it into its operative position for scraping the pipe when desired.

Gaslight and Coke Company's Training Scheme for Lads.

In connection with the Gaslight and Coke Company's scheme for training boys for their service, the London County Council undertook in the summer of last year to recommend 24 suitable boys for admission to a two years' course of training in the Company's workshops, and to provide instruction for them at the Westminster Technical Institute. The instruction was to consist of workshop arithmetic, mechanical drawing and sketching, English composition, and elementary mechanics (or physics and chemistry), on three half days a week. The Company found that, owing to the boys in the second year of the course being sent daily to various parts of the country, it would not be possible to adhere to the arrangement. They suggested, however, that the boys should attend the institute for one whole day a week. At the meeting of the Council last Tuesday, the Education Committee recommended that the resolution of June 30, 1908, should be rescinded, and that the Council should undertake to provide instruction at the Westminster Technical Institute on one whole day a week for boys in the second year of their training to become gas-fitters in the employ of the Company. The recommendation was passed without discussion.

The Welsbach Incandescent Gaslight Company, Limited, have declared a dividend of 6 per cent. for the half year ended the 30th of September last.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Hamburg Gasholder Disaster—Air-Testing of Plant.

SIR,—The terrible disaster at the Hamburg Gas-Works and its fatal consequences cannot fail to attract the attention and sympathy of everyone connected with the industry. I, for one, have been particularly impressed by the sad news, if only for the sentimental reason of having been on the Grasbrook works, and stood under the ill-fated holder, two days previous to the catastrophe.

It would be idle to ascribe the occurrence to any definite cause before the official inquiry is concluded, and all details are known. However, from the accounts to hand, it seems pretty certain that a charge of air had been used to test the new holder for gas-tightness. Whether a residual quantity of this air was left over when filling operations commenced, we cannot say; and the presence of an explosive mixture is denied from several quarters. I was informed, during my inspection of the works, that experiments had been going on to ascertain the action on incandescent mantles of the non-luminous gas drawn from the first charge of the holder. At the time, I put the non-luminosity of the gas down partly to the preferential dissolving power of the unsaturated tank water, and partly to some air not removed from the holder. But I should like to point out that these experiments were conducted some days before the disaster occurred; and there must have been a considerable alteration of conditions by that time. The primary cause may, or may not, have been due to the firing of an explosive mixture; but, if present, it must have precipitated matters, and influenced the consequences.

Seeing that the testing of units of gas plant by air pressure is not an uncommon—if not the usual—practice, I venture to make a suggestion, to obviate or lessen the risks attached to such a procedure. Could it not be made a rule—possibly to be embodied in factory regulations—to carry out these tests with a more or less inert gas, such as ordinary combustion gases? All that would be required would be to connect the suction of the blower or compressor employed to a pipe coming from a flue or chimney; and a small coke scrubber for cooling and cleaning, and, if necessary, a limestone scrubber for removing sulphur dioxide, might be advantageously interposed. If, for instance, purifier-boxes were blown out with this inert gas before removing the lids, the not infrequent explosions by spontaneous ignition could in most cases be avoided. This would greatly reduce the number of casualties debited to the gas industry—to the chagrin of those who are only too ready to make use of accidents of this kind for the purpose of competitive propaganda.

Southampton House, 317, High Holborn, W.C.,
Dec. 18, 1909.

R. LESSING.

The Catastrophe at the Hamburg Gas-Works.

SIR,—In your issue of the 14th inst., you publish a letter from Mr. F. S. Cripps, in reference to the above, in which he says: "The 'Mirror' stated the holder to be 7,060,000 cubic feet, which is 71 per cent. less than the 12,000,000 cubic feet holder of the South Metropolitan Gas Company."

Is this correct? Surely the figure should be 41 per cent.

Of course, the holder of the South Metropolitan Gas Company is 71 per cent. larger than the one at Hamburg.

Probably this is what Mr. Cripps meant.

J. W. WHIMSTER.

Lower Sydenham, S.E., Dec. 17, 1909.

The Gas Heating Field.

SIR,—Since your valuable articles (Sept. 3 and Oct. 15, 1907, and July 1, 1908) upon this subject were published, many things have tended to concentrate attention upon it, and considerable progress has been made.

It is becoming more than ever recognized that gas is an economical and effective heating agent, and that its use is an invaluable aid to comfort and health. So far as can be generally ascertained at present, this season promises to produce a record for the increased adoption of gas-heating appliances, while a spirit of optimism is abroad respecting the future of gas-heating.

Gas undertakings generally are assisting in the effort; but a yet bolder policy must be adopted to ensure reaching the ultimate goal. Rentals for gas appliances are being reduced to vanishing point, even where they have not been altogether abolished. After all, a merely nominal rental is perhaps the best safeguard against the indiscriminate adoption of unnecessary apparatus, with its consequent needless addition to capital expenditure. The manufacturers of such apparatus are fully entitled to the gratitude of the gas industry for their splendid efforts in designing and producing suitable types at a reasonable cost; and great improvement has recently been made in this direction. The medical profession, too, is recognizing the usefulness and hygienic value of properly designed and fixed gas-fires; and its recommendation will undoubtedly increase the popularity as well as the importance of these appliances.

Much, however, yet remains to be done to enlist the sympathy and assistance of architects and builders. One of the chief difficulties to be surmounted is that caused by the unsuitability of most houses for the fixing of gas apparatus to the best advantage. How many homes might be improved by the adoption of gas-heating apparatus, if adequate provision had been made for them in the original design. There is also a great natural objection to having floors ripped up, and walls damaged, in laying supply pipes. In a new design, it would be an easy matter to provide a covered channel for pipes; and this would be of untold advantage whenever an examination was necessary. It should be considered important to bring this matter very strongly before the

notice of those responsible for the design of dwelling houses. Public authorities, too, may do much to reduce the smoke nuisance by advocating the use of purified gas for heating purposes; and experiments such as are now being carried on by some of the largest gas undertakings will be most useful in forwarding this object.

It may be added that in Huddersfield, the differential charges in force (for lighting, 2s. per 1000 cubic feet, and for heating and power, 1s. 6d.) have proved advantageous, and are undoubtedly preferable to a flat-rate, as the following figures partially demonstrate.

The gas sold for stoves, engines, &c., in the year ending March, 1898, was 81,700,000 cubic feet; and in the year ending March, 1909, 247,631,000 cubic feet—being an increase of over 200 per cent. in the eleven years.

In addition to the above, a large proportion of the gas sold through prepayment meters (6,127,000 cubic feet in 1898, and 214,300,000 cubic feet in 1909) is used for heating purposes. What the exact proportion is, there are no means of determining; but taking it at one-half, the total gas used for heating purposes, it will be as follows: Year ending March, 1898, 84,763,000 cubic feet; year ending March, 1909, 354,781,000 cubic feet—showing an increase in the eleven years of 270,018,000 cubic feet, or 318 per cent.

The dogged perseverance in attacking the problem of gas-heating that you have so often advocated, is having remarkable results all over the country.

Huddersfield, Dec. 18, 1909.

EDWARD A. HARMAN.

Gas-Stoves for Heating Aviaries and Bird-Rooms.

SIR,—In taking up the cudgels against the inconsequential abuse of gas as a heating and lighting agent from a hygienic point of view, Mr. D. H. Helps, in his letter in the "JOURNAL" for the 7th inst., in no way overstates his case. Hundreds of gas-stoves are to-day used in aviaries and bird-rooms by bird fanciers throughout the country. Breeders are even enthusiastic in their praises of this means of maintaining the aviary at a uniform temperature, and at the same time keeping the birds in perfect condition.

One well-known fancier (Mr. Henry J. Fulljames) writes in "Canary and Cage Bird Life," for Nov. 24, 1905, as follows:—

Some twelve or more years ago, I was visiting a friend at Weymouth who had a very fine collection of choice exotic ferns, and while I was listening to his recital of the history of the principal plants in his collection, I noticed that the frost which was prevailing at the time was being kept out of his fernery by the aid of a Clark's "Syphon" gas-stove. Knowing that, of all living things likely to be susceptible to deleterious fumes, such plants as those in the possession of which my friend delighted would be the very first to be injuriously affected, I asked him if he noticed none of such ill-effects as might be expected to be consequent upon his means of heating. For reply he referred me to the condition of his collection, and I decided that what was good enough for tropical ferns was good enough for tropical birds; and immediately upon my return to my home, I installed one of the stoves in my bird-room, in which I was at the time keeping some 200 foreign birds. My experience justifies me in fully recommending this method of heating a bird-room.

This practical testimony to the non-injurious effect upon plant and bird life of gas used as a heating agent surely combats effectually the absurd notion that the atmosphere is charged with sulphuretted hydrogen and other terribly poisonous products wherever gas is used.

Canonbury Road, N., Dec. 15, 1909.

F. HATCHER.

PARLIAMENTARY INTELLIGENCE.

GAS COMPANIES (STANDARD BURNER) BILL.

Friday was the last day for depositing in the Private Bill Office copies of Bills promoted for the ensuing session. One of the principal measures, so far as gas companies are concerned, is the above-named Bill, which, as already mentioned when dealing with the statutory notices, provides for the adoption of the "Metropolitan" No. 2 burner as a standard, in substitution for the various burners now in use for the official testing of the illuminating power of gas. We have received from the Parliamentary Agents (Messrs. R. W. Cooper and Sons) an early print of the Bill, and are thus enabled to indicate its scope. As our readers are aware, it is being promoted jointly by a number of companies, whose names, which are attached to three separate Bills, were given in the "JOURNAL" for the 23rd ult. (p. 548).

The preamble sets forth that by the City of London Gas Act, 1868, Parliament prescribed that the burner to be used for testing the illuminating power of gas supplied in the City of London should be "such as shall be the most suitable for obtaining from the gas the greatest amount of light, and be practicable for use by the consumer." It then goes on to say that the Gas-Works Clauses Act, 1871, enacts that the illuminating power of gas supplied by the various gas undertakings of the kingdom should be tested by burners to be prescribed by the Special Act relating to each company, none of which burners (with the exception of the burner prescribed in all Gas Acts of recent date, and subsequently referred to) fulfil the conditions prescribed, or meet the requirements essential for a fair and scientifically accurate test for illuminating power. The Metropolitan Gas Referees, after careful experiment, have satisfied themselves that the burner known as the "Metropolitan" argand No. 2 is the best known burner for testing the illuminating power of gas; and since the year 1906 they have adopted it for the purpose of testing the illuminating power of the gas supplied by the three Metropolitan Companies. It has been proved that this burner gives a fair and true result for all qualities of gas up to an illuminating power of 20 candles, which limit covers the statutory obligations of all the Companies enumerated in the first schedule.

The burner alluded to is now invariably prescribed in all Acts and Provisional Orders conferring powers of supply upon gas companies and local authorities, as also in Acts and Provisional Orders promoted by existing companies and local authorities for obtaining further powers. The several promoting Companies are consequently desirous of having the "Metropolitan" No. 2 burner substituted for the one prescribed in the Acts or Orders relating to their respective undertakings. The clauses of the Bill are then given, as follows:—

1.—This Act may be cited for all purposes as "The Gas Companies (Standard Burner) Act, 1910."

2.—"Prescribed burner" means the burner prescribed pursuant to the provisions of the Gas-Works Clauses Act, 1871, in any Act or Order relating respectively to the promoting Companies. The "standard burner" means the Metropolitan argand burner No. 2, described by the Metropolitan Gas Referees in their Notification for the year 1908 (a model of which burner has been deposited with the Warden of the Standards), or any other burner which the Board of Trade may approve under the provisions of this Act as being equally or more suitable for the testing for illuminating power.

3.—This Act shall come into operation on the 1st day of January, 1911.

4.—Notwithstanding anything in any Acts or Orders relating to the promoting Companies contained, the testing for illuminating power of the gas supplied by the promoting Companies shall, subject to the provisions of this Act, be by means of the standard burner, which shall be deemed to be the prescribed burner within the meaning of the Gas-Works Clauses Act, 1871, for the purposes of any test for illuminating power under that Act and the Acts and Orders set forth in the first schedule to this Act; and such Acts and Orders are hereby severally amended, and shall be read and have effect accordingly: Provided that the Board of Trade may, on the application of the company or the local authority concerned, approve the use of any other burner the chimney and burner-holes of which may have other dimensions, and which may appear to the Board to be equally or more suitable for the testing: Provided, further, that such other burner shall be the most suitable for obtaining from the gas the greatest amount of light, and be practicable for use by the consumer.

5.—The following conditions shall be observed when testing with the standard burner:—

- (1) The glass chimney to be used with the standard burner shall be 6 inches in length by $1\frac{1}{8}$ inches in internal diameter.
- (2) The gas shall be consumed in the standard burner at the rate of 5 cubic feet per hour, and the air supply thereto shall be adjusted according to the regulations contained in Part I. of the second schedule to this Act.
- (3) If the gas is so rich that it cannot be burned with the full air supply and at the prescribed rate of consumption without tailing above the chimney, the rate of consumption shall be reduced until the flame burns properly within the chimney, as described in the said second schedule. The rate of consumption shall then be carefully ascertained, and from this the illuminating power of the gas under test shall be calculated by simple proportion for any reduction of such rate of consumption below 5 cubic feet per hour.
- (4) Proper correction shall be made, according to the method set forth in Parts II. and III. of the second schedule to this Act, for variation from standard atmospheric conditions of 30 inches height of mercury pressure and 60 degrees Fahrenheit.

6.—All costs, charges, and expenses of and incident to the preparing for, obtaining, and passing of, this Act, or otherwise in relation thereto, shall be paid by the promoting Companies.

The first schedule contains the names of the promoting Companies and the Acts or Orders to be amended. The second schedule contains: (1) Regulations for using the standard burner; (2) regulations as to correcting to standard temperature and pressure; (3) table to facilitate the correction of the volume of gas at different temperatures and under different atmospheric pressures.

LEGAL INTELLIGENCE.

THE PORTSMOUTH WATER-APPROPRIATION CASE.

Judgment for the Portsmouth Water Company.

In recent issues of the "JOURNAL" (see *ante*, pp. 626, 686), we reported the proceedings in an action brought by the Portsmouth Water Company against the London, Brighton, and South Coast Railway, to restrain them from taking water from a spring, termed the "Railway" spring, on their land at Bedhampton, near Portsmouth. The case, which extended over several days, was tried by Mr. Justice PARKER, who reserved judgment. This was delivered last Wednesday.

HIS LORDSHIP said the action related to the respective rights of the Water Company and the Railway Company in the water rising from a spring situate on the latter Company's land, and known as the Railway spring. The site of it was formerly in the bed of a millpond situated immediately above, and used in connection with, the Upper Bedhampton Mill. In the year 1848, the mill and millpond belonged to two gentlemen named Stoneham. The water, after passing through the mill or over the weirs, flowed to, and was used to work, another mill known as the Lower Bedhampton Mill, which in 1848 belonged to other owners. Both mills appear to be of considerable antiquity; and the inference he drew from the facts proved was that the millpond was originally formed by placing a dam at the Upper Bedhampton Mill across the bed of a natural stream—the effect being to back the water up the channel and its tributaries, causing them to overflow their original banks, and thus constituting a millpond. If the person who erected

the dam owned all the land affected by the backing-up of the water, the dam could not give any cause of complaint to upper riparian owners. With regard to lower riparian owners, their rights would in no way be affected by the existence of the dam if the water from the natural stream and its tributaries still flowed undiminished in quantity either through the mill or over the dam and weirs. The various sources from which the millpond was supplied with water at the date named included Wyatt's spring, situate in the bed of the pond; the two Bidbury springs, situated, together with the channels by which the water therefrom reached the pond, on land belonging to the Stonehams; and a stream coming to the pond on the east from various other springs, among which were those known as Blue Hole springs and St. Chad's Well—the latter stream being also intermittently fed with water from a brook known as the Hermitage. According to the plaintiffs' contention, the Railway spring was yet another important source of supply. The defendants, on the other hand, alleged that such spring had no existence until the year 1901 or 1902. On the evidence, he came to the conclusion that in 1848 this spring did exist, and yielded a considerable supply of water, which passed through the millpond to the upper, and thence to the lower, mill. He further found that but for the existence of the dam the water from this spring would have flowed, and when the millpond was emptied by raising the mill hatches did in fact flow, in a defined channel from the spring head into another defined channel, which brought down the waters from the Bidbury springs to the mill. Under these circumstances, it followed that the Stonehams were not entitled in 1848, as against the then owners of the Lower Bedhampton Mill, to interfere with the accustomed flow of water either from the Bidbury springs or the Railway spring.

In the year 1848, the predecessors in title of the defendants required a portion of the millpond; and they bought this land from the Stonehams under a conveyance dated Aug. 16, 1848. The portion thus acquired extended right across the bed of the pond from east to west, and included the site of the Railway spring, a small part of the channel by which, when the pond was emptied, the water from this spring reached the channel that brought down the water from the Bidbury springs to the Mill, and part of the latter channel. The conveyance contained a recital, among others, to the effect that the Railway Company had agreed in nowise prejudicially to obstruct the full flow of water in the stream to the millpond under the works constructed or to be thereafter constructed. The part of the millpond conveyed was described as "all that piece or parcel of land covered with water, being a portion of the said millpond, except and reserved unto the grantors the full flow of water into the said channel from the said stream." Two interpretations of these words had been suggested. Mr. Buckmaster (for the plaintiffs) contended that the flow of water in the stream to the millpond included all the water passing from the part of the pond which was sold to that which was retained by the vendors, and therefore included the water from the Railway spring; whereas Mr. Younger, on the other side, contended that the words referred only to the stream from the Bidbury springs, which at the date of the conveyance came from the north of the land sold to the Railway Company, passed under their existing bridge, and thence flowed to the mill. The latter interpretation seemed most in accordance with the words used; but he could not accept the argument founded on it, that the exception and reservation of the full flow of water from the Bidbury stream implied a grant of the full flow of water from the Railway spring—a grant of a right in the nature of an easement, by virtue of which the Railway Company could impound and divert altogether the water from the spring. His conclusion was that the exception and reservation left unaffected the rights of both the Stonehams and the Railway Company in the water from the Railway spring; and that in regard to this water they respectively became, by virtue of the conveyance, upper and lower riparian owners. In other words, after the execution of the conveyance the Stonehams were entitled, just as the owners of the Lower Bedhampton Mill were entitled, to have the water from this spring flow in its accustomed channel, undiminished by the Railway Company except to the extent to which the Company could justify its diminution by virtue of their rights as upper riparian owners.

It remained to be considered whether the rights referred to had been altered by anything which had happened since the conveyance. On Aug. 1, 1877, the Water Company acquired the Lower Bedhampton Mill—their purchase including all the land on both sides of the stream from the Upper Bedhampton Mill down to the sea; so that they were entitled to use the water coming down without reference to the rights of any lower riparian owner. On Dec. 1, 1880, they acquired the Upper Bedhampton Mill, the millpond, the Bidbury springs, and the channel which brought down the water therefrom to the mill, except in so far as the pond and the last-mentioned channel had been conveyed to the Railway Company in 1848. In 1889, they enclosed Wyatt's spring, carried a pipe from it to their pumping-station, and began to utilize the water for the purposes of their undertaking. This they could lawfully do, as there was no lower riparian owner whose rights had to be considered. Similarly, in 1898 they enclosed the two Bidbury springs, and in one of them sunk a cylinder in order to concentrate the flow of the water. In another they made a boring down to the chalk, which, according to the evidence, was the natural reservoir that supplied all these springs with water. There was some evidence that this boring, when open, diminished to a certain extent the supply of water in the Railway spring; but he came to the conclusion that, notwithstanding the work done in connection with the Bidbury springs in 1898, the Railway spring still continued to yield a considerable quantity of water. After enclosing the two Bidbury springs, pipes were laid from them connecting with the pipe from Wyatt's spring to the Company's pumping-station, each pipe having an overflow into the millpond considerably to the south of the land sold to the Railway Company. At the same time, a pipe was laid for surface-water drainage from the north side of the railway under the bridge, so as to have an outlet in the millpond south of the Railway Company's land. These pipes were laid through the land of the latter Company by arrangement with them; and the result was that it became possible to fill up the millpond under the bridge without interfering with the flow of water from the Bidbury springs, or of surface water from the north of the railway. In the year 1901, the Water Company proposed two further schemes. First, they contemplated laying a 36-inch main from their pumping-station across the millpond and

under the railway line; and, secondly, constructing a private siding partly on the Railway Company's land and partly on their own. For the execution of both projects some arrangement with the Railway Company was necessary. The arrangement came to in regard to the 36-inch main was ultimately embodied in an agreement dated June 13, 1901; and that as to the siding in another dated Dec. 3, 1901. After reading certain clauses of the first agreement, his Lordship said it was argued that this agreement authorized the Railway Company to fill up all the millpond so far as it had been conveyed to them in 1848, and therefore inferentially to fill up the site of the Railway spring, and divert its waters to their own use. But, in his opinion, it was reasonably clear that all they were authorized to do was to fill up the part which was on their own land of the disused channel which formerly brought down the water of the Bidbury springs to the mill. The channel from the Railway spring was at the date of the agreement in no sense a disused channel, but continued then to bring down, as it had always done, the waters of the spring to their point of junction with the channel from the Bidbury springs. This agreement, therefore, did not in any way affect the rights of the respective parties in the waters of the Railway spring. It was not necessary to consider the provisions of the agreement of Dec. 3, 1901, which provided only for the construction of the contemplated siding. The actual work in respect of both these schemes commenced before the date of the earlier of the two agreements; the work being carried on more or less contemporaneously. Before commencing the embankment, the Water Company put down a 42-inch pipe at right angles to its proposed line, for the purpose of carrying the water from the pond to the north to the pond south of it. The only water in the northern part was then the water coming from the Railway spring; the overflow from the Bidbury springs being south of the embankment. The first soil applied to form the embankment over this 42-inch pipe seemed to have been excavated from the millpond in digging holes for the piers on which the 36-inch main was to be carried; and in digging a hole in the immediate neighbourhood of the Railway spring the workmen were inconvenienced by the water, which appeared to have been flowing in considerable quantities. It was not, in his opinion, the fact that the Railway spring originated, or that its yield was materially increased, by anything done in the laying of the 36-inch main, or during the construction of the embankment. The two schemes were in due course carried out; and, until further works were erected, the water from the Railway spring flowed, as it had previously done, down to the Upper Bedbampton Mill, except that it was carried from north to south of the embankment by means of the 42-inch pipe. In his opinion, the respective rights of the parties remained unaltered.

In 1902, the Water Company proposed, with a view of preventing the water from the Railway spring being contaminated with surface water from the north, to construct a retaining-wall, partly on their own land and partly on that of the Railway Company; and they approached the latter in order to obtain their consent. Thereupon the Railway Company claimed the sole right to take and use the water of the Railway spring. The Water Company denied the validity of this claim; alleging that they and their predecessors had hitherto taken and used, and they claimed the right to take and use, the water flowing from the spring, notwithstanding that the spring was on the Railway Company's land. Under these circumstances, the parties came to an arrangement embodied in the agreement of Sept. 27, 1902, under which the Water Company were to be at liberty to make the proposed retaining wall on certain terms then specified. The agreement was determinable after four years by six months' notice by either party; and on its determination, the Water Company were, if required, to remove the wall, and restore the land to its former condition. The rights of the parties, whatever they might be, existing at the date of the agreement, were to be revived, and be in full force as soon as the agreement determined. Subsequently the idea of making the wall was abandoned; and, in lieu thereof, the Water Company, with the consent of the Railway Company, sank a cylinder in the Railway spring, in order to concentrate the waters as far as possible, and surrounded it with a retaining wall—enclosing the spring. From the interior of the spring they carried a pipe emptying into the 42-inch pipe under the embankment. The pond north of the embankment thus became dry, and was filled up by the parties—the old bridge being removed. By an agreement dated July 7, 1905, the cylinder and retaining-wall thus constructed were substituted for the wall mentioned in the agreement of Sept. 27, 1902. As from Sept. 29, 1907, this agreement was determined by the Railway Company; and it thereupon became necessary to define the rights of the two Companies in the water of the Railway spring as they existed prior to the date of the agreement. These rights, in his opinion, were then, and still remained, the usual rights of upper and lower riparian owners respectively; and, consequently, the Water Company, as lower riparian owners, were still entitled to have the water from the spring flow through the 42-inch pipe into their pond south of the embankment undiminished in quantity, except to the extent to which the Railway Company could justify such diminution under their rights as upper riparian owners.

The Railway Company's contention that they were entitled to all the water of the spring because it rose on their land, and their threat to impound and divert all such water to their own use, could not, in his opinion, be upheld or justified. This disposed of the greater part of the action. It was, however, suggested that the sinking of the cylinder in the Railway spring had largely increased its yield of water; and it was contended that the Railway Company were exclusively entitled to such increase. This was not an issue raised upon the pleadings; and even if the Railway Company were right in their contention, he was clearly of opinion that where an upper riparian owner alleged that he had increased by artificial means the flow of water from a spring the water of which ought *prima facie* to come down to a lower riparian owner, the onus of proving the fact and the amount of such increase rested with the upper riparian owner, who, as a condition of enforcing his rights, would be required to prove what was the extent of the flow before the artificial means were applied. The Railway Company had not, in this respect, discharged the onus of proof. The sinking of a cylinder in the spring might, of course, have increased the flow, by removing obstruction to the rising water. But there was no real evidence that it did so; and it was highly improbable, on the evidence, that the water now rising in the spring had anything in common with

that found under the railway line during the excavations for the 36-inch main, even if such water were really spring and not surface water.

He should therefore declare that the respective rights of the plaintiffs and defendants in the water of the Railway spring were, at the date of the agreement of Sept. 27, 1902, the ordinary rights of lower and upper riparian owners respectively; and that on the determination of this agreement, as modified by that of July 7, 1905, such rights revived and became again of full force. He therefore proposed to grant an injunction restraining the defendants from diverting, intercepting, or otherwise dealing with the Railway spring or the water in such manner as to interfere with the rights of the plaintiffs referred to in the declaration. Defendants must pay the plaintiffs' costs of the action.

A stay of execution for one month was granted to allow of certain mechanical arrangements being made to enable the defendants to comply with his Lordship's declaration.

DISPUTED WATER-RATE FOR BUSINESS PREMISES.

A short time ago, Deputy-Judge Lush, sitting at the Westminster County Court, had before him a claim by the Metropolitan Water Board for five quarters' rate for water supplied to Messrs. Baker, carpet manufacturers and importers, of Warwick Square and Newgate Street, London. The case for the Board, for whom Mr. A. B. Shaw appeared, was that defendants occupied two buildings, with separate entrances, and used the two premises as one whole. The New River Company's charges were continued until the Board's new Act came into force on April 1, 1908, when they were bound to follow the City rating authority, and make revised charges on the same lines. The rate-book showed two assessments, and the Board made two, at the usual 5 per cent. on the rateable value of the premises. The claim was for £34 os. 10d. for five quarters under the revised charges. If the Board were wrong, the owner or occupier of adjoining premises might have a supply to one cut off, use the water supplied to one for both, and pay one rate, even though the premises to which the supply pipe went were assessed at a low value and the adjoining premises at a high one. There was intercommunication between the premises occupied by defendants, who used them as one building. For the defendants, who were represented by Mr. Drucquer, evidence was given that a well on the premises when defendants went into possession was now the source of water supply to the whole of the premises. There were seven numbers in Warwick Square, and formerly the buildings were assessed in three locally. There was always a separate assessment for No. 9, the premises to which the Board had supplied water; and up to the time of the revised charges coming into force, the water-rate was on an assessment for this building only. The whole of the premises were held under one lease. It was contended that No. 9 only was liable to assessment for water-rate during the time the supply was given by a communication pipe that went to that house, and that the fact that there was intercommunication with adjoining premises did not render them liable to assessment. His Honour took time to consider his judgment; and it has just been communicated to the parties. It is against the Board; and there will probably be an appeal.

Welsbach Light Company of Australasia, Limited & Reduced.

A petition asking the sanction of the Court to a reduction of the capital of this Company came before Mr. Justice Joyce last Tuesday. Mr. Thompson, who appeared in support of the petition, said the Company carried on a very successful business as dealers in light-fittings, in this country and in Australia and New Zealand. The capital was £35,000, in £1 shares, fully paid; and this being largely in excess of their requirements, it was proposed to return 19s. per share, so that in future the capital would be 35,000 shares of 1s. each. A resolution had been duly passed with this object, and the invested funds were amply sufficient to make the payment. There was a certificate of the debts; the principal creditor being the London and Joint Stock Bank, Limited, who consented to the petition. The other debts amounted to only £195 8s. 9d., to meet which money would be put to a separate account in the bank. His Lordship made the order confirming the resolution.

The South Suburban Gas Company's Water-Rate Case.

Mr. Justice Neville had before him in the Chancery Division of the High Court of Justice, on the 11th inst., a motion to review or vary the minutes of the order made in the action brought by the South Suburban Gas Company against the Metropolitan Water Board in regard to the charge for water supplied to the gas-works, the proceedings in which were reported in the "JOURNAL" for the 19th of October (p. 191). Sir Alfred Cripps, K.C., said he had had an opportunity of conferring with Mr. Danckwerts on the matter, and fortunately they had been able to agree on what they thought would be the right form. It was a declaration that, under and by virtue of sections 8, 9, and 13 of the Metropolitan Water Board (Charges) Act, 1907, the plaintiffs were entitled to be supplied by the defendants with water for domestic purposes as owners and occupiers of the buildings, for the engineers', assistants', directors', and Secretary's lavatories, and for all the various places mentioned in the statement of claim, for the domestic purposes in the parish referred to. But they were not entitled to be supplied for such purposes under section 16 of the Act; and were not entitled to be supplied with water for the heavy and light horse stables otherwise than under that section. Counsel said both sides were anxious to get a decision; and this made it as specific as possible. The order would, he supposed, be dated that day. Mr. Danckwerts agreed, and the order was made accordingly.

Twineham Water Supply.—The Cuckfield Parish Council have resolved to accept the offer of the Public Works Loan Commissioners for a loan of £1216, at 3½ per cent. per annum, for furnishing a water supply to Twineham, for which the consent of the Local Government Board has already been received.

MISCELLANEOUS NEWS.

PRESTATYN GAS TRANSFER ARBITRATION.

First Day's Proceedings.

As was briefly stated in last week's "JOURNAL," an arbitration was held at the Surveyors' Institution on the 6th and 7th inst., to determine the price to be paid by the Prestatyn Urban District Council for the local gas undertaking, which is the property of Lady M'Laren. The Council obtained power to purchase the works under an Act passed in the last session of Parliament (see "JOURNAL" for June 15, p. 735, and June 29, p. 983).

The Arbitrators were Mr. CORBET WOODALL for Lady M'Laren, and Mr. E. H. STEVENSON for the Prestatyn Urban District Council. Sir HUGH OWEN, G.C.B., acted as Umpire.

The Hon. J. D. FITZGERALD, K.C., and Mr. RAYMOND ASQUITH (instructed by Messrs. Sharpe, Pritchard, and Co.) appeared for Lady M'Laren; the Council being represented by Mr. WEDDERBURN, K.C., and Mr. F. N. KEEN (instructed by Messrs. Baker and Co.).

THE CASE FOR LADY M'LAREN.

Mr. FITZGERALD, in opening, said the history of the gas-works extended over seventeen years in point of time. Prestatyn was a small seaside place on the estuary of the Dee; and Mr. Henry Pochin, Lady M'Laren's father, who was possessed of considerable property in the neighbourhood, in 1892 obtained a Provisional Order authorizing him to establish gas-works there. He took this course with the view of assisting in the development of the place, which at that time was so small that no remunerative return could be expected for a considerable period. The Order stated that the limits of supply would be the parishes of Meliden, Cwm, Dyserth, and Newmarket, in the County of Flint. The capital under the Order was not to exceed £5000; and the maximum dividend was to be 10 per cent. Borrowing powers up to £1250 were allowed, the maximum interest payable to be 5 per cent.; and the gas was to be of 15-candle power, with a maximum price of 6s. per 1000 cubic feet. There was a proviso in the Order—"That if the undertaking is at any time assigned to any other body, company, or person, such body, company, or person shall, from the date of such assignment, be the undertakers for the purpose of this Order, in lieu of the person or persons above-mentioned; but no such assignment shall have any validity or effect until after the approval of the Board of Trade to such assignment has been signified in writing signed by a Secretary or an Assistant Secretary of the said Board. Provided that nothing in this Order contained shall prevent the undertakers borrowing money on the security or mortgages of the undertaking not exceeding the amount by this Order prescribed, or shall make the consent or approval of the Board of Trade necessary to the validity or effect of any such mortgage." So far as he knew, this was an ordinary provision inserted in Orders of this description. When the Order was obtained in 1892, Prestatyn was merely a seaside village; and no one would have thought of establishing a gas-works there, unless he had been interested in the locality, like Mr. Pochin was, and felt willing to wait for a considerable period before getting any remunerative return on his investment. That was exactly what had happened in this case. The works were carried on at a loss for the first two years; subsequently for several years there was a nominal profit; and then the profit went on slowly increasing, until during the last two years the undertaking had become remunerative. The population had increased, many new houses had been built, and consequently the consumption of gas was very much greater. It had been stated that in 1901 the population in the gas area was 2400 odd; and that last summer the resident population had increased to 3650, in addition to which there were visitors amounting to between 4000 and 5000 persons. The gas sold for private lighting in 1904 was 2,465,800 cubic feet; while last year it had reached 4,247,100 feet. During the same period, the quantity of gas consumed for public lighting had gone up from 259,300 cubic feet to about 341,000 feet. The amount of increase in the gas sold in the four years was close upon 14 per cent.; and this increase was still going on. There had naturally been a corresponding rise both in the gross and the net income. In 1904, the revenue was £650, and the profit £121; while in 1908 the gross income was £1166, and the net income £418, or between 6 and 7 per cent. on the capital expended on the concern. All this showed the progressive nature of the undertaking; and proved that if it had continued in the hands of Lady M'Laren for a couple of years longer, it would have been paying the maximum dividend allowed under the Order. The existing capital powers having become exhausted last year, Lady M'Laren applied to the Board of Trade for a Provisional Order for further capital, and this was granted; the additional amount being £5000, with borrowing powers to the extent of £1250. Simultaneously with this, the Urban District Council, having become aware, through a communication from Lady M'Laren, that she was applying for a fresh Provisional Order, brought in a Bill to enable them to compulsorily acquire the undertaking. This Bill was passed by Parliament; and, of course, the Provisional Order was thereupon rejected, as having become unnecessary. The Act provided that, failing agreement, the price should be determined by arbitration under the provisions of the Lands Clauses Acts; and the sale and purchase should be deemed to be by compulsion. It was also stipulated that, in addition to the amount to be paid under the arbitration, the Council should pay the sum of £250 towards the costs and expenses incurred by Lady M'Laren in connection with the promotion of the 1909 Order and her opposition to the Council's Bill, so far as such opposition related to the transfer of the undertaking. The Council would take over the undertaking free from liabilities of every kind, and free from all debts on current account; and the Act stated that the vendor should be entitled to all the gas-rents and other debts due to her, and to all receipts from the undertaking, up to the date of transfer. The stock of gas coal and other stores at the date of transfer would, of course, be

taken over at an agreed price, or as settled by a valuer. The Act stated that the price to be charged by the Council for gas supplied by meter should not exceed 5s. per 1000 cubic feet; and section 17 read: "The limits of this Act for the supply of gas shall be, and include, the district and the parishes of Meliden and Dyserth, in the County of Flint." For some reason, the Council did not wish to extend their area; but that remained useless to Lady M'Laren. The works were good, solid ones; and the price charged for gas was a reasonable one, below the maximum named in the 1892 Order. What had to be ascertained for the purposes of the arbitration was the net profit of the undertaking at the present moment; and this being a progressive concern, it was, of course, desirable to get the net profit up to the very latest minute. The tables that had been put in and agreed between Messrs. Cash, Stone, and Co., for Lady M'Laren, and Messrs. Keen and Co., acting for the Council, were for the period terminating on Dec. 31 last; and the reason they agreed the tables at this date was that when Messrs. Keen and Co. were asked to go into the figures for this year, of which three-fourths had already expired, they declined to do so—stating that they had been instructed on behalf of the Council not to go into any figures later than Dec. 31 last. Of course, they were bound by their instructions; but the reason why those instructions were given was perfectly obvious. This was a progressive undertaking, in which the consumption of gas and the net revenue were increasing year by year; and if the figures for this year were taken, they would be found to be considerably in excess of those for last year. However, the refusal of Messrs. Keen and Co. to go into the later figures did not in any way preclude these figures from being ascertained; and consequently they had been set out by Messrs. Cash, Stone, and Co. for the three quarters already expired. In every one of these quarters there had been a considerable increase over the consumption in the corresponding quarters of 1908. He thought the figure was 14½ per cent., which was slightly in excess of the progressive figures for the previous year. So as to be quite sure of being on the right side, only 10 per cent. increase had been taken for the Christmas quarter; and working the matter out in this way, they arrived at a profit for the year of £521, as against £418 for the previous year. For capitalization, they had taken 28½ years' purchase, which was about the lowest figure that was asked for in cases of this kind, where a statutory company was being dealt with. In estimating the value of the undertaking, account should be taken of the fact that, if not next year then the year after, the profit would certainly be sufficient to pay the full maximum dividend. The 10 per cent. dividend on the £5000 required £500, and 5 per cent. on the £1250 borrowing powers £62½—making a total of £562½. Then there was a very large amount outstanding in the shape of back-dividends. The total amount of these back-dividends was £4670; and they reckoned £2477 as the present value of this sum. In round figures, the amounts he had mentioned added together produced a total of £20,000; and in addition there was an allowance for compulsory sale, which was usually taken at 10 per cent., bringing the total of the claim up to £22,000.

Mr. William Cash, Chartered Accountant, of the firm of Messrs. Cash, Stone, and Co., examined by Mr. FITZGERALD, said he had examined the undertaking and had made out, in conjunction with Messrs. Keen and Co. an agreed statement, "subject to any question of revision of expenses to maintain the undertaking." This was a note which the Accountants on the other side wished put in, and which was quite proper. The table showed a steady progression in the net balance. In the five years ending 1908, the number of consumers had gone up from 152 to 266. He had also prepared a revenue account for 1909, which Messrs. Keen and Co. had declined to go into with him. The gas actually sold in the first three quarters was 3,527,800 cubic feet, compared with 3,075,600 feet in the corresponding period of 1908. This was an increase of 14½ per cent.; and for the remaining quarter he had estimated an increase of 10 per cent., or a consumption of 1,364,300 cubic feet. His figures brought out a total profit for 1909 of £521; and this table had been prepared as nearly as possible on the same lines as the agreed statement—that was to say, as regarded wages, treatment of stoves, and so forth.

Mr. WEDDERBURN, in cross-examination: I think the date of the notice to treat is somewhere in September, 1909; and you, with your experience, would agree that it is quite usual to take the years—one, two, or three years—preceding the notice to treat?

Witness: Yes; the other plan would be to take it as near as you can to the date of arbitration.

The usual thing is to take the last completed year?—That may be usual; but I do not think you would suggest that it would preclude going into the latest available information.

No; I say the usual thing. This claim may be unusual in many respects. What we have to consider is the value of the undertaking as it stands at the date of the notice to treat?—Quite so.

The table does not take into account, does it, anything additional for spent capital? Have you taken the trouble to ascertain whether during 1909 there has been any further capital expended, though unauthorized?—There was further capital expended, no doubt. I cannot tell you how much.

But that is all-important?—I do not think it is very important.

Assume for the moment that, in order to earn this additional profit, it is necessary to spend (say) £500, £600, or £700. It is all-important, is it not?—No; I think not. Supposing there had been additional expenditure, that does not affect what is to be drawn out.

As we know, it was actually at the end of its tether, and could not go on earning a profit without an expenditure of further capital; and it has overspent the authorized capital in order to be what you call progressive. Then, in order to see what chance there is of being able to make up back-dividends, you must see what the further expenditure has been, and what the return on that will be?—Certainly; but I do not think that affects the right of the undertaker to draw up to the maximum dividend authorized by the Order.

But it affects the possibility of her being able to do so to a very marked degree. Supposing, in order to go on earning what she had been earning, she has to spend a lot of capital. She has to get a return not only on the old capital but on the new; and supposing she has to raise it at (say) 7 per cent., it would handicap her powers in the undertaking?—I agree; but it might be worth while to expend capital and

seek no return on that capital, in order to earn the maximum dividend on authorized capital.

Further cross-examined: The overspent capital was now about £550. In his table, he had taken the rates actually payable. He had not considered the question of leakage. He could not agree that a small undertaking would necessarily not present so good a security as a large one.

Mr. Henry M'Laren, a son of Lady M'Laren, examined by Mr. RAYMOND ASQUITH, said he thought some £300 or £400 more than the authorized capital had been spent, in order to bring the works up to a satisfactory condition to meet the growing demands.

Cross-examined by Mr. WEDDERBURN: It was a fact that in some of the M'Laren leases the condition was made that a certain number of gas-burners were put into the houses. They had, however, only let very few houses. Certainly, the owner had this power; and it would be lost to the undertaking by the severance, which to this extent made it a lessened security.

Mr. Henry Woodall, of the firm of Messrs. Corbet Woodall and Son, examined by Mr. FITZGERALD, stated that he had been all over the district, and knew the works well. They were in very good order for small works. There was a certain margin at present; but with small capital expenditure, the output could be very materially increased. Within the last few years, the growth of the business had been rapid; and there was every indication of this state of affairs continuing. At the end of 1908 he made a structural valuation of the works; and the total of this came to £6752. The amount shown of capital expended was £6447. The latter figure worked out at £1405 per million cubic feet of gas sold. The unaccounted-for gas in 1908 was 10.95 per cent., which was certainly much higher than it should be. A small expenditure on renewing services would put this right. He would be dissatisfied if he could not reduce the figure to 5 per cent. At present the make per ton was only 9417 cubic feet; and he estimated that if an exhauster were put in, something approaching 11,000 cubic feet could be made. The cost would be £135. This was one of the things he recommended should be done if the new Provisional Order had been obtained and the further capital raised. He would also have reduced the cost of purification ultimately by adding two more purifiers. Then, also, they could have increased the pressure, which was a thing they would have liked to have done. He anticipated that when the actual figures were arrived at in January, it would be found that the increase had been larger than 10 per cent. for the last quarter of this year. In his valuation, he had capitalized the £521 profit arrived at for 1909 by applying the multiple of 28½ years' purchase. It was the lowest figure he had known to be taken in these cases, when dealing with a statutory company. This came to £14,848. To arrive at prospective profits, he had estimated on a 12 per cent. basis for 1910, though the increase had been at the rate of 14 per cent. He took as a basis £100 profit per million cubic feet of gas sold, which gave an additional profit of £62 for 1910. This he multiplied by 28½, and discounted it back one year, making in this way £1700 to add to his valuation. Then he dealt with the next year in the same way—that was, he added £70, multiplied by 28½, and discounted back two years, making £1845—because at the end of that year they would have earned all the dividend they were entitled to. The additional capital expenditure necessary to put the works and mains in a condition to earn the dividend he had estimated at £805. This reduced the total capital value to £17,588. He had ascertained the present value of the £4670 of back-dividends to be £2477. He had prepared a table showing what capital expenditure would be necessary each year, and the profits reckoned on an increase of 12 per cent.; and this indicated that by the year 1920 they would have received in back-dividends £3485, the present value of which was £2477.

Mr. CORBET WOODALL: What fixed the date of 1920?

Witness: The principle of it was to fairly estimate the capital expenditure which would be necessary.

Is any provision made for a reduction in the price of gas in the meantime?—No.

Examination continued: This made his valuation £20,065, to which he had added £2006 (10 per cent) for compulsory purchase—making the total value £22,071. As to the prices charged for gas, he had taken from the Board of Trade returns the particulars of undertakings within a radius of 20 miles; and he found that this concern charged less than any one of the others of the same size. More than one-half of the gas sold at Prestatyn (where differential prices prevailed) was at the rate of 4s. per 1000 cubic feet.

Mr. WEDDERBURN: Can you call my attention to any valuation in another case which follows the lines of yours?

Witness: I have never seen one like it before, because I have never seen an undertaking bought up at such an early period of its existence, before being able to earn profit.

But surely that does not affect the principle on which you are to value it. You do not suggest that there should be different sets of principles on which an undertaking should be valued according as it is bought up in the tenth, or twentieth, or thirtieth year of its existence?—Certainly, I do. There are back-dividends that might be earned.

Whatever figure is taken, ought you not, in the first instance, to deduct any profit on fittings, and then bring it in again, so that you do not multiply them by the factor 28½ years or less, but you multiply them by only five years?—The figure here is very small; and I think it is one that could be maintained. If it were a big figure, I should have done differently.

Cross-examination continued: He could quite conceive the security being very much better in a small undertaking than in the case of a large one. A large undertaking might very well depend upon an industry which might be decaying, or something of that sort. It was perfectly reasonable to put the value that he had put on this one. He did not think 28½ years' purchase was too much to ask; and less had never been asked.

Mr. STEVENSON: Of recent years, do you mean? Because my experience goes back farther than yours; and I have known 20 years asked for on statutory undertakings, and then 25 years.

Mr. FITZGERALD: That was a very long time ago.

Re-examined by Mr. FITZGERALD: So far as he was aware, no objection had ever been taken by the Local Authority to the depth at which the mains were being laid.

Mr. STEVENSON: On what ground do you claim 10 per cent. for compulsory purchase upon prospective profits and back-dividends?

Witness: I take it the Act says we are to have 10 per cent., it being a sale by compulsion; and I take 10 per cent. on the whole thing.

But do not you know that that is absolutely untenable?—No. I have discussed it with several people; and I do not think it is untenable. I think the 10 per cent. might just as fairly be said to come on prospective profits as on the main figure.

And back-dividends?—Yes. You have to value the concern, and say: "Now I want whatever is the right figure for compulsion."

Mr. CORBET WOODALL: Speaking about the question of repairs and maintenance, there has been a very large increase of recent years in the amount spent by the average gas company, has there not?

Witness: Very large. The cause has been very largely the prepayment supplies. Here there are but few prepayment consumers, and they do not supply them with any fittings or stoves.

But apart from the outside business, is there any increase in the amount of expenditure upon repairs and maintenance on the works?—I do not think there has been in works of this size.

I was not referring to that. I was thinking of the average expenditure on works nowadays. Is it larger or not than it was (say) fifteen years ago?—Certainly, because a bigger works uses a large amount of machinery; but in a works of this size there is no machinery.

With regard to stoves, is it a fact that they are nearly all on the hire-purchase system?—They are.

Do you know whether there was any arrangement under which the supplier of these stoves maintains them?—I do not know what arrangement there is.

Mr. FITZGERALD: I understood Mr. Wedderburn to ask for any case where a valuation had taken place in the year in which notice to treat was given. I happen to have here the proceedings in the Chard case, which are as nearly as possible identical with this—that is to say, the Act authorizing the transfer was passed in 1903, and the notice to treat was given, I am informed, in September, 1903; and Mr. E. H. Stevenson, who appeared for the Company, in putting forward their claim, took the profits of the year 1903, both those before and those after the notice to treat, as the basis of his valuation.

Mr. STEVENSON: Yes.

Mr. FITZGERALD: And in doing so, Mr. Stevenson was right.

Mr. STEVENSON: The reason for my doing that, perhaps you may know, was that the Company had built entirely new works; and that was the first year of working with the new works.

Mr. FITZGERALD: That may have been one reason.

Mr. STEVENSON: That was the only reason.

Mr. FITZGERALD: Obviously that cannot make any difference as to the principle—I mean as to the year of the notice to treat.

Mr. WEDDERBURN said that in the Pontefract case Mr. Lankester, who appeared for the Company, admitted that he could not go past the notice to treat. What Mr. Lankester there had to do was this: He said: "I agree you cannot take as the basic figure anything since the notice to treat; but I can use this question of the greater increase in order to show that the basic figure which I shall take is a maintainable figure." This, he submitted, was the true way to do it. That was to say, in the present case they could not change the £418 into £521; but they could point to the £521 to show that the £418 was maintainable.

Mr. FITZGERALD: I know that what I have put forward has been the ordinary practice—and that is that, where a period has elapsed which enables the figures to be given even after the notice to treat, those figures are put before the Arbitrator; and they are taken as the basis for the particular case. Indeed, it was done in the Chard case; and the distinction which Mr. Stevenson has mentioned there cannot affect the question of law or the basis of valuation.

Mr. Cash having been re-called to show how certain agreed figures with regard to stoves had been arrived at,

The evidence on behalf of Lady M'Laren was closed.

THE CASE FOR THE COUNCIL.

Evidence in support of the Council was then at once called.

Mr. Frederick Wilkinson, Surveyor and Engineer to the Prestatyn Urban District Council, examined by Mr. WEDDERBURN, said he had control of the public lighting; and at the end of last month, he had the roads opened in various places for the purpose of examining the size and condition of the gas-mains. The maximum depth at which he found mains was 2 ft. 3 in.; and the minimum, 6 inches. In regard to the latter case, possibly the top of the road might at some time have been taken off. He had been in office twelve months, and no complaints had been made to him of insufficient pressure.

Cross-examined by Mr. FITZGERALD, witness said he believed all the pressures shown in a table produced were in excess of those in the Provisional Order. He did not give notice to the other side when he opened the streets to look at the mains. He saw no reason why he should communicate with them, as he assumed they knew the depth of their mains.

Mr. CORBET WOODALL: Would it not have been better to give the undertakers notice, because this is more a question on the facts; and because they were giving one fact and a different version was being given by others, see how perplexing it is?

Witness: I assumed they already had this information.

But you were preparing evidence to bring down here; and would it not have been very much better if you had given them this satisfaction? I can never see why there is this disposition to act as if you were enemies, instead of purveyors of truth to the Court?—As a matter of fact, the Engineer has had several of these same holes opened.

Second Day's Proceedings.

Mr. Joseph Banks, a member of the Council, examined by Mr. KEEN, said he had complained of "bad gas" and of the street lighting. He had also suffered from the variable pressure of the gas.

Mr. CORBET WOODALL: On what ground do you say the gas is bad?

Witness: It smells abominably at times in the burning; and we have had great difficulty with the taps sticking.

Mr. W. Brock Keen, Accountant, examined by Mr. KEEN, said he joined with Messrs. Cash, Stone, and Co. in preparing the agreed

tables. According to these tables, the repairs were less in 1908 than in any of the other four years included. All the items, *plus* depreciation on cookers, for that year came out at 2'09d. per 1000 cubic feet. The highest was 1906—5'02d. Bad debts—0'19d.—were very small; but he did not question this figure, because the Manager (Mr. Linnell) was satisfied the amount would be sufficient to meet all debts that would in fact prove bad. There was included in the revenue account the sum received from consumers who had stoves on hire-purchase. He put this for 1908 at £8 4s. At the rate of repayment the balance, of principal still owing from the hirers would be paid off in a little over three years; and the revenue therefrom ought not to be capitalized at any more than the three years at which it would stop. If it were suggested that other hire-purchase transactions would take place, the reply would be that the undertaking had no further capital to invest in the purchase of stoves to sell again on the hire-purchase principle—the capital being already exhausted. Up to the end of 1907, the whole of the profit was earned by expenditure of capital within the statutory limits; but for 1908 to a small extent the profit was earned by capital expended in excess of the authorized amount. As regarded any question of profit available for the payment of back-dividends, dealt with in Mr. Woodall's valuation, still more must this be earned by capital expenditure in excess of the authorized limits. Mr. Woodall's profit of £521 to be capitalized referred to the year after notice to treat; and according to his (witness's) experience, it was unusual to make the basis of the purchase on this. The last completed year was the time.

Mr. FITZGERALD: In my experience, it is quite the usual practice to take the year in which the notice to treat is given.

Witness (further examined) said there was obviously an objection to take the accounts on an incomplete period, because the item of estimate entered so largely into it. He should start with the £418; but profit on fittings and rental on hire-purchase stoves ought not to be included in this figure and dealt with on the one principle. An adjustment ought to be made, too, in regard to the charge for repairs and maintenance, and for rates. He could not understand the insertion of Mr. Woodall's item of prospective profits.

Mr. KEEN: Mr. Woodall having taken the figure of £521 and capitalized it at 2½ years' purchase, and taken the prospective profits at £62 multiplied by 2½ years and discounted back one year, and £70 multiplied by 2½ years and discounted back two years, you think he is over-estimating the increase of profit for 1910 and 1911?

Witness: Yes. The first thing that attracts my attention is that even at the time £62 carries the matter beyond the maximum profit. Adding the £62 to the £521 makes £583. The maximum dividend and interest is £562 10s. Adding on the next figure of £70 makes a total of £653, or £91 in excess of the authorized amount.

What is the effect of taking the addition and capitalizing it?—You are capitalizing the future profits anticipated to result from the capital and energy of the purchaser; and I suggest this has nothing to do with the undertaking that is being sold. You must buy an undertaking as it is.

You are dealing with an undertaking in the hands of the vendor at the time of the notice to treat?—Yes. If not, why stop at these two years—why not go on indefinitely?

As regards the excess of £91 over the statutory dividends, what relation has it to the question of back-dividends which he deals with later on?—That is the profit which, if earned, will be applied to pay the back-dividends; and therefore if any claim for back-dividends were made, a larger claim for profit is capitalized out of which the back-dividend is going to be paid.

Then he is really claiming the back-dividend twice over?—Obviously, in the item of prospective profits and in the item of £2477 which he adds.

Mr. CORBET WOODALL: Does that apply to the prospective profits altogether?

Witness: I think it applies to the prospective profits as a whole.

Mr. KEEN: Is this question of back-dividends really only dealt with twice or three times?

Witness: I think it is dealt with three times. I take it that it enters into the number of years by which you capitalize the maintainable profits. It goes to the question of security.

In your opinion, can any item of back-dividends be properly claimed in any case other than where a company is earning its maximum dividend?—No; I think it is only a proper claim where the company is at the time of the purchase earning a profit which is in excess of its maximum dividend. Then it has these profits actually at the time of the purchase accruing, out of which, if it is left alone, the back-dividends would be paid. This, I think, is really the circumstance that justifies a claim for back-dividends. Otherwise, it is a claim for back-dividends payable out of the profits which the purchaser is going to make as the result of his capital and his energy.

In your opinion, can the undertaking as it exists to-day have any future value, if you apply the proper multiplier?—No; I think not.

And so far as your experience goes, is that the accepted principle of valuing an undertaking which is not earning and paying its maximum dividend?—Yes.

Mr. FITZGERALD (in cross-examination): You would not, of course, make any payment in respect of back-dividends till the maximum dividend has been more than earned. Supposing in the year or at the time the notice to treat was given the full dividend had been earned, and that it was a progressive undertaking in which for a number of years profits had increased every year, and were likely to continue in future, do you contend that the Arbitrators should not take into account the question whether, if the concern had remained in the hands of the existing undertakers, they would not have been able to earn back-dividends?

Witness: I think the Arbitrators can take into account the ability to earn back-dividends out of the excess of profit earned at the time of purchase beyond the maximum dividend; but only to that extent.

But supposing at the time of purchase the maximum dividends were earned, and there was no substantial excess; but owing to the nature of the company there had been an increase in income for the year, and this increase was likely to continue, so that the back-dividends were likely to be able to be paid, do you suggest that the Arbitrators would not be entitled to take that into account?—Certainly not.

Mr. FITZGERALD: Is it not a fact that in the North Warwickshire Water case (when you gave evidence) the claim for compensation was entirely in respect of prospective profits, when the Company were earning no profits?

Mr. WEDDERBURN: My recollection is that there was a special enactment in the North Warwickshire case enabling them to claim prospective profits up to ten years; and without that enactment, you could not claim it.

Mr. FITZGERALD: It was only based on the growth of the district and prospective profits?

Witness: For the ten years limited by the Act.

The proviso in the Act limited the amount of claim for prospective profits; it did not authorize it?—I do not think we should have been entitled to claim at all but for that clause.

Your case is that the Arbitrators are entitled to take into account existing profits, and not to be allowed to consider that the owner would make a bigger profit if he continued owner?—They are entitled to do that by the number of years' purchase. In no other way would they be entitled to do so.

Evidence has been given that the amount of the assessment is about 1d. per 1000 cubic feet. If you take all the cases given in "Field's Analysis" for provincial towns the average is 1'18d. per 1000 cubic feet?—That does not assist me in arriving at the rateable value.

What you have to say with regard to repairs and maintenance is that the undertaking is in good repair, is it not?—That the expenditure is sufficient to keep the undertaking in good repair.

And if the expenditure is sufficient to keep the undertaking in good repair, it does not matter in the least whether it is 4d., 5d., or 6d. per 1000 cubic feet?—Yes. In dealing with the profits of any particular year, you should not necessarily assume that the money spent during that year represents the charge on the undertaking in respect of the year. There is such a thing as a renewal fund which always comes into these calculations, and which has the effect of equalizing the expenditure over a series of years. Supposing the whole of the repairs during the five years included in the tables were done in 1907, and there had been no expenditure in 1908, it would not be fair to say that the profit of 1908 accurately represented the profits of the undertaking.

Re-examined by Mr. KEEN, witness said in the North Warwickshire case there was no profit to be capitalized by a multiplier, which showed that the case was altogether exceptional. It was an agreed bargain between the Corporation and the Company.

Mr. Sidney E. Stevenson, examined by Mr. WEDDERBURN, said he had visited the Prestatyn works, and had come to the conclusion that they were just about of sufficient capacity to maintain the supply of the quantity of gas at present required. There was one exception—the scrubber, which was far too small. He had made a valuation, starting with £418, the profit shown by the balance-sheet of the last completed year before the notice to treat. From this he deducted the profit on fittings, £5, in order that it might not be multiplied by the full number of years. As to repairs and maintenance, &c., it was agreed that the accounts showed 2'09d. per 1000 cubic feet; and to this he had added 0 3d. for labour. The work was practically all done by outside firms, and labour was included in it. Therefore he allowed no extra labour on maintenance of works. On maintenance of mains, &c., there would, however, be some labour. Taking year in and year out, he thought 6½d. would be a fair sum for repairs and maintenance. He therefore added £78 11s. As to rates, a re-assessment of the works should take place at once, in which case he thought the assessment would work out at 2d. per 1000 cubic feet of gas sold; so that he would have to practically double the present assessment, adding £19 2s. Thus he arrived at a maintainable profit of £315 7s. He took 20 years' purchase—making £6307. Adding £15 for three years' profits on fittings, the total was £6322. The undertaking could not grow without the expenditure of further capital. He agreed with Mr. Keen that, on the question of prospective profits, they could only take these into account when they came to consider by what number of years they should multiply the basis figure of £315. He had given effect to this in fixing upon 20 years. Profit on fittings he multiplied by three years, because it was open to every kind of competition. He made a deduction of £656, for the cost of lowering mains to 2 ft. 6 in., as he understood that three-fourths of them required to be so treated. This work would result in a saving of leakage, for which he had allowed a sum of £220. Deducting £140 in respect of hire-purchase of stoves, made his final valuation £5746, apart from any allowance for cost of re-investment.

Mr. FITZGERALD (in cross-examination): Do you observe that the result of your valuation is that these works, having been established seventeen years, and having now got into a paying and prosperous condition, are not worth the money expended on them?

Witness: That is my opinion. I think they are heavily over-capitalized.

As I understand, you did not look into the figures for 1909 at all?—No.

With your knowledge of gas-works, and knowing that this undertaking has been increasing, both in the sale of gas and in the profit, every year, do you mean to suggest here that in the present year (1909) the profits will not be larger than they were in 1908?—I am afraid I cannot go into 1909 at all.

You say that in a small undertaking the risk of breakdowns would be more serious in character than in a large one?—I might put it that the risk of breakdowns is always in existence in retort-settings. In my experience, I have never passed a winter without one or more retort-settings failing.

That is apparently one of your reasons for reducing the number of years' purchase to 20?—It is one of my reasons.

Then if you were told, as the fact is, that these works have been in existence seventeen years, and there has never been a breakdown of the character you describe, would not that influence your mind?—No. Breakdowns always come unexpectedly. I agree that this is all good, solid plant, except the scrubber, for the present make of gas.

Re-examined by Mr. WEDDERBURN: The capital expended per 1000 cubic feet of gas sold was about £140. This was a large figure.

This completed the evidence.

Mr. FITZGERALD then put in some revised figures in connection with Mr. Woodall's valuation. The calculation for prospective profits was reduced from £1700 and £1845 in the original valuation to a sum of

£1124—reckoning the prospective profits at £41 per annum. This involved the correction of the sum of £805 under capital expenditure to £625. The £17,588 thus became £15,347. The £2477 for back-dividends he proposed to leave as it was. Thus the £20,065 became £17,824; and the total valuation, adding the 10 per cent. for compulsory purchase, became £19,606.

Mr. WEDDERBURN said the question that had to be decided was one which in its nature they were all agreed upon—the value of the undertaking to be transferred. The difference of principle that arose was when they came to consider at what period they were to assess the undertaking. He submitted that the notice to treat had always been regarded as the contract. The moment the notice to treat was given, a date was fixed; and what had happened before that, and what had happened after that, were facts which assumed very different importance. What they had to look at was the value of the thing to be sold in the hands of the owner at the date at which it was contracted to be bought—namely, at the date of the notice to treat. The two views put forward were widely different as to its value. They were, of course, the views in the two valuations, which, after all, were now the only two documents of importance in the case, because everything one had to say could be hung on the one or the other of them. There was only one observation he had to make independently of these two documents. When Mr. Fitzgerald was opening, he asked him to read a particular section of the Provisional Order, which said that the undertaking could not be transferred without the assent of the Board of Trade. He desired the Court to take note of this, because, though it was not a very large point, it was still a point when one came to consider what the value of the undertaking was. It could not be bought and sold quite in the ordinary way. It could not be disposed of by the vendor to any person without the assent of the Board of Trade being obtained; and this must to some extent affect its market value. There was no doubt the two main figures at which the Court had to arrive were the annual profit (which was a question of fact); and then the factor by which this was to be multiplied (which was a question of maintainability. Mr. Woodall's valuation was in a totally unprecedented form; and it was a remarkable state of things. Mr. Woodall's table referred entirely to the figure of £521, with the result that he started with an amount which was largely based upon an estimate. He (the learned Counsel) contended that all material after the notice to treat was only applicable to show that the ascertained figure up to the date of the notice to treat was a maintainable figure. They could not go beyond the date of the contract, and take a prospective figure, to be multiplied then by the same number of years as they would do with the actual figure. On principle, therefore, he asked the Court to discard the £521, and adopt the £418. Then Mr. Woodall's figure for prospective profits was brought in upon a false principle. These profits were not the owners' to sell at the present moment. They could never be obtained without the purchasers' capital and labour; and they were altogether speculative. What they had to look at was the amount which could be realized under the existing conditions at the date of the contract—namely, at the date of the notice to treat. His argument was that prospective profits were outside their purview. In answer to this, Mr. Fitzgerald quoted the North Warwickshire case. That was a Water Company started in the neighbourhood of Coventry in 1898. They had as part of their district an area which the Coventry Corporation thought would soon be included in their own boundaries; and consequently the Corporation said they would oppose the granting of this area to the Company. Therefore a bargain was come to between the parties, that the Company, when the Corporation secured the area by extension and came to turn them out, should be entitled to only ten years of prospective profits. Therefore the North Warwickshire case was a peculiar one. Mr. Woodall admitted that with the existing authorized capital they could not exceed the £418 profit, subject to deductions; and so the Council said that this £418 was the proper figure. The same thing applied exactly to the back-dividends. If it was admitted that on the existing capital they could only earn £418, of course they never could pay any back-dividends at all. In the revised table, Mr. Fitzgerald seemed to think fit still to keep in a claim for 10 per cent. both on prospective profits and on back-dividends; but this was absurd. As regarded the 10 per cent. itself, the Court were not bound to give it at all. The only figure they had to give—and he admitted they would give something, it might be $1\frac{1}{2}$ or 2 per cent.—was for the cost of re-investment, and possibly for the loss of interest between getting the money and re-investing it. Think what it would mean if they were to burden a small town like Prestatyn with £20,000 as the price of an undertaking which was yielding only £418 unadjusted. Then when they came to adjustments, they would see that the figure was only £315, and that it was an undertaking which, in order to yield the £418, had had to overspend its capital. In addition, it was in a district which was not developing as rapidly as might be expected. Coming to Mr. Sidney Stevenson's valuation, there was no doubt that his £418 was a right figure, because it was agreed. He submitted that he was also right in deducting the £5 as a figure not to be multiplied by the number of years; so that the £413 was right. He was also right, because it was an agreed figure, in saying that 2'09d. per 1000 cubic feet was what the accounts showed as the amount put to repairs and maintenance and depreciation; and he had added, under circumstances he explained, 0'3d. for labour. Therefore it had to be admitted that, so far as one could gather, the amount shown in the accounts was much below the 6'3d. which experience indicated to be necessary averaged over a number of years. Thus something more had to be deducted from the £413; and, accepting the figure of 0'3d., £78 11s. correctly represented the deficiency. As to rating, it was absurd to suppose that the present assessment was going to remain; and they contended that the true figure would come to about 2d. per 1000 cubic feet. Deducting the result of these amendments, they arrived at £315, which he said was the figure that had to be multiplied by some number of years' purchase. As to the multiplier, 20 years represented a 5 per cent. basis; and he asked the Court to accept this as fair. With reference to the lowering of the mains, it could not be supposed that the Council were going to leave the mains which were (beyond dispute) improperly laid—such as those at depths of 6 inches, 9 inches, and 15 inches. It was calculated that about 75 per cent. of them would have to be relaid. But allowance in the cost of this

would, of course, have to be made for the reduction in leakage which would ensue. The hire-purchase stoves could not come in on the 20 years' basis; and a deduction would have to be made in this respect. The only other matter, he had already referred to—the amount to be allowed for re-investment. He asked the tribunal not for an instant to think of giving 10 per cent. He submitted nobody had ever heard of 10 per cent. being given in a gas case, where there was no question of inconvenience or sentiment, but merely of business. Of course, something extra ought to be given.

Mr. FITZGERALD, in reply, said he agreed that they had got to ascertain the value of the undertaking as at the date of the notice to treat; but it was the value of the concern then with all its potentialities and possibilities. Mr. Wedderburn's conclusion that they were not to consider what the earnings were in the year when the notice to treat was given, was, he ventured to say, opposed to the experience of every person who had practised in this class of case, and had only to be stated in order that the absurdity of the proposition might be seen. The basis of the compensation was the value to the person who was compelled to sell; and though they were to ascertain the value of the undertaking at the date of the notice to treat, they were gravely told that they were not to take into account the profit which was actually being earned at that date, and must refer back to a previous year. The strongest and the best evidence that could possibly be given now was the amount of profit which the undertaking was earning actually at the time. It was immaterial that Lady M'Laren received from the concern £418 in 1908, if they came to the conclusion that in 1910 she would have earned nothing. It was altogether the profits that were going to be earned which constituted the value of a commercial undertaking, and the profits that had been earned were looked at for the purpose of ascertaining what the future profits would be. He complained very much that, when the Bill was in Parliament, the case put before the Committee to induce them to allow Lady M'Laren to be compulsorily expropriated was that she would lose nothing by the transfer, and would get an allowance for prospective profits; and when the matter came to arbitration, there was a complete change of front, and they were told on behalf of the Council that they could not go into the question of prospective profits at all. It had been said that Mr. Woodall's method of valuation was unprecedented, and that no claim of this kind had ever before been made. In the Dundalk gas transfer in 1887, exactly the same thing was done for the promoters as had been done here. The notice to treat having been served in a particular year, and the arbitration being held in the spring just after the expiration of that year, they took as the basis of their calculation the profits earned in the year in which the notice to treat was served. Where the circumstances admitted of it, it was done as a matter of course. In the Chard case, exactly the same thing was done. Mr. E. H. Stevenson had stated that why it was done there was because the works had been remodelled, and that was the first complete year afterwards. This might be an excellent reason for taking that year, but it could not affect the principle at all as to whether or not it was right to do it. Then there was the North Warwickshire case, to which Mr. Wedderburn had referred. There was a restricting clause there which limited allowance for prospective value to ten years. This was not an enabling, but a restricting, clause; and if it had not been inserted, the Company could have claimed prospective profits for 20 or 30 years, if they could have proved them. That was a case in which, with the exception of some mains, no works at all were taken over. On what basis could it possibly be put that a claim for prospective profits was not to be entertained? The prospect a company had of earning further profits added enormously to the value. If the concern had been acquired when it was earning nothing, he supposed it would have been argued that they should give nothing for compensation.

Mr. KEEN: No; that is clearly not the point put on this side. The point was that when you got a profit which you capitalized by multiplying, you were entitled to take the prospective profits into consideration in the multiplier. In the case of no profits, as with the North Warwickshire Company, you took this into consideration.

Mr. FITZGERALD (continuing) said that, in view of what he had put forward, he asked that the basis of the award should be the year 1909, which was now practically completed. Therefore the sum of £521 being the basis of the calculation, the next question was the number of years' purchase. Mr. Woodall had stated that, in taking 28½ years, he had adopted the lowest figure he could find that had been asked in any recent arbitration where a gas undertaking had been compulsorily transferred. Mr. Stevenson, on the other hand, took 20 years, which he (Counsel) thought would be a very unreasonable figure indeed. It was endeavoured to make out that 20 years was a reasonable figure by diving into Stock Exchange lists and showing in the "JOURNAL OF GAS LIGHTING," or some other paper, quotations of prices in respect of particular companies' shares which varied from 20 to 25 years' purchase of the dividend. Quotations of this sort were not, of course, evidence at all; and they were often merely nominal. Besides, they could not purchase the whole of an undertaking in the stock market. A person like Lady M'Laren, who owned the whole of the undertaking, was in such a position that, if anyone wanted to buy from her, they must pay a much larger price than they would for a small lot of shares on the Stock Exchange. Taking Mr. Stevenson's valuation, he would refer first to the deduction of profit on fittings. This was a commercial undertaking; and part of its business was to sell these fittings; and the sum which they earned in this particular year was £5. In the next year, it was still larger. There did not seem any reason why they should not apply the same number of years' purchase to the portion of the income that was derived from the sale of fittings as was applied to the portion of the income which was derived from the sale of gas. He knew, however, that what Mr. Stevenson wished them to do had been done in certain cases; but there really was no reason for treating the profit from the sale of fittings on a different basis from any other part of the business, if they came to the conclusion (and there did not seem to be any justification for not coming to this conclusion in the present instance) that, so long as the undertaking went on in Lady M'Laren's hands, she would derive this income from selling the fittings. As to the £78 11s. which Mr. Stevenson took from the profit because he said 6'3d. per 1000 cubic feet ought to be allowed for repairs, it should be pointed out that here the staff consisted of a foreman and an assistant;

and there was also Mr. Linnell, the Estate Agent, who gave part of his time to the management of the works, and his son, who acted as Clerk and Secretary. It was inevitable in a works of this character that the repairs from time to time should be done to a large extent by the ordinary staff, and that there were no additional wages to be paid in respect of it. The facts showed that the works were in good order; and no rule of the kind laid down by Mr. Stevenson could apply to an undertaking of this sort. Then his deduction of £19 2s. on the ground that the works were not sufficiently rated was a most audacious proposition. There was a Rating Authority; and they had not raised the valuation. But if they did so hereafter, it would be a deduction from the increased profit to be made hereafter, which, according to the Council, was not to be taken into account at all. Then as to the deduction of £650 for lowering the mains, why should this be made? The mains were laid seventeen years ago at a depth quite sufficient for the ordinary traffic. If now there was a steam-roller, the person using it became liable. No evidence had been given that any fractures had taken place.

Mr. KEEN: Our case is that they are not laid at the right depth; and my friend controverts that by saying there has never been a fracture. We put our case on general principles, and say that 6 inches is not a proper depth at which to lay mains.

Mr. FITZGERALD: There is no such general principle. The general principle is as I have said; and it was decided in the well-known case some years ago of the *Gaslight and Coke Company v. Vestry of St. Mary Abbots*.

Mr. KEEN: We have evidence that 6 inches is not the proper depth. Mr. FITZGERALD: There is no such thing as the right depth. If you want to say it is not right, you have to show that damage occurred; and you have not done so.

Mr. KEEN pointed out that the Surveyor had stated that at certain spots the ground was permeated with gas.

Mr. FITZGERALD (continuing) said, in his long experience of such cases, this was the first time that he had heard such a suggestion as that a gas undertaking on being taken over should have all its mains relaid at a lower depth, and that a deduction from the price should be made on that account. Of one thing they might be perfectly certain—and that was that the Council, when they got this undertaking, would never spend £650 for the purpose of relaying the mains. Just imagine them spending £650 for the purpose of making a saving of £11 a year—which, according to Mr. Stevenson, was the total saving that would be made. The fact was that the leakage was too high, and ought to be reduced to 5 or 6 per cent. As Mr. Woodall had told them, however, this leakage arose from the services, and not from the mains; and it could be remedied at quite a moderate expenditure, with the result that the returns would be increased. With regard to the deduction off rental of hire-purchase stoves, the same remarks applied as to the sale of fittings. As to Mr. Woodall's valuation, was there any reasonable doubt that in the year 1910 the profit earned would be at the very least £41 more than that for 1909? If so, this profit, as prospective profit, had to be treated in exactly the same way as the income earned this year—that was to say, capitalized on the same basis, but discounted back one year, making a figure of £124. Then for the purpose of carrying on the undertaking through next year it would be necessary to spend £625, which Mr. Woodall had deducted. The only other points were as to the back-dividends and the 10 per cent. for compulsory purchase. It had been said that the back-dividends could not be taken into account; but he did not know why. In the London Water Arbitration cases, where back-dividends existed, they were all of them claimed.

Mr. KEEN: Were not maximum dividends being earned there?

Mr. FITZGERALD: In some cases they were, and in some they were not. The contest there turned, as it does properly turn, on whether the history of the Company showed in the past that these dividends would be earned in the future. If you come to the conclusion that the income from this undertaking would not increase, and accordingly that no maximum dividend stage would ever be reached, then, of course, my claim for back-dividends goes. But if you come, as I think you ought, to the conclusion that in a progressive undertaking of this kind the back-dividends would, within the number of years mentioned by Mr. Woodall in his table—that is, up to the year 1920—have been paid to the extent of £3000 odd, and that the present value of those is £2477, this amount ought to be allowed. Continuing, he remarked that it was also said they could not take back-dividends into account because further expenditure of capital was required, and Lady McLaren had no power to spend it; but this, again, was a misconception of the position. It was an invariable practice of Parliament from time to time to give sufficient capital powers to enable an undertaking to supply gas to its district. In conclusion, he argued that the ordinary 10 per cent. for compulsory purchase should be allowed, and that it should be allowed on the full purchase money of the undertaking.

This brought the proceedings to a close.

New South Wales Coal Strike and the Sydney Gas Supply.—According to a telegram which reached England through Reuter's Agency last Thursday, owing to the North Shore (Sydney) Gas Company being unable to purchase coal, it was feared that the supply of gas would cease at the end of the week. The Railway Companies, however, managed to provide them with coal, and the failure was happily averted.

The New Issue of Brentford Gas Stock.—Tenders were opened last Wednesday for the £30,000 of new stock (1881) of the Brentford Gas Company which were recently invited in our advertisement columns. The applications received amounted to £66,805; the prices offered ranging from the minimum (£180 per £100) to £195 5s. Tenders at £184 (the lowest accepted) will receive about 41 per cent. of the amount applied for.

Bilston Gas Company.—At the annual general meeting of this Company on the 3rd prox., the Directors will report that, after paying the usual interim dividends, there is a credit balance of £8766 on the profit and loss account for the year ended the 30th of September. It is proposed to pay further dividends of 5s. 6d. per share on the "A" shares and 4s. per share on the "B" shares (making with the interim dividends 11s. and 8s. per share respectively for the year), and leaving a balance of £6081 to be carried forward.

THE KIRKCALDY GAS TRANSFER.

Important Statement by the Town Clerk.

On Friday evening, a meeting of the Gas Committee of the Kirkcaldy Town Council was held in the Magistrates' Room, in connection with the petition by objectors to the purchase of the gas undertaking, asking that a plebiscite be taken as to whether or not the purchase should be made.

Mr. W. L. MACINDOE (Town Clerk) made the following statement in connection with the question.

When the burgh of Dunfermline was adopting the Gas Act, they took the opinion of Mr. J. B. Balfour, afterwards the Lord President of the Court of Session, as to the manner in which a poll should be taken. The Gas Act says that the poll is to be taken in the manner prescribed by the Police Act of 1862. The Police Act of 1862 was repealed by the Police Act of 1892; and a question therefore arises as to how the poll is to be taken. The opinion given by Mr. Balfour was clear and distinct. He advised that there was no doubt that the poll must be taken under the old rules of the Police Act of 1862—that is, by open voting, the voters being male occupiers of land of the value of £4 and upwards. Mr. Balfour laid down that the general rule is that, where the provisions of one Statute are incorporated by reference in another, and the earlier Statute is afterwards repealed, the provisions so incorporated continue in force in so far as they form part of the later enactment.

I got this opinion from the Town Clerk of Dunfermline in 1897, when the deputation from Kirkcaldy visited that town; and I have kept the opinion beside me ever since, with the view of using it when the time came. I have examined the opinion several times, in the hope of finding some way of escape from the result it lays down. It was not, however, till I returned from London the other day that, on examining the opinion once more with the view of taking the final steps for a poll, it occurred to me where to look for a way of escape from its result. I now find that the statement laid before Mr. Balfour is radically defective. The statement told Mr. Balfour that the Burgh Police Act of 1892 contains no provision for a poll of householders being taken. It omitted to tell him that the Burgh Police (Scotland) Act, 1893, which falls to be read along with the Act of 1892, does contain a provision for a poll of householders. The statement also told Mr. Balfour that the Police Act of 1862 was repealed by the Police Act of 1892 except to such extent as it was incorporated by reference in local Police Acts. This statement is a quotation from section 6 of the 1892 Act. Mr. Balfour was not referred to section 5 of the same Act, which provides that the Act shall supersede, and come in place of, the general or local Police Acts; and, most important of all, Mr. Balfour was not referred to the provisions of an Act called the Interpretation Act, 1889—being an Act for consolidating enactments relating to the construction of Acts of Parliament for further shortening the language used in Acts of Parliament. This Act, among other things, contains new general rules of construction; and the 38th section runs as follows:—

Where this Act or any Act passed after the commencement of this Act repeals and re-enacts with or without any modification any provisions of a former Act, references in any other Act to the provisions so repealed shall, unless the contrary intention appears, be construed as references to the provisions so re-enacted.

This new rule of construction to a large extent sets aside the main doctrine upon which Mr. Balfour's opinion was founded. The reference given by Mr. Balfour for his opinion is the classic work by Maxwell on "Interpretation of Statutes;" but that book is dated 1875, whereas the Interpretation Act was in 1889. It may seem a little strange that an eminent lawyer like Mr. Balfour should not have known of the Interpretation Act. It only shows how fallible lawyers are. I may say that many other people besides myself seemed to have believed that Mr. Balfour's opinion was correct, because for some years the Convention of Burghs has been endeavouring to get a new Bill passed to rectify the supposed defects of the Burgh Gas Act in regard to the matter of a poll. I have ascertained that opinion has also been given by the present Lord Advocate to the effect that, notwithstanding the repeal of the 1852 Act, the manner of poll prescribed in that Act has still to be followed. This, of course, is the same opinion as that given by Mr. Balfour; and it appears to be equally erroneous. The Scottish Office seem to have accepted as correct the opinions of the late Mr. Balfour and the present Lord Advocate, and they actually proposed and promised to introduce into Parliament next session a Bill to remedy this supposed defect.

With the new light that has now come to me, I have no hesitation in advising the Committee that the poll falls to be taken in the manner prescribed in the Police Act of 1893—that is to say, by ballot. The voters under this Act are substantially the same as the voters for the municipal election; the only difference being that non-resident proprietors and lodgers do not have a vote. I have just ascertained that the Burghs of Carnoustie and Monifieth took polls as I recommend under the 1893 Act, and that no questions were raised. I have prepared and submit herewith a proof of a bill ordering a poll; and it is for the Committee to say on what day they wish the poll taken.

I take this opportunity of mentioning another matter in which to a certain extent I appear to have been wrong in an opinion I previously expressed. In a statement which I made to the Town Council in 1897, and which was recently reprinted, I said that I thought the purchase price of the Dunfermline undertaking had been about 28 years' purchase of the maintainable profit. This opinion was founded on calculations which, after considering the evidence in the Dunfermline case, I thought was a probable guess as to how the result was arrived at. The result I brought out was a purchase price of £91,000. I thought at the time, and, indeed, till quite recently, that this figure was a fairly accurate guess. On more careful examination, I find that there is an error in the figure. My guesses, if correct, should have brought out a result of £80,000. There was a mortgage of about £11,000 on the Dunfermline gas undertaking; and I thought that my old guess was correct, and that the £11,000 had got to be deducted from the £91,000, making the £80,000. On more careful examination, I have now found that the interest on the £11,000 mortgage was deducted from the

maintainable profit, and that my calculations, if they had been correct, should have brought out the figure of £80,000, and not £91,000. The figures are simply guesses as to how the Arbitrators arrived at their result. The guesses seem to be fairly probable; but no one can pretend to say exactly how the result was reached.

In the belief that my old calculation was correct, I mentioned in my report the figures of 28 years' purchase. This figure, you will easily see from my calculations, arises from taking 26 years' purchase, and adding thereto 10 per cent.* For simplicity, I merely added the two together and made 28. In my corrected calculation, it will be seen that the figure is simply 26 years' purchase; and that there is no allowance of 10 per cent. for supposed compulsory purchase, nor any allowance for expenses for winding up.

My opinion as a lawyer is that a gas company in Scotland whose works are acquired under the Burgh Gas Supply Act are not entitled to any 10 per cent. allowance for compulsory purchase. There is a popular misunderstanding about this 10 per cent. allowance. It is commonly supposed that the Lands Clauses Act prescribes that a landowner is to get 10 per cent. for compulsory purchase. There is no such provision whatever in the Lands Clauses Act. It has been the practice, however, of Arbitrators under the Act to allow 10 per cent. for compulsory purchase in the case of houses and building land. In the case of arable land, the practice has been to allow about 45 years' purchase, as against 30 years' purchase for an ordinary sale. There is nothing whatever in the Act as to either the 45 years' purchase or 10 per cent. additional. Both these figures have arisen simply from the practice of Arbitrators. There is another popular misunderstanding. The Lands Clauses Act does not contain powers of compulsory purchase. It simply contains a code as to how compulsory powers contained in another Act—namely, the particular Private Act for the undertaking—are to be applied. The compulsion, in fact, exists in the Private Act, whereby somebody is authorized to take his neighbour's land, and not in the Lands Clauses Act itself. A Private Act containing compulsion runs as follows: "The undertakers may enter upon, take, and use the lands delineated on the deposited plans."

There is no option conferred upon the owners of the lands to decline to sell. They are compelled to sell. Compare this language—that "the undertakers may enter upon, take, and use"—with the language contained in the Burgh Gas Supply Act. This Act provides that the Corporation shall give notice to the Company that they are willing to buy or treat for the purchase of the undertaking; and that if the Company shall consent to sell the same, the Corporation shall purchase the undertaking on terms mutually agreed upon, or to be fixed by arbitration in the manner provided by the Lands Clauses Act. There is not one word in this language to suggest compulsion. It expressly says that the sale is only to take place if the Company shall consent. It is true that the Lands Clauses Act is referred to; but this is only for the purpose of specifying the manner in which an arbitration is to be conducted, and, as I have explained, there is nothing in the Lands Clauses Act about compulsion.

The argument by which it was attempted in the Dunfermline case to claim the 10 per cent., was that the threat of competition by the Corporation must be regarded as the equivalent of compulsion. I think this argument is totally unsound, and that there is no justification for an Arbitrator allowing 10 per cent. for compulsion in an arbitration under the Burgh Gas Supply Act. As I have explained, the 10 per cent. for compulsion has arisen in certain cases in the purchase of land, because it has been the practice of Arbitrators generally in regard to land. No such practice can be alleged in regard to arbitrations under the Burgh Gas Supply Act. Altogether, there have only been two or three cases under this Act; and even if 10 per cent. had been allowed in these cases, it could not possibly constitute a practice.

In England, there is no General Act authorizing the purchase of gas-works; and therefore no general practice in England can be founded on to explain the General Act in Scotland. I am clear, therefore, that, if I was an Arbitrator, I would allow no 10 per cent. for compulsion in the case of purchase under the Burgh Gas Supply Act. For similar reasons, I would make no allowance for the expenses of winding-up the Company. The Company voluntarily chooses to sell its undertaking; and there is no reason why it should not pay out of the price its winding-up expenses.

I am pretty well satisfied, therefore, that the Arbitrators in Dunfermline did not allow 10 per cent. for compulsory purchase, and that the number of years' purchase of the maintainable profit which they did allow was about 26. My report twelve years ago was therefore mistaken, in that I said that the probable price was 28 years' purchase; while I should have said that the probable price was 26 years.

It does not at all follow that, because I said twelve years ago the probable price was 28 years' purchase, or, as I now think I should have said, 26 years' purchase, that this is what I think is the probable or proper price to-day. Twelve years ago all securities were at their very highest. Consols were 113; and 4 per cent. railway debenture stocks were about 160. To-day the corresponding prices are: Consols, 83; railway debenture stocks, about 110. In my opinion, a similar fall in value has taken place in almost all other securities yielding fixed or comparatively fixed rates of interest. My view to-day, therefore, is that 22½ years' purchase of the maintainable profit of a gas company, and not 28, nor even 26, is a probable price.

In former times—that is, prior to 1896—the purchase price of gas undertakings, like the prices of other securities, had been constantly rising. The year 1896 was the highest summit for the prices of all securities; and since that year the prices of almost all have been steadily declining. I see no reason why the price of gas undertakings should not follow those of other securities in falling, in the same manner that they followed them in rising.

As I explained in my original report, there are other elements for consideration besides the number of years' purchase of the maintainable profit. I do not enter into these details just now. I merely desire to correct the error in the main calculation which I made twelve years ago, and at the same time to explain what are my views as to the corresponding figure nowadays.

In my letter to Treasurer Kilgour, dated July 26, 1907, I stated that I was confident that one way or the other the gas undertaking, if purchased, could be financed by the town without any call upon the rates.

I am prepared to go further, and to say that it is my opinion that, if the town purchases the gas undertaking, the result will be that, so far from having to make any call upon the rates, or to raise the price of gas, they will be able to lower the price of gas, rather than have to raise it.

It was arranged that the voting for or against the purchase should take place on Wednesday, Jan. 12.

TICEHURST WATER AND GAS COMPANY'S AFFAIRS.

The Old Directors Censured—New Directors Appointed.

An Adjourned Meeting of the shareholders of the Ticehurst and District Water and Gas Company was held last Tuesday, at the Institute of Chartered Accountants, Moorgate Place, E.C., for the purpose of receiving the report on the Company's financial position ordered at the previous meeting (see *ante*, p. 554).

Mr. W. B. MARTIN (the Chairman of the Company) presided, and without any preliminary remarks called upon Mr. C. Ryland Beeby, the Receiver for the Debenture Holders, to submit his report.

The report opened with the statement that the arrangement for the acquisition of the undertaking was carried out with Mr. E. O. Preston, and that the Company appeared to have been brought into its present financial condition from the following chief causes: (1) Lack of working capital from the commencement and of capital to meet the demands of necessary extensions and repairs. (2) Entering into unremunerative arrangements for supplying water. (3) Heavy expense incurred in the issuing of a portion of the capital. (4) Lack of proper business and financial management. In connection with the second cause, Mr. Beeby mentioned, in particular, one arrangement entered into on Dec. 21, 1904, whereby the rights which the Ticehurst Company held to supply water to certain districts were parted with to the Gas and Water Works Supplies and Construction Company, Limited; the chief right only being retained to terminate the arrangement on condition that the Ticehurst Company bought up the land and works constructed for such supply. This arrangement always had been, and was now being, carried on at an unremunerative price. On Dec. 21, 1904, the Directors of the Company were Messrs. W. R. White, H. L. Currie, W. B. Martin, and Edmund Eaton (Managing-Director). The Directors of the Construction Company, on the same date, and their respective holdings, according to the filed return, were Messrs. W. R. White, W. B. Martin, Charles Wheeler, and Edmund Eaton, each holding 50 preference shares, and Messrs. Edmund Eaton and W. R. White also held jointly 1314 ordinary and 4000 preference shares.

Coming to the accounts, Mr. Beeby reported that he had examined into these up to Dec. 31, 1908, as published by the Directors; but, owing to the incomplete state of the books and the absence of sufficient material evidence, such examination was rendered very difficult, and he had confined his attention chiefly to the capital account. Under this head he wished particularly to call attention to an asset of £8265, which in the books purported to represent calls and shares unpaid. The first separate item in this amount was £3000, represented as unpaid calls for shares due by Edmund Eaton on 600 shares allotted to him on June 25, 1906. Yet the Directors' minutes of that date described these shares as fully paid; and a certificate for 600 fully-paid ordinary shares had actually been issued. It appeared that these shares were held by Mr. Eaton as Trustee for the Company; and they still stood in his name on the register—no transfer passing them back again having been registered. The reason alleged for this transaction was that the Company owed Mr. Eaton money, for which debt it was agreed to take debentures in part satisfaction. But before further debentures could be issued, it was discovered that, under the Act, further share capital would have to be raised; hence the issuing of these 600 shares. It was agreed that these shares should only be held by Mr. Eaton until transferees could be found, as per the minute of June 25, 1906. The second separate item was £4200, and was accounted for as the difference in the amount at which 1400 ordinary £5 shares were issued, and their nominal value. These 1400 ordinary shares were allotted to the Construction Company for a tender for certain works to be done for £2800, accepted by the Directors, and recorded in the minutes of meetings held respectively on Jan. 18, 1905, and Feb. 6, 1905. A certificate for 1400 fully-paid ordinary shares was issued. The other separate items were put down as £450—an amount received during the present year, and paid to Mr. E. O. Preston and debited to his loan account. £200, representing 40 shares allotted to Mr. F. Miller, as per minute of Feb. 24, 1903. (The books recorded no consideration for this allotment. The shares were transferred to Mr. E. Eaton as per minute of May 8, 1903.) £500, representing 100 fully-paid shares allotted to Mr. E. Eaton in consideration for land at the reservoir, as per minute of May 24, 1905; but the land account in the books had not been debited with this £500. The actual total of these five separate items was £8350, showing an untraced discrepancy of £85.

With respect to debentures, the report set forth that the Company had power to issue them on the basis of share capital subscribed. Deducting the £3000 representing the 600 shares in the name of Mr. Eaton, the subscribed share capital amounted £46920, on which debentures amounting to £15,640 had been issued; but of this sum only £14,000 had been legalized by the granting of a certificate of a Justice of the Peace—a necessary proceeding under the Act. In addition, debenture issues had been made in disregard of the limitation of share capital; and a reference to the balance-sheet of Dec. 31, 1908, in the published accounts revealed an issue of £1500 of provisional debentures to certain creditors of the Company. To be added to these were the following: £700, further debenture certificates issued as collateral security to creditors, which creditors had transferred the debenture certificates to other holders; £1200, further debenture certificates issued for which there was no record of any consideration; and £1100, further debenture certificates issued to creditors—no records being found to show that these had parted with their certificates.

In the items of expenditure was a charge of £3500 for laying a 3-inch gas-main from the Ticehurst works to the boundary, Hurst Green. Here Mr. Beeby added the following note: "I have been informed by

local residents and two of the present Directors of the Company that they are of the opinion that the work for this charge has not been carried out. As regards the other items specially enumerated, my inquiries have not been able to ascertain whether the work for which the charges are made has been completed, or whether any part is chargeable to the promoter."

The creditors of the Company, as shown by the ledger, are Messrs. E. O. Preston and Co. (moneys advanced), £2242 2s. 9d.; Water-Works, Lighting, and Power Investment Corporation, £800; W. L. Christie, £977 14s.; Hardwicke Colliery Company, £834 8s. 7d.; Gas and Water Works Supplies and Construction Company, Limited, £1566 9s. 3d.; and other creditors, £2596 2s. 10d.—making a total of £9016 17s. 5d.

Mr. Beeby concluded his report as follows: "As to the present, the works are still being carried on, and the Managing-Director, Mr. A. W. Lunt, is sparing no pains to bring the Company, which supplies a valuable area, to a better footing. There are certain repairs needed, some of which have already been put into execution as being necessary to a continuance of the business. In this report I have dealt with all matters upon which I have been able to obtain particulars from the books and documents of the Company that have come into my possession. But these are manifestly incomplete; and there are many other things calling for explanation, particulars of which would have to be obtained from other sources."

The reading of the report was followed by silence; the obvious expectation being that the Chairman would speak. As nothing was heard,

Mr. HOOPER asked the Chairman to state whether, since the inception of the Company, properly audited and certified accounts had ever been presented and passed, or any statement made of the Company's financial affairs that was not accompanied by some covering statement pointing out gross irregularities.

The Chairman being unable to satisfy his questioner on this point, Mr. HOOPER proposed the following resolution: "That, owing to the absence of properly audited accounts, the absence of books, the submission of vague reports, and general mismanagement, the conduct of the Directors of the Company is to be severely condemned; and this meeting of the shareholders, in dispensing forthwith with the services of the Directors, passes a vote of censure."

The CHAIRMAN protested that the resolution was couched in unwarrantably strong language; and, in defence of himself and his colleagues, he pointed out that they had not held office continuously. He admitted, however, that they had been on the Board of Directors for the past two-and-a-half years.

Mr. HOOPER said he would go no further than the Chairman's own admission. For two-and-a-half years continuously he had been Chairman of the Company, and yet during all that time he had never taken any steps to recover a large sum of money—£8265—which, according to the books, was due on unpaid calls. More than this, he had never even ascertained if this money was actually due. If this did not constitute gross neglect and mismanagement, he (the speaker) could not imagine what did.

The CHAIRMAN still objected to the terms of the resolution.

Mr. GLOVER, in seconding the motion, said that, in his opinion, the terms employed by Mr. Hooper were not strong enough. It was an instance of scandalous mismanagement. It was not proposed to let the inquiry end there. Before they finished, they hoped to be able to bring the matter home to the guilty parties; and when this was accomplished, they would know how to deal with them. [This remark was received with loud expressions of approval.]

The motion was then put and carried unanimously.

Mr. HOOPER said it seemed only right and proper, before dispersing, that new Directors should be appointed; and he proposed the names of Messrs. C. S. Glover, W. H. Collier, and A. W. Lunt.

The motion was seconded by Mr. GIBBS, and carried unanimously.

The subsequent discussion was of a desultory character; Mr. White, and afterwards Mr. Martin, explaining their motives while in office, and asseverating that they acted throughout solely for the benefit of the Company. Both gentlemen alluded to their voluntary relinquishment of all Directors' fees during their last term in office.

Mr. GIBBS, however, referred to fees drawn by these gentlemen during previous tenures of office.

Mr. MARTIN said his total fees and allowed expenses during his entire connection with the Ticehurst Company did not exceed £36.

Mr. GLOVER pressed Mr. White to give the amount of his fees.

Mr. WHITE said he was unable to do so. He denied, however, that they approximated £500, or anything like it.

The proceedings then closed.

Inspection of Consumers' Gas-Fittings at Portsmouth.—The officials of the Portsea Island Gas Company are issuing invitations to the consumers to allow a gratuitous inspection of the whole of their internal fittings, with a view of securing the best illuminating results. All incandescent mantles are, of course, to be paid for. Business shops and public buildings will be inspected every fortnight, and private residences once a month.

Willful Waste of Water.—A man named Hero Scott was last Wednesday fined £1 and costs, with the alternative of 14 days' hard labour, for wilfully wasting water belonging to the Devonport Corporation. William T. Lee, a water inspector, and other employees of the Water Department, as well as several policemen, gave evidence that on various dates water had been found running to waste on defendant's premises. He had been spoken to about it, but had treated the warnings with contempt. Thousands of gallons of water could run through the tap in the course of a day. Mr. F. W. Lillicrap, the Corporation Water Engineer, said that in consequence of the reports of the waste of water he had written to the defendant, but without effect. Defendant now said that his eldest son, who was deranged, had a mania for turning the tap and letting the water run away; and another son said his brother did it to annoy the neighbours. The Magistrates said it was the defendant's duty to take steps to control his son; and if he did not prevent the waste of water, he would be dealt with more severely.

THE AMALGAMATION OF BUENOS AYRES GAS COMPANIES.

The Terms of the Agreements.

In the "JOURNAL" last week (p. 771), it was mentioned that meetings of the three Companies concerned in the above-mentioned amalgamation—the Primitiva Gas and Electric Lighting Company and the Buenos Ayres (New) and River Plate Gas Companies—had been convened for to-day to confirm the agreements provisionally entered into. The following are the terms on which the proposed fusion will take place: The Primitiva Company will acquire the whole of the assets and undertaking of the River Plate Gas Company, subject to the outstanding liabilities, which include £352,000 of 4 per cent. debenture stock; the consideration being an allotment, credited as fully paid, of 200,000 5 per cent. cumulative preference shares and 100,000 ordinary shares, all of £5 each, ranking *pari passu* with the existing preference and ordinary shares of the purchasing Company as from the 31st inst. They will acquire the whole of the assets and undertaking of the Buenos Ayres (New) Gas Company, except £150,000 of shares in the South Barracas (Buenos Ayres) Gas and Coke Company, Limited, subject to the outstanding liabilities, which include £250,000 of 4 per cent. debenture stock, and certain payments for compensation to Directors for loss of office; the consideration being an allotment, credited as fully paid, of 100,000 5 per cent. cumulative preference shares and 50,000 ordinary shares of the purchasing Company, all of £5 each, ranking *pari passu* with the existing preference and ordinary shares as from the 31st inst. Each of the selling Companies will be entitled to retain out of its assets sufficient to pay a dividend on the share capital for the current year at the same rate as was paid for 1908. These arrangements will permit of a distribution of two preference shares and one ordinary share, all of £5, in the Primitiva Company in exchange for one £10 share in the River Plate Company; and of £5 in cumulative preference shares and £2 10s. in ordinary shares in the first-named Company in exchange for every £7 of the shares of the Buenos Ayres (New) Company, the shareholders in which will receive in addition their *pro rata* amount of the £150,000 of fully-paid shares in the South Barracas Company.

BRITISH COALITE COMPANY, LIMITED.

The following is the report of the Directors of the Company for the year ended Sept. 30, which (with the accounts) will be presented at the ordinary general meeting of shareholders to-day.

Since the close of the financial year, a further sum of £62,500 has been received from Coalite, Limited, in further reduction of the liability on unpaid calls, and which could not be brought into the accounts now presented. The balance will be liquidated early in the ensuing year.

As the past twelve months have been almost entirely occupied in continuing the development and constructional work mentioned in previous reports, the volume of business done has not been sufficient to permit of a profit being realized on trading account.

Very extensive plant is being erected at Barking, Wednesfield, Plymouth, and Hythe. The delay in completion has been unavoidable, as the economical expenditure of a large capital is necessarily a question of time, and cannot be hurried. The Directors have the fullest confidence in the immediate financial success of the undertaking.

The year in question has been occupied chiefly with the erection of the above coalite-producing plants, but it has also developed new features of great importance to the Company, commercially and scientifically; and the improvements in manufacture mentioned in our report of last year have shown highly economical results, which will add to the profits of the enterprise.

New batteries have been completed at Barking, and others are in course of erection. Plans are already prepared of further extensions for handling greatly increased quantities of coal and coalite. A large distilling plant at Barking is nearly completed, and will be capable of dealing with the whole of the tar produced there and at Plymouth, Hythe, and other works.

The Wednefield works continue to run steadily, and give a satisfactory output. The foundry turns out excellent work, and has enabled the Directors to effect great economies in constructional costs.

The plants at the works of the Plymouth and Stonehouse Gas Company and the Hythe and Sandgate Gas Company are giving steady returns; the gas being rich in illuminating power, the quality of which exceeds the contract requirements.

Further contracts are being negotiated with other gas companies which it is hoped will be brought to a conclusion at an early date.

The Directors are pleased to report that the only First Diploma of Merit was awarded to "Coalite" at the Sheffield Smoke Abatement Exhibition in March of the present year; and at the White City Exhibition, 1909, the Gold Medal was gained in the Smoke Abatement Section.

The demand for the fuel coalite increases daily; and the original scheme outlined in the prospectus for supplying London is being steadily pushed forward.

The accounts accompanying the report show that the sales of coalite and bye-products brought in £11,376; the value of these materials used in manufacture and in the foundry is put down at £1044; and the stock of them at £1830. A sum of £6452 represents interest received on calls in arrear, and £5946 the amount accrued to the date of the accounts—making together £12,398. A sum of £21,895 is carried to the balance-sheet; and a few small items make up a total of £51,118. On the expenditure side of the account, the amounts spent at the Barking, Wednesfield, and Plymouth works are set out as follows: Coal, coalite, and bye-products, £16,327; wages and salaries, £13,196; rents, rates, and taxes, repairs to plant, machinery, and buildings, &c., £4855; carriage, sacks, and packing-cases, £2010—total, £36,388. The head office expenses for the year, including Directors' fees, salaries, legal and other charges, &c., were £11,410; fees paid to the Consulting Engineer and Chemist amounted to £818; other items make up a total of £51,118.

POSITION OF TAUNTON ELECTRICITY UNDERTAKING.

The "Strong Indictment" by the "Journal."

In the "JOURNAL" for the 23rd ult., some comments were made in "Electricity Supply Memoranda" on the position of the electric light undertaking of the Taunton Corporation, as revealed in a report prepared by Mr. Albert C. Mole for the Taunton Chamber of Commerce. The comments were reproduced in the local papers; and the attention of the Town Council was called to them at the meeting last Tuesday, by Mr. E. T. Alms, a newly-elected member, who is a local Solicitor and Clerk to the Magistrates of the County Petty Sessional Division. On the Chairman of the Electricity Committee (Dr. Macdonald) moving the adoption of their monthly report, Mr. Alms remarked that the article referred to contained a "strong indictment" with regard to the financial position of the electricity works. At this point, the Mayor (Mr. W. H. Westlake) interposed, and said that as this matter was not mentioned in the report of the Committee, it ought not now to be introduced. Mr. Alms thereupon asked whether he must confine himself entirely to the Committee's report; and the Mayor replied that he could express an opinion on anything mentioned in it, or ask a question respecting any matter referred to with which he was not satisfied. Mr. Alms pointed out that as a very strong indictment had been made against the electricity undertaking, he considered it was a matter of public interest that attention should be called to it. The Town Clerk (Mr. G. H. Kite) read a section of the Council's bye-laws to the effect that only matters mentioned in the monthly reports could be dealt with by the Council until the end of the meeting, when memorials could be presented, or complaints received. Mr. Alms said he was neither presenting a memorial nor making a complaint. He was simply saying that the report of the Electricity Committee did not deal with the position of the undertaking. He repeated that a very strong indictment had been made against its financial position; and he thought it was due to the ratepayers of the town that the indictment should be clearly met, and it should be put before them as to whether or not it was true. The Mayor said that the matter had already been considered by the Council, and the attention of the Local Government Board had been called to it. Mr. Penny asked whether it was not a fact that the Electric Light Committee had fully reported on the question of the financial position of the undertaking. He should not like it to go forth that the Committee had buried the thing; but they were not in the habit of replying to what appeared in the newspapers, and they had already communicated to the Chamber of Commerce, who had first called attention to the matter, the Council's decision on the subject. The Town Clerk remarked that, inasmuch as the Council kept their accounts (including those of the electricity undertaking) in accordance with the requirements of the Local Government Board, they had invited the Chamber of Commerce to investigate the accounts for themselves, if they desired, or get the Local Government Board to hold a public inquiry on the matter. This communication had been sent by the Council to the Chamber of Commerce, who had forwarded it to the Local Government Board. Since then he had not received any further communication as to how it had been received. Dr. Macdonald said he had nothing to add to the remarks which had been made. The matter then dropped, and the report was adopted.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

On Tuesday, in the Stonehaven Town Council, Bailie Robertson moved that the Council take steps to ascertain on what conditions the Stonehaven Gas Company would sell their undertaking to the Council. He did not, he said, want to quarrel with the Company. They had managed their business very well, and ought to be paid a fair price for their undertaking. He understood that the Company had 2500 shares, at 30s. each, which was equal to £3750. The present selling price of each share was about £3 10s. 6d.; and they paid a dividend of 17½ per cent., equal to £67 10s. In Carnoustie, the annual make of gas was 23½ million cubic feet; in Stonehaven, the annual consumption was 16½ millions. In Carnoustie, the offer of the Town Council was £21,000. For the works in Stonehaven, he thought £14,000 would be a fair price. This sum, repayable in thirty years, would amount to £732 annually; but if they adopted the Gas Supply Act, they could repay the money in forty years, which would make the annual contribution less, and would leave about £80 more than the Company at present required for the payment of dividend. He thought the Company deserved great credit for the way they had done their work. In no town in Scotland, of similar size, did he find cheaper gas. The subject of taking over the gas-works was before the Council more than twenty years ago, and again ten years ago. He thought that it might be to the advantage of the Council to take them over just now. The motion was agreed to unanimously; and the whole Council, with the exception of Provost Torry and Mr. Mitchell, who are Directors of the Company, were appointed a Committee of Inquiry.

In an address to Liberal electors in Glasgow on Wednesday evening, Councillor Duncan Graham dealt with some of the proposals which had been considered in connection with the recent House Letting Bill. One of the questions, he said, which had engaged the attention of the Corporation on this and previous years was the large annual deficit of about £23,000 which was incurred in connection with the lighting of common stairs and private streets. Under the Glasgow Police Act, the charge for lighting common stairs was 10s. per burner, and for lighting private streets 15s. per lamp; whereas the Burgh Police Act allowed the Town Councils of other burghs to charge 20s. for stair lights and 25s. for private street lights. If the scale of charges allowed by the Burgh Police Act were applicable in Glasgow—and they could be made applicable by a simple resolution of the Corporation—this deficit of £23,000 would be wiped out. At present the deficit was met by adding 1d. to the municipal assessments, charged upon occupiers only; so that if the rates for the lights were increased, it would mean a reduction of 1d. on the Glasgow municipal assessments. The reason why

the lighting of stairs and private streets had not been placed on the general assessment was simply because this was paid by the occupiers of all premises, and was not contributed to by the proprietor. Lighting of stairs and private streets was charged against the owners, with a right of relief against the occupiers in the case of common stairs.

The Arbroath Town Council had before them on Monday a claim for £2 as damages for gas poisoning, arising out of the fracture of a gas-main in Church Street by the use of a road-roller. It was stated that Mrs. Walker, the wife of the tenant of the house at No. 12, Church Street, smelt gas in the house, but she and her husband did not think it sufficiently serious to necessitate sending information to the gas-works, and they retired for the night. In the morning, Mr. and Mrs. Walker and a child were found by neighbours in a semi-conscious condition. Mrs. Walker recovered almost immediately; but the husband and child were more seriously affected. The claim was allowed.

I would call attention to the opinion of Mr. W. L. Macindoe, the Town Clerk of Kirkcaldy, given on another page, with reference to the gas transfer in that town. Mr. Macindoe reaches conclusions which are a distinct variation from those arrived at by much more distinguished lawyers than himself; but his opinion is not, on this account, to be set aside as erroneous. Counsel give their opinion in any particular case upon the memorial which is placed before them; and it is quite possible that previous opinions may have been erroneous because the framers of the memorials were not sufficiently intelligent to place the matter properly before counsel. Mr. Macindoe's opinions as to the allowance for compulsory purchase, and the decreased amount which ought now to be eligible, are extremely important. They introduce a new element into arbitrations—that is to say, if Mr. Macindoe is to be accepted as right. Whether he be or not, his views are certain to be pressed in the course of arbitration proceedings, not necessarily in connection with gas transfers only, but upon other subjects, such as the acquisition of lands and the like. This gives some idea of the wide-sweeping nature of the document which we publish.

The dinner of the Western District of the Scottish Junior Gas Association this evening need not be referred to in this column, were it not for the purpose of expressing gratification at the presence of Mr. G. R. Hislop, of Paisley, at the gathering. It was a great compliment to the Juniors that one so eminent in his profession as Mr. Hislop should have come among them and taken part in their proceedings. Such encouragement given to them ought to urge on the Juniors everywhere to more strenuous effort in the cause of the industry.

In the Hamilton Town Council on Tuesday, the Gas Committee reported that, in terms of the remit from the previous meeting of the Council, they had discussed the subject of the present price charged for gas consumed through prepayment meters, and that they had instructed the Manager—Mr. J. Ballantyne—to prepare and submit a report showing the expenditure upon free piping, prepayment meters, &c., in order that the terms of sections 17 and 23 of the Act of 1909 may be complied with.

In the Ayr Town Council on Monday, Mr. W. Smith had the hardihood to oppose a proposal to extend the use of electric lighting in the streets of the town. He stated that in 1895, before the electricity works were started, the cost of lighting the burgh was £1500 a year, whereas it was now £4837. He admitted that the town was now better lighted, but contended that it could be lighted by incandescent gas-lamps at half the cost. Mr. Smith, however, did not find a supporter; and the recommendations of the Lighting Committee were adopted.

At the annual meeting of the Turfiff Gas Company, Limited, held last week, a dividend at the rate of 5 per cent. was declared; and it was agreed to continue the price of gas at 6s. 3d. for lighting and 5s. 3d. for cooking and heating.

A gentleman who is said to have accidentally dropped a lighted match the other day in the public park at Wishaw, was surprised to find that a flame burst up to a height of about 2 feet. The authorities were informed. A sample of the escaping gas was taken; and an analysis showed that it was natural gas. The matter was brought before the Town Council at their monthly meeting on Monday, and instructions were given to have the ground protected against possible injury to children. It is supposed that the gas arises from old underground coal workings. At the same meeting of the Council, Bailie Bell, the Convener of the Gas Committee, objected to a proposal by the Committee, passed at a meeting he was unable to be present at, to sell coke to local bakers at 1s. per ton lower than the average price at the gas-works. It was pointed out that the reduction was more apparent than real, as the bakers will have to load and cart the coke themselves. The recommendation of the Committee was agreed to by eight votes to four.

Concessions to Large Consumers in Manchester.—In response to applications made by certain large firms, the Gas Committee of the Manchester Corporation have decided to make concessions in price to those consuming not less than a million cubic feet of gas per annum.

Increased Rates v. Increased Gas and Water Charges.—A proposal of the Morley Gas Committee to increase the price of gas from 2s. 9d. to 3s. per 1000 cubic feet from the 1st prox., and that the Committee should be empowered, if thought desirable, to revise the scale of discounts to large consumers, was the subject of a long discussion by the Town Council. The proposal was the outcome of a suggestion by the Mayor that, in view of the probable necessity for raising more money in the borough, the prices of gas, electricity, and water should be put up, with the object of avoiding any increase in the already rather heavy rates. It was contended by several speakers that the burden of the increase in the price of gas would fall upon the small consumers, and that of the occupiers of the eighteen mills in the borough that were not already lighted by electricity many would instal electricity plant to avoid the payment of the increased cost of gas, thus causing a loss of revenue to the gas undertaking. It was suggested that, if anything should be increased in price, it was the water supply to the manufacturers; the charge at present being only 6½d. per 1000 gallons. An amendment deleting the proposition was carried by a majority of nearly the whole Council. A recommendation of the Electricity Committee, to advance the price of electricity for lighting purposes from 5d. to 6d. per unit, was adopted.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, Dec. 18.

There has been renewed activity during the past week, occasioned not only by dealers covering their requirements for December shipment, but to a certain extent also by a better demand from consumers both in this country and abroad. A further advance in prices has to be recorded; and the market closes at its best. The nearest values to-day are £11 6s. 3d. to £11 7s. 6d. per ton f.o.b. Hull, £11 8s. 9d. to £11 10s. per ton f.o.b. Liverpool, and £11 7s. 6d. to £11 8s. 9d. per ton f.o.b. Leith, from which it will be observed that Liverpool shows the greatest improvement. For January-June delivery next year, the majority of makers maintain their quotation at £11 12s. 6d. per ton; but so far this figure is not reported to have been paid, the bulk of the requirements being apparently in the near position. A small amount of business has transpired, however, at £11 10s. per ton f.o.b. shipping ports for January-March, 1910.

Nitrate of Soda.

This article remains unchanged; buyers showing little disposition to operate, and sellers holding firmly for 9s. 3d. and 9s. 6d. per cwt., on spot, for ordinary and refined qualities respectively.

Tar Products.

LONDON, Dec. 20.

The markets for tar products have been steady throughout the past week. In pitch, there has been a decided improvement; there having been further inquiry from the Continent, and some of the French buyers have paid advanced prices. The Belgians still decline to come on for next year except at prices which are considerably below the equivalent of those asked in England to-day. No business of importance has taken place in London; but on the east coast 27s. 6d. is reported to have been paid and also declined. On the west coast, good figures have been offered. In Scotland, pitch is very firm indeed. Creosote is steady. London makers are still practically out of the market, as is also the case in the Midlands. In the North, in some districts oil is decidedly cheap; but in other quarters manufacturers are apparently well sold, and quite content to wait for the present. Benzol, 95 per cent., is very firm for prompt delivery. In the North, 6d. has been paid; and it is doubtful whether anything under 7d. would be accepted in London. Fifty-ninety per cent. benzol is firm, while toluol appears to be decidedly scarce for early delivery. Solvent naphtha is firm; and there is a decided scarcity in the London and Manchester districts. Carbolic acid is very weak; while crystals are practically unsaleable. Naphthalene is depressed, and quantities of pure which are acquired are very small; but salts are in good demand.

The average values during the week were: Tar, 13s. 6d. to 17s. 6d., *ex works*. Pitch, London, 27s. to 27s. 6d.; east coast, 26s. 6d. to 27s. 6d.; west coast, 26s. 3d. to 27s. 3d. f.a.s., 27s. 6d. f.o.b. Benzol,

90 per cent., casks included, London, 6½d. to 7d.; North, 6d. to 6½d.; 50-90 per cent., casks included, London, 7½d.; North, 6½d. Toluol, casks included, London, 9½d. to 10d.; North, 9d. to 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3½d. to 4d.; solvent naphtha, casks included, London, 1s. 1d. to 1s. 1½d.; North, 11½d. to 1s.; heavy naphtha, casks included, London, 10½d. to 11½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2½½d.; North, 2½d. to 2½d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east coast, 10½d.; west coast, 10½d. Refined naphthalene, £4 10s. to £8 10s.; salts, 40s., packages included and delivered.

Sulphate of Ammonia.

This article has been steady during the past week, and prices have advanced to 2s. 6d. per ton all round. In London, it is doubtful whether outside makes can be secured upon Beckton terms under £11 3s. 9d.; while the principal Gas Companies ask £11 8s. 9d. for prompt, and £11 12s. 6d. for January-June. In Hull, tender parcels are reported to have been sold at very good prices indeed; and it is doubtful whether anything can be obtained at under £11 5s. to £11 7s. 6d. In Liverpool, £11 7s. 6d. is said to have been paid. In Leith, makers have very little to dispose of, but report having declined £11 8s. 9d., and ask £11 12s. 6d. for January-June.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade in the North has been agitated the last few days by the critical nature of the negotiations between coalowners and miners as to the arrangements under the Eight Hours Act. While in Durham the matter has been amicably settled, in Northumberland there have been difficulties that are not readily surmounted, and that have influenced the sales and the markets. Best steam coals are now nominally about 11s. per ton f.o.b. There is, however, very little for sale for this year now; and until there is more of a settlement, owners do not readily sell further forward. Second-class steams are about 10s. per ton f.o.b., and steam smalls from 5s. 3d. to 6s. 6d. In the gas coal trade, the demand is now at its fullest, both on contract and for occasional cargoes; and prices are very firm. Best Durham gas coals are 11s. to 11s. 3d. per ton f.o.b. Other qualities vary from 9s. 6d. to 10s. 3d.; and "Wear specials" are from 11s. 6d. to 11s. 9d. The demand continues for next year; but coalowners are not quite so ready to quote forward, as they have sold forward freely, and there is a considerable activity in the request for prompt supplies. Small forward contracts are quoted something near the current prices. Coke is steady; and gas coke is firm considering the heavy

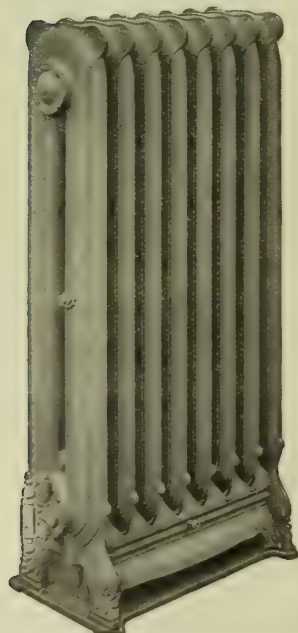
For The Office!

Greater than ever is the Sale of our "ST. ANDREW" GAS-STEAM RADIATOR to business men for the Heating of Offices, etc. The "St. Andrew" is thus still further proving

The "St. Andrew."

its well-known power of opening up—

The "Official."



New Fields
of
Gas Consumption!

For poorly ventilated and over-crowded Offices—
its Consort—the "Official"—is fast making its
unique merits known.



JOHN WRIGHT & CO.,
The Radiator Experts,
Essex Works, BIRMINGHAM.

production at present. Good gas coke is from 12s. 9d. to 13s. 6d. per ton f.o.b. Tyne or Wear.

Scotch Coal Trade.

Trade is good, and the prospect is better than it has been. Prices are, however, as yet unaffected. The quotations now are: Ell 9s. 9d. to 10s. 6d. per ton f.o.b. Glasgow, splint 10s. 6d. to 10s. 9d., and steam 9s. 3d. to 9s. 6d. The shipments for the week amounted to 284,786 tons—an increase of 7369 tons upon the preceding week, but a decrease of 10,976 tons upon the corresponding week of last year. For the year to date, the total shipments have been 14,606,981 tons—an increase of 657,255 tons upon the corresponding period.

Universal Gas Methane and Buisson Hella Company, Limited.

A petition asking the Court to sanction a scheme of arrangement for the distribution of the assets of the above-named Company among the shareholders came before Mr. Justice Swinfen Eady last Tuesday. The Company was formed with a nominal capital of £600,000, to acquire certain French patents for the mantle named in the title. It was proposed to pay the debts and divide the remaining assets of the French Company which had recently been sold. The English patents had been disposed of to an English Company, in consideration of 80,000 shares; and the French and other patents all over the world had been sold to the French Company. The latter Company bought from the former the 80,000 shares, so that they would get the benefit of the whole of the invention. His Lordship sanctioned the scheme.

Progress of "Coalexld."

We learn from Mr. J. Jowett, the Managing-Director of Coalexld Limited, that good progress is being made with the use of the material. Last month, the sale of chemicals increased more than 50 per cent. as compared with the corresponding month of the past year, and up to last Saturday there was a still larger increase. It is being found that gas engineers are beginning to make "Coalexld," as it is helpful to them in the disposal of their regular supply of coke, which, when converted into "Coalexld" finds a readier market than it does in its ordinary condition. It is now, we are informed, adopted largely by the users of anthracite stoves; and, according to a testimonial recently received from the "National" Gas-Engine Company, Limited, it is found to be excellent for use in suction-gas plants. The Managing-Director's assistant (Mr. F. W. Robson) writes: "It gives good gas, is free from tar, and there is no trouble with clinker in the generators. From this point of view we are able to speak of it in the highest terms; and we will have every confidence in recommending 'Coalexld' for use in suction-gas plants." Mr. Jowett has just completed some tests, in an ordinary household sitting-room grate, with coal and "Coalexld." Half-a-hundredweight of the latter, costing 6d., burnt exactly the same length of time as a hundredweight of coal, costing 1s. 3d., gave out more radiant heat, and made a beautiful fire, without smoke.

Improved Public Lighting at Swansea.

At the meeting of the Swansea Town Council last Wednesday, the Surveyor reported the result of his negotiations with the Manager of the Gas Company (Mr. G. Thornton Andrews) with reference to a scheme for improving the street gas lighting by the conversion of all the flat-flame burners to incandescents; and upon his recommendation it was resolved to adopt the following proposals as mutually agreed between them: (1) That the Company convert all the flat-flame lamps to incandescent burners, to consume $3\frac{1}{2}$ cubic feet of gas per hour, within three years from Jan. 1, 1910; the conversion to be equally distributed throughout the three years, and the selection of the lamps to be so converted to be made by the Corporation. (2) That the annual charge for the present $4\frac{1}{2}$ cubic feet per hour incandescent lamps remain the same as now—viz., £3 13s. 5d.—and the annual charge for all $3\frac{1}{2}$ cubic feet per hour incandescent lamps be £2 15s. 1d. (the charge now made for the existing flat-flame lamps), no initial charge being made for conversion. The foregoing charges are based upon the price of gas being 2s. 8d. per 1000 cubic feet. (3) That the Corporation supply during the period of conversion a number (not exceeding 100 per annum) of new lanterns of a modern type to the approval of the Company to replace lanterns worn out or mutually deemed obsolete, at a price not exceeding 16s. 6d. each, including porcelain reflectors and copper chimneys; and that the remainder of the lamps, as and when converted, be fitted with porcelain reflectors and copper chimneys by the Company at a cost not exceeding 4s. per lamp, to be paid by the Corporation. (4) That the annual lighting hours remain as at present—viz., 3473. (5) That in certain streets and roads, to be subsequently defined, where there is not at present any electric cable laid, nor likely to be in the near future, the Corporation undertake that gas-lamps, altered to new burners, shall not be displaced by any other form of lighting for a number of years to be agreed.

Cost of the Holsworthy Water-Works.—It was reported at a meeting of the Holsworthy District Council last Tuesday that the new water-works were now practically complete. Mr. Parsons said the original contract was for £4740, but the actual cost to date was £7140. The increases over the estimate included £812 on account of the reservoirs, £514 for the filter-beds, and £400 for engineering expenses. It was decided to apply for permission to raise a further loan of £2400.

Gas Scheme for Warsop.—It may be remembered that one of the Provisional Orders for which application is being made to the Local Government Board (see *ante*, p. 624) is to enable the Warsop Urban District Council to supply gas, and to erect the necessary works and plant. Warsop is a little town of nearly 5000 inhabitants on the border of Sherwood Forest, and the right to supply gas to it has been held by the Mansfield Corporation. They have, however, now disposed of it to the District Council, who have instructed Mr. Arthur Graham, the Gas and Water Engineer to the Corporation, to carry out a complete scheme for them as soon as the Order is obtained.

THE INTERCHANGEABILITY and HIGH EFFICIENCY OF Richmond's "A.B.C." Gas Fires IS THE ONE



ARABIAN.



BAVARIAN.



CASTILIAN.

"CONSUMING"

Topic heard in the Gas Industry to-day. We welcome the most exhaustive tests. Over 500 Gas Companies and Departments are Hiring and Hire-purchasing these Fires to-day.

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.

London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington.

Explosion near Blackfriars Bridge.

About noon last Wednesday, some commotion was caused at the north end of Blackfriars Bridge by the sudden upheaval of several yards of pavement under the railway bridge which crosses the west end of Queen Victoria Street. A workman who was descending a manhole was blown into the street, another was knocked down, and a pedestrian was injured on the leg by a flying fragment. Fortunately the casualties were not more serious. It appears that the explosion was caused by one of the Post Office officials going down into a chamber, some 10 feet square, containing electric cables. It is believed that he had been warned by one of the Gaslight and Coke Company's men that there was gas about; but, notwithstanding this, he struck a match to light his candle, with the result that an explosion followed. As our readers are aware (*ante*, p. 665), there has lately been an alteration in the levels of the mains at this spot, in connection with the construction of the passenger subway; and the gas came from a split cap on one of the mains which had been lowered. The matter was referred to at the meeting of the Court of Common Council next day, when the Chairman of the Streets Committee explained that in the diversion of the main a leakage of gas developed through a defective joint. This was made up with lead, and the pipe embedded in concrete; but the leak continued. He added that the Corporation were in no way responsible for the explosion.

Reduction in Price by the Gaslight and Coke Company.—As already intimated in the "JOURNAL," the price of gas in the district of the Gaslight and Coke Company will be reduced 1d. per 1000 cubic feet (from 2s. 9d. to 2s. 8d.) as from the end of the current quarter.

Reinstatement of Roads after Disturbance.—The Surveyor to the Camborne District Council reported at the last meeting of that body that he had been in communication with the Water Company with reference to the reinstatement of the surface of roads after disturbance by the Company. Some of the repairs had been done in a way, but the metal used was not of the quality required for county roads; and he suggested that the Council should give him authority to do the work properly, and to fix a time limit in which the Company should act. Mr. Passmore said the roads were always being taken up by somebody, and it would be better if the Council were to repair them and charge the parties with the cost. The Surveyor said he had been endeavouring for some time to get this done. It was decided that the Surveyor should again suggest to the Company the desirability of this arrangement being carried out.

New Reservoir for Cardiff.—Mr. C. H. Priestley, the Engineer, has given the Cardiff Water Committee some interesting figures in regard to the new reservoir in the Beacons. It will have a water area of 144 acres, compared with an area of 51 acres of the No. 1 Beacons reservoir, and 42 acres of the Cantref reservoir. The capacity will be over 1200 million gallons. Cantref has a capacity of 323 million gallons, and No. 1 reservoir of 345 million gallons. The actual cost of Cantref was £160,087, and of No. 1 reservoir £213,353; while the cost of the new reservoir, with a capacity four times as great as either of the other two, was estimated at £288,000. The Committee subsequently discussed the acquisition of further land in connection with the construction of the reservoir. Alderman Beavan asked if this land was contemplated in the original estimate of the cost of the reservoir. Mr. Priestley replied that it was not, and added that the additional land was wanted because Parliament had given them an increase of 5 feet in the depth of the reservoir. The estimated cost of the deeper reservoir was about £290,000; but this sum did not include the cost of the land now required. This land, however, would be let at a remunerative rental; so that, in reality, the total cost of the deeper reservoir would not exceed £290,000. It was decided to negotiate for the purchase of the land.

APPLICATIONS FOR LETTERS PATENT.

- 28,390.—VALENTINE, H. S., "Gas-fires." Dec. 6.
 28,395.—RYAN, J., "Mantle holder." Dec. 6.
 28,467.—DICKER, S. G. S., "Analysis of gas." A communication from Underfeed Stoker Company of America. Dec. 6.
 28,470.—WILKINS, T. M., "Valves." Dec. 6.
 28,472.—HIBBERD, C. E., "Gas-meters." Dec. 6.
 28,591.—LAKE, W. E., "Gas lamps and heaters." A communication from the Rector Gas-Lamp Company. Dec. 7.
 28,610.—TEED, F. L., SULMAN, H. L., and PICARD, H. F. K., "Recovery of sulphur from gases." Dec. 7.
 28,644.—AINLEY, L., "Meter money-box." Dec. 7.
 28,704.—BENTLEY, A. W., "Mantle support." Dec. 8.
 28,706.—HAMILTON, J. B., and J. B. HAMILTON AND CO., LTD., "Governors." Dec. 8.
 28,736.—BERRY, J., MAYLOR, J. A., and METERS LIMITED, "Prepayment meters." Dec. 8.
 28,790.—HINKS, J., AND SON, LTD., and HINKS, H. D., "Gas-pendants." Dec. 8.
 28,807.—SIEMENS BROS. AND CO., LTD., "Disc water-meters." A communication from Siemens and Halske Akt.-Ges. Dec. 8.
 28,826.—WISE, F., "Acetylene generators." Dec. 9.
 28,864.—ALLEN, C., "Gas-cookers." Dec. 10.
 28,867.—LOGAN, A., "Water-meters." Dec. 10.
 28,868.—RADCLIFFE, J., "Recovery of ammonia from distillation gases." Dec. 10.
 28,870.—DARWIN, H., and PERRY, W. F., "Lighting of burners from a distance." Dec. 10.
 28,884.—BADCOCK, E. B., "Internal-combustion water-pumps." Dec. 10.
 28,904.—HUGHES, J., "Gas-heated irons." Dec. 10.
 28,935.—SUGG, W., AND CO., LTD., and SUGG WRIGHT, E., "Inverted lamps." Dec. 10.
 28,937.—FALK, S., "Incandescent burners." Dec. 10.
 29,029.—LAKE, W. E., "Manufacture of gas from hydrocarbon oils." A communication from the Hydrocarbon Converter Company. Dec. 11.
 29,031.—SERNE, L., and NEIGHBOUR, R. C., "Gas heating-appliances." Dec. 11.



The "ONYX."

13-inch Fire Opening.

NOTE

The Wide Fire Opening,
Intense Pillar Fuel, and
Oval Fire Front,

as introduced by us last Season.

RESULTS OBTAINED ARE
UNEXCELLED FOR EFFICIENCY
AND ECONOMY.

ALL SINGLE ROW FUEL FIRES
ARE SUPPLIED WHEN REQUIRED
WITH THESE IMPROVEMENTS.

The "AGATE."

15-inch Fire Opening.



The Parkinson Stove Company, Ltd.
(Incorporating Maughan's Patent Geyser Co.),

BIRMINGHAM:

Stour Street.

LONDON:

Office and Show-Rooms:

129, High Holborn, W.C.

Price of Gas at Aberavon.—At the monthly meeting of the Gas Committee of the Aberavon Corporation on Monday of last week, the question of a reduction in the price of gas was considered; and it was decided to lower the charge from 4s. 2d. to 3s. 6d. per 1000 cubic feet to ordinary consumers. Formerly the prices were 4s. 2d. per 1000 feet for lighting, and 3s. 4d. for cooking, heating, and power purposes by separate meter. The average was 3s. 9d. per 1000 feet; and the new price of 3s. 6d. will thus represent a reduction of 3d. per 1000 feet in the receipts. Prepayment consumers are also to have a reduction of 6d. per 1000 feet—19 feet instead of 17 feet for a penny. For power purposes and public lighting, the price will remain at 3s. 4d. The change will take effect from the 1st prox.

Revised Water Charges at Huddersfield.—On the recommendation of the Water Committee, the Huddersfield Corporation have adopted the following revised scale of charges, to come into operation on the 1st of April next: The charges for water supplied by meter inside the borough will be at the rate of 9d. per 1000 gallons for the first 800,000 gallons used per half year, and 7½d. per 1000 gallons above this quantity, and those outside the borough will be 1s. and 10d. per 1000 gallons respectively; the charge for water for domestic purposes to dwelling-houses, public-houses, temperance hotels, eating-houses, and clubs will be increased 1 per cent. on the present basis; and the charge for water for warehouses, shops, and offices, &c., not connected with dwelling-houses will be increased 10 per cent. It was said the revision of the charges would bring in an increased revenue of about £7000.

Suicide by Gas.—Two more cases of suicide by gas poisoning have occurred in Manchester. John Edward Clive Wright, a draper, of West Gorton, was found dead in bed by his brother. From the gas-jet there was a tube extending to the bed and placed under the clothes near deceased's mouth. The gas was turned on full, and Wright had been dead for at least an hour when found. At the inquest, when a verdict of "*Felo de se*" was returned, the evidence showed that deceased had been in ill-health for some time, and had had other troubles. The second case was that of a charwoman named Mary Myers, who lived in Chorlton-on-Medlock. She had been missing for some days, and on her bedroom door being forced open it was found that the gas had been turned on, and that the woman was dead in bed. She had locked the door, stopped up all the apertures with articles of clothing, fastened down the windows, and tied a stocking over her mouth. "Suicide" was the jury's verdict.

Quality of the Gas at Slough.—It having been reported to the Slough Lighting and General Purposes Committee that the quality of the gas supplied to the public lamps was not so good as it should be, they recommended that the attention of the Gas Company be called to the fact, with a request that some improvement be made; and this course the Urban District Council have agreed to. One member said that the lack of light in the main streets was due to naphthalene.

Salford Corporation Bill Dropped.—Messrs. Dyson and Co., the Parliamentary Agents to the Salford Corporation, have been instructed not to deposit the Salford Corporation Bill for 1910, of which notice had been given (*ante*, p. 623). It is hoped that arrangements may be made with the authorities in the gas supply area that will enable the Corporation to promote a General Bill at the earliest possible moment. The authorities affected have received a communication from the Town Clerk of Salford suggesting a conference with the object of arriving at a settlement of the differences which led to such strenuous opposition on the part of the former to the gas clauses in the last Bill.

At the close of the evening service at Chapel Street Congregational Church, Southport, last Sunday week, the electric wires fused; and the building was plunged in darkness. The lighting of a few gas-jets, which were fortunately in position, enabled the congregation, however, to disperse with some degree of comfort.

Having had the matter of lighting the workhouse before them for about two years, the South Dublin Board of Guardians have adopted a report of the Special Lighting Committee which recommended "that the Local Government Board be requested to hold an inquiry into the relative merits of lighting by gas and electricity, as the Guardians intend to apply for a loan for electricity."

The fourth annual dinner in connection with the cricket club of the Isle of Thanet Gas Company was held at the Imperial Hotel, Margate, on the 11th inst.—the President (Mr. T. C. Fuller) occupying the chair. After the usual loyal toasts, that of "The Club" was proposed by Mr. Sindwell and responded to by the President and Mr. A. J. Stickels. Advantage was taken of the occasion to welcome the new Engineer, Mr. J. M. Campbell; and he thanked the company present for the way in which they had received him, and expressed his great appreciation of the hearty co-operation and sympathy of the officials and staff in taking up his new duties.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situation Wanted.

SECRETARY, MANAGER, AND ACCOUNTANT. No. 5115.

Financial Assistance Wanted.

INVENTION RELATING TO THE GAS INDUSTRY. No. 5164.

Fire-Clay Goods.

GUILDFORD GAS COMPANY. Tenders by Jan. 1.
MANCHESTER GAS DEPARTMENT. Tenders by Jan. 7.
ROTTERHAM GAS DEPARTMENT. Tenders by Dec. 31.

Stocks and Shares.

GAS COMPANY AVERAGING 9½ PER CENT. No. 5165.

TENDERS FOR

Autogen Welding Shop, &c.

"K. W." 9873 c/o RUDOLF MOSSE, COLOGNE.

Regenerator Retort Settings.

GUILDFORD GAS COMPANY. Tender by Jan. 1.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 801.

Issue	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p.c.				£ s. d.	£	Stk.		p.c.				£ s. d.
590,000	10	Oct. 14	7	Alliance & Dublin 10 p.c.	17-17½	-½	5 14 3	195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
298,955	10	"	7	Do. 7 p.c.	11-12½	-½	5 14 3	561,000	Stk.	"	10	Liverpool United A.	223-225	..	4 8 11
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	718,100	"	"	7	Do. B.	166-168	..	4 3 4
200,000	5	Oct. 28	6½	Bombay, Ltd.	5-6	..	5 8 4	306 083	"	June 25	4	Do. Deb. Stk.	164-166	..	3 15 6
40,000	5	"	6½	Do. New, £4 paid.	4-4½	+½	5 6 8	75,000	5	Nov. 26	5	Malta & Mediterranean.	4-5	..	6 0 0
50,000	10	Aug. 26	15	Bourne- 10 p.c.	28-28½	..	5 5 3	560,000	100	Oct. 1	5	Met. of 15 p.c. Deb.	59-62	..	4 18 0
311,810	10	"	7	Mouth Gas } B 7 p.c.	16-16½	..	4 3 7	250,000	100	Nov. 11	4½	Melbourne } 4½ p.c. Deb.	100-102	..	4 8 3
75,000	10	"	6	and Water } Pref. 6 p.c.	15-15½	..	3 16 2	541,920	20	"	3½	Monte Video, Ltd.	124-13	..	5 7 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	25-25½	..	4 17 8	1,775,292	Stk.	July 29	4½	Newcastle & Gateshead Con	166-168	..	4 3 4
300,000	"	"	9½	Do. New	189-191	-1	4 19 6	518,795	Stk.	June 25	3½	North Middlesex 7 p.c.	93-94	..	3 14 6
50,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	55,040	Stk.	Aug. 26	7	Oriental, Ltd.	13-13½	..	5 3 8
206,250	"	June 11	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	300,000	10	Nov. 26	8	Ottoman, Ltd.	137-139	..	5 15 1
220,000	Stk.	Sep. 10	11	Brighton & Hove Orig.	26-26½	..	5 3 3	31,830	53	Sep. 10	8	Portsea Island A.	137-139	..	4 19 0
246,320	"	"	10	Do. A Ord. Stk.	190-192	..	5 5 3	60,000	50	Aug. 26	13	Do. B.	129-131	..	4 19 3
460,000	2½	Oct. 14	10	British	42-43	..	4 11 11	100,000	50	"	10	Do. C.	120-123	..	4 17 7
109,000	Stk.	Aug. 26	6	Bromley A 5 p.c.	118-120	..	5 0 0	114,800	50	"	12	Do. D and E.	101-103	..	4 27 1
165,700	"	"	4½	Do. B 3½ p.c.	88-90	..	5 0 0	398,490	5	Oct. 28	7	Primitiva Ord.	7-7½	..	4 16 7
82,278	"	"	3½	Do. C 5 p.c.	106-108	..	5 1 10	796,885	5	July 29	5	Do. 5 p.c. Pref.	58-60	..	4 15 3
55,000	"	June 25	3½	Do. 3½ p.c. Deb.	88-90	..	3 17 9	488,900	10	Dec. 1	4	Do. 4 p.c. Deb.	97-99	..	4 10 10
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	14-14½	+½	4 16 7	1,000,000	10	Oct. 14	8	River Plate Ord.	16-17½	..	4 12 9
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	99-101	+½	3 19 3	312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	100-102	..	3 18 5
100,000	10	"	—	Cape Town & Dis., Ltd.	3-4	..	—	62,500	10	Sep. 29	8	San Paulo, Ltd.	14-15	..	5 0 8
100,000	10	"	—	Do. 4½ p.c. Pref.	5-5½	..	—	125,030	50	July 1	5	Do. 6 p.c. Pref.	11-12½	..	4 18 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	47-48½	..	6 3 9	135,000	Stk.	Sep. 10	10	Do. 5 p.c. Deb.	51-52	..	4 16 2
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82-84	..	5 7 2	239,984	"	"	10	Sheffield A.	233-235	..	4 5 1
157,150	5	Aug. 12	5	Chester 5 p.c. Ord.	108-110½	..	4 10 6	523,500	10	Oct. 14	10	Do. B.	233-235	..	4 5 1
4,193,280	Stk.	Aug. 26	5½	Commercial 4 p.c. Stk.	109-111	..	4 13 8	70,000	10	"	10	Do. C.	233-235	..	4 5 1
560,000	"	"	5	Do. 3½ p.c. do.	103-105	..	4 15 3	6,429,895	Stk.	Aug. 12	5½	South African.	124-124½	..	7 10 11
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	31-83	..	3 12 3	1,395,445	"	July 14	3	South Met., 4 p.c. Ord.	119-121	..	4 8 1
800,000	Stk.	Dec. 10	5	Continental Union, Ltd.	95-97	..	5 3 1	209,823	Stk.	Aug. 26	8	Do. 3 p.c. Deb.	82-84	..	3 11 5
200,000	"	"	7	Do. 7 p.c. Pref.	137-139	..	5 0 9	605,000	Stk.	Aug. 12	5½	South Shields Con. Stk.	160-162	..	4 18 9
492,270	Stk.	"	4	Derby Con. Stk.	121-123	..	4 1 4	60,000	"	July 14	5	Sth Suburb'n Ord. 5 p.c.	119-121	..	4 10 11
55,000	"	"	4	Do. Deb. Stk.	103-105	..	3 16 2	117,958	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
148,995	"	Oct. 2	5	East Hull 5 p.c. Ord.	97-99	..	5 1 0	502,310	Stk.	Nov. 11	5	Do. 5 p.c. Deb. Stk.	122-124	..	4 0 8
486,090	10	July 14	12	European, Ltd.	24-25	..	4 16 0	120,000	Stk.	Aug. 12	6½	Southampton Ord.	99-111	..	4 20 1
354,060	10	"	12	Do. £7 10s. paid.	18-19	..	4 14 9	453,940	"	"	5½	Tottenham A 5 p.c.	153-155	..	5 1 9
15,141,545	Stk.	Aug. 12	4½	Gas 4 p.c. Ord.	102-103½	..	4 10 1	149,470	"	June 25	4	Do. B 3½ p.c.	111-113	..	4 15 3
2,600,000	"	"	3½	light 3½ p.c. max.	87-89	..	3 18 8	182,380	10	June 11	5	Edmonton 4 p.c. Deb.	100-102	..	3 18 5
3,799,735	"	"	4	and 4 p.c. Con. Pref.	103-105	..	3 16 2	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	10-102	..	4 18 0
4,193,975	Stk.	June 11	3	Coke 3 p.c. Con. Deb.	82-84	..	3 11 5	230,476	Stk.	Aug. 14	5	Tynemouth 5 p.c. max.	110-112	..	4 0 3
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	92-94	..	5 6 4	255,636	Stk.	Aug. 26	6½	Wands- B 3½ p.c.	139-141	..	4 14 0
82,500	"	"	6½	Do. do. 5 p.c.	117-119	..	5 9 3	79,416	"	June 25	3	worth 3 p.c. Deb. Stk.	73-75	..	4 0 0
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	17-18	..	6 2 3	895,272	"	Aug. 12	5	West Ham 5 p.c. Ord.	123-125	..	4 6 0
131,000	Stk.	Sep. 10	6½	Ilford A and C	144-146	..	4 9 0	210,000	"	"	5	Do. 5 p.c. Pref.	127-129	..	3 17 6
65,783	"	"	5	Do. B	108-110	..	4 10 11	253,300	"	June 25	4	Do. 4 p.c. Deb. Stk.	108-110	..	3 12 9
65,500	"	June 25	4	Do. 4 p.c. Deb.	102-104	..	3 16 11								
4,940,000	Stk.	Nov. 11	8	Imperial Continental	175-177	..	4 10 5								
1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	94-96	..	3 12 11								

Prices marked * are "Ex div."

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In consequence of the CHRISTMAS HOLIDAYS, it will be a convenience if Communications for the next issue of the "JOURNAL" and Orders respecting ADVERTISEMENTS are received at the Office by 10 o'clock ON FRIDAY MORNING.

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MANCHESTER CORPORATION GAS-WORKS.
THE Gas Committee invite Tenders for
the Supply and Delivery of the FIRE-CLAY
GOODS required during Next Season at their several
Gas-Works.

Full Particulars and Forms of Tender may be ob-
tained from Mr. Fredk. A. Price, Superintendent, at
the Gas Offices, Town Hall, Manchester, on payment
of a deposit of Two Guineas, which will be returned on
receipt of bond-fide Tender.

Sealed Tenders, endorsed "Tender for Fire-Clay
Goods," addressed to the Chairman of the Gas Com-
mittee, must be delivered at the Gas Offices, Town
Hall, Manchester, on or before Friday, the 7th of
January, 1910.

The Gas Committee do not bind themselves to accept
any Tender, and reserve to themselves the right to
divide any Offer as they may deem advisable.

By order,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Dec. 17, 1909.

COUNTY BOROUGH OF ROTHERHAM.

THE Gas-Works Committee of the
Rotherham Corporation are prepared to receive
TENDERS for the Supply of RETORTS and FIRE-
CLAY GOODS.

Specifications, Quantities, and Forms of Tender may
be obtained upon Application to the undersigned.

The Person whose Tender is accepted will be re-
quired to enter into a Contract which will contain the
usual Fair-Wages Clause.

Tenders, endorsed "Retorts and Fire-Clay Goods,"
to be sent to the Town Clerk not later than Friday,
the 31st of December next.

By order,
J. S. NAYLOR,
Engineer and General Manager.
Gas-Works, Rotherham,
Dec. 20, 1909.

GUILDFORD GASLIGHT AND COKE COMPANY.

RETORTS AND REGENERATOR SETTINGS.

THE Directors of the above Company
invite TENDERS for the following:—

- (a) 144 □ RETORTS, each 10 ft. long, having a
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Specifications and further Particulars can be ob-
tained upon Application to Mr. P. C. Cleasby, Gas-
Works, Guildford.

Tenders, Sealed and Endorsed "Tender for Retorts"
or "Tender for Settings," addressed to the Chairman
of this Company, to be delivered at these Offices not
later than 9.30 a.m. on Saturday, the 1st of January,
1910.

The Directors do not bind themselves to accept the
lowest or any Tender.

By order,
WILLIAM TITLEY,
Secretary.

Gas Offices, Onslow Street,
Guildford, Dec. 14, 1909.

WEST HAM GAS COMPANY.

NOTICE is Hereby Given, that in

pursuance of the provisions of The Gaslight and
Coke Company's Act, 1909, under which this Company
will become amalgamated with The Gaslight and Coke
Company on the 1st of January next, the REGISTERS
OF TRANSFERS OF CONSOLIDATED ORDINARY,
PREFERENCE, and DEBENTURE STOCKS of this
Company WILL BE PERMANENTLY CLOSED on
and after the said 1st of January next, upon which date
Stocks of The Gaslight and Coke Company will be
issued in substitution for the corresponding Stocks of
this Company, and on and after which date Transfers
must be prepared in Terms of the substituted Stocks.

Transfers of Consolidated Ordinary, Preference, and
Debenture Stocks of the West Ham Gas Company will
therefore not be received for Registration in this Com-
pany's Books after the 31st of December, 1909.

By order,
A. G. SNELGROVE,
Secretary

Stratford, E., Dec. 18, 1909.

SALES BY AUCTION OF GAS AND WATER
STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to
notify that their SALES BY AUCTION OF NEW
CAPITAL ISSUED UNDER PARLIAMENTARY
POWERS, and of STOCKS and SHARES belonging to
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MAIN LAYING.

Paper by PERCY GRIFFITH, M.Inst C.E., and BRUCE MCGREGOR
GRAY, Assoc. M.Inst. C.E., before the Association of Water Engineers.

A. The Authors used *Flanged Pipes* for the Rising Main up the
Steep side of the Barff, and their experience proved that this was
not an advantage, as the rigidity of the Joints involved considerable
difficulty in regard to the depth of the Trench, and a good deal of
Cutting to make the final Connections at each end of the Pipe-Line.

B. In the case of the Delivery Main, the Joints were *Ordinary*
Socket Joints, but made with Lead only. The only difficulty met
with here was the necessity for pouring the Lead in at a suitable
temperature to prevent it melting the Solid Lead Fillet, and running
through into the Pipe.

C. In some of the Smaller Branch Connections, Lead Wool
was used, and proved highly successful.

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CAST-IRON PIPES FOR GAS, WATER, & STEAM,
also VALVES of all descriptions.
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And LAMBHILL FOUNDRY, GLASGOW.
OFFICE: 147, MILTON STREET, GLASGOW.

GEO. R. LOYE'S
INCLINES AT 45 DEGREES.

CARBONIZATION MADE EASY.

A Few Recommendations for this System:—

Simplicity of Design.
No Machinery to get out of
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Carbonizing charges 40 per
cent. less than with Horizontals.
No skilled Stokers necessary.

Yield of Gas per ton guaranteed
about 1000 cubic feet more than
under present conditions, of
guaranteed candle power.

Heats under absolute control
throughout the whole length of
the Retorts.

Saleable value of Coke greatly
increased.

25 per cent. greater yield of
Ammonia.

More liquid Tar.

Stopped Pipes unknown.

Naphthalene always in solution.
45 per cent. less ground space
required.

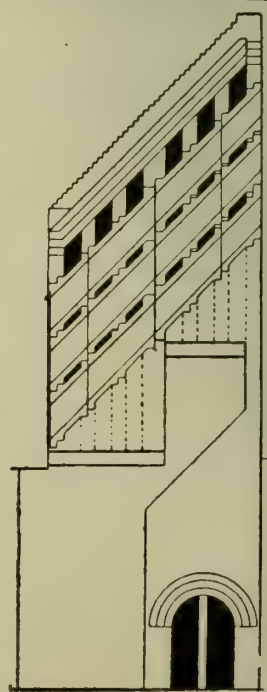
Constructional cost per Ton
carbonized considerably less than
with Horizontal or Ordinary In-
clined Retorts.

Several Installations in course
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Sole Agents:

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GRAETZIN LIGHT

Important Improvements.



BURNERS.

1. **20-Candle Power more light** without increase in the consumption of gas.
2. **Patent Gas Adjuster**; cannot get out of order.
3. **Automatic Gas Regulator**, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. **Accurate Regulation of the Air Supply.**
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
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From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

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THE MOST UP-TO-DATE

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For TAR JOINTS.

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**OUR DISCOUNT SYSTEM GAINS
GROUND DAY BY DAY.**

Greatly increases Sale of Gas.

Particulars and fullest description on
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SILICA MACHINE MADE RETORTS.

TRADE "C.O." MARK.
REGISTERED.

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Will withstand high temperatures and is **Guaranteed
not to Contract or Soften** under Heat.

**GREATER CONDUCTIVITY THAN ANY
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For Particulars and prices apply—

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Machine-Flanged
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SPECIAL BRICKS
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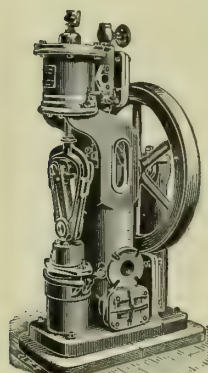


Fig. 705. "SINGLE RAM"
STEAM-PUMP.

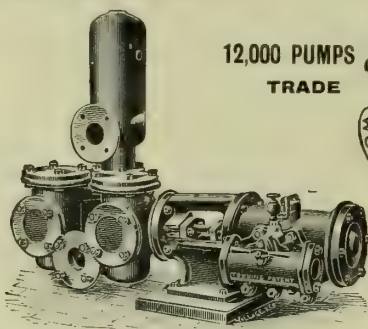


Fig. 598. "CORNISH" STEAM-PUMP FOR
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TRADE



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IN STOCK AND PROGRESS.
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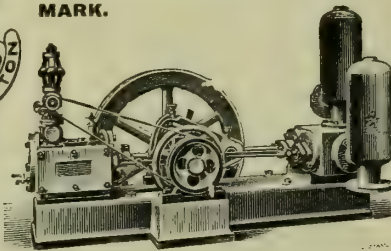


Fig. 685. "RELIABLE" STEAM PUMP FOR
TAR AND THICK FLUIDS.

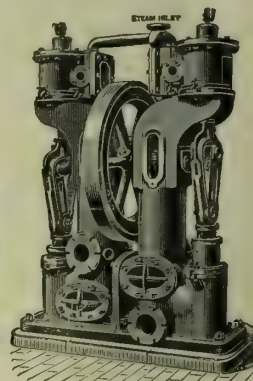


Fig. 712. "DOUBLE-RAM"
STEAM-PUMP.

Rheinische Chamotte-und Dinas-Werke, Cologne on Rhine.

Construction of

Entire Gas-Works & Coke Oven Plants, Retort Furnaces,

Furnaces for Chamber Settings **New Coke Ovens**
(Patent), (Patent),

With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia
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HORIZONTAL, VERTICAL, INCLINED
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SO FAR 97 CHAMBERS BUILT AND
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IN POINT OF EFFICIENCY, COST OF
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2000 WORKMEN.

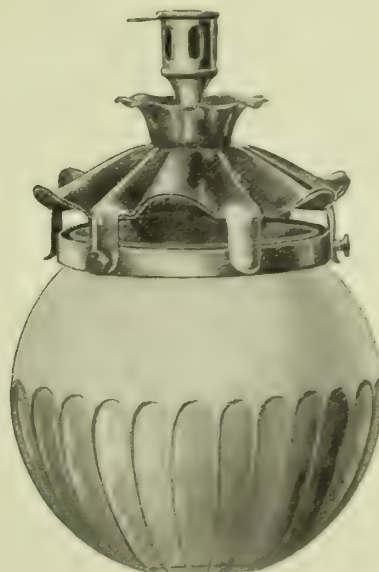
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Season from the

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THE
"DARWIN"
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INVERTED BURNERS.



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Have been remodelled, and we now offer you

BETTER BURNERS
AT
REDUCED PRICES

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CONSUMPTION . . . 3.55 ft.
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CANDLE POWER . . . 122.76

These figures speak for themselves.

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FOR

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SIX 20 ft. THROUGH RETORT HUNTER-BARNETT PATENT COKE PUSHERS, and
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For the **South Metropolitan Gas Co.,** presently in hand.

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FOR FULL PARTICULARS APPLY TO THIS ADDRESS.

Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

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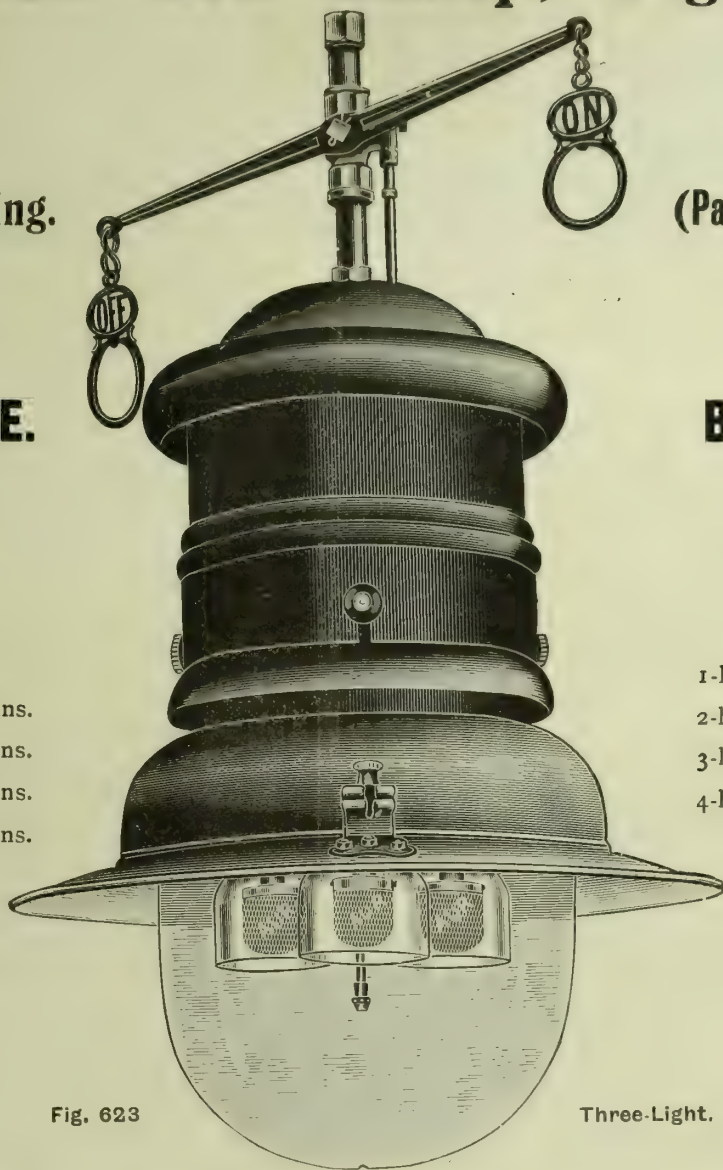


Fig. 623

Three-Light.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52 6	6/- extra.
2-light	8 feet	260	47 6	6/- extra.	4-light	16 feet	550	72 6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3 6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2 9 3 6
" " " In Case lots per dozen.	19 6	57 9	57 9	93/-	Parabolic Reflector, extra	"	3 6	6/-	7 6
Case contains	80	18	18	12	Welsbach Mantles, each	6d. subject as usual.			

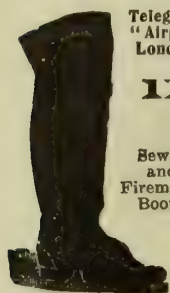
The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

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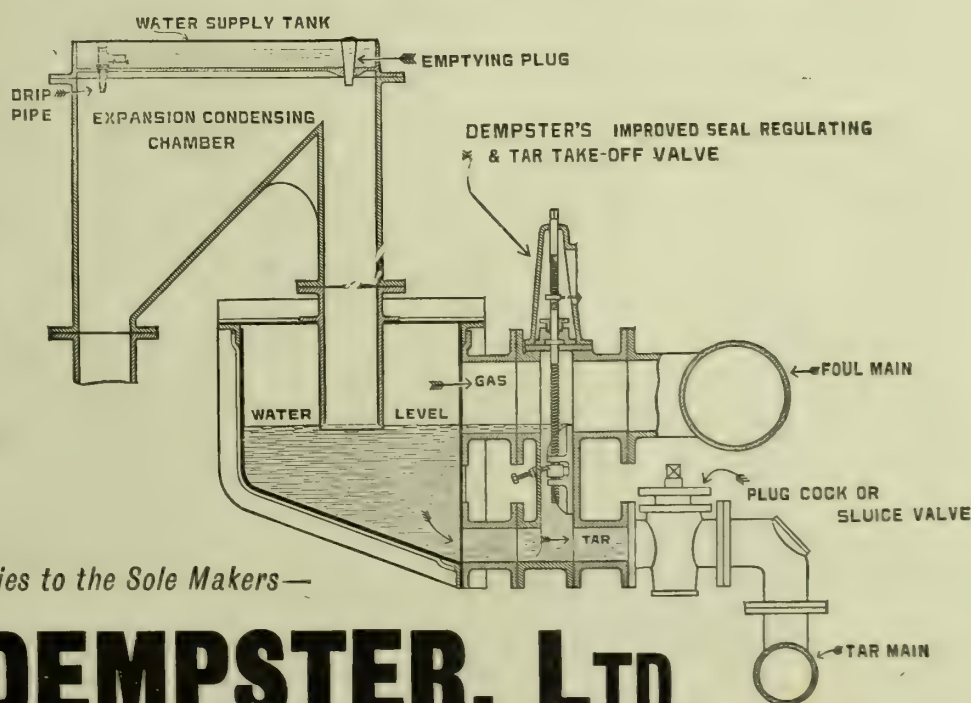
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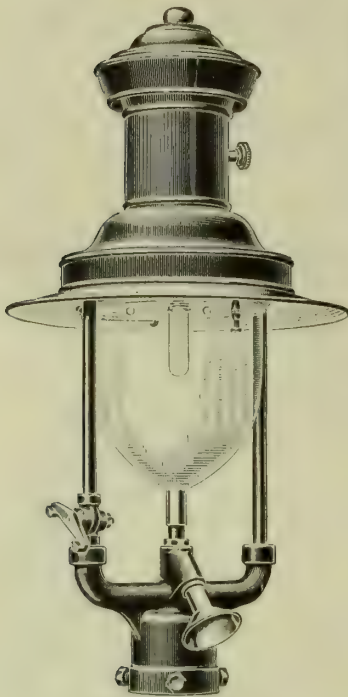


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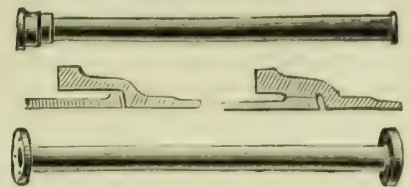
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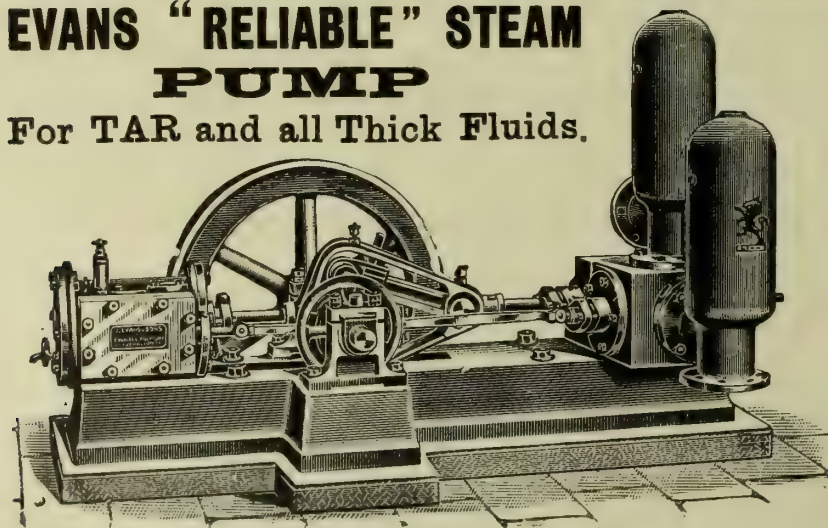
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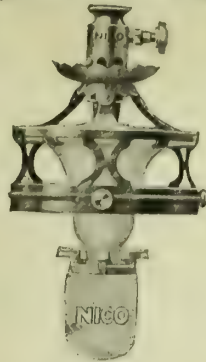
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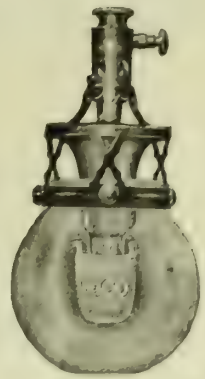
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With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia Works, and Cyanogen Extraction Plants.

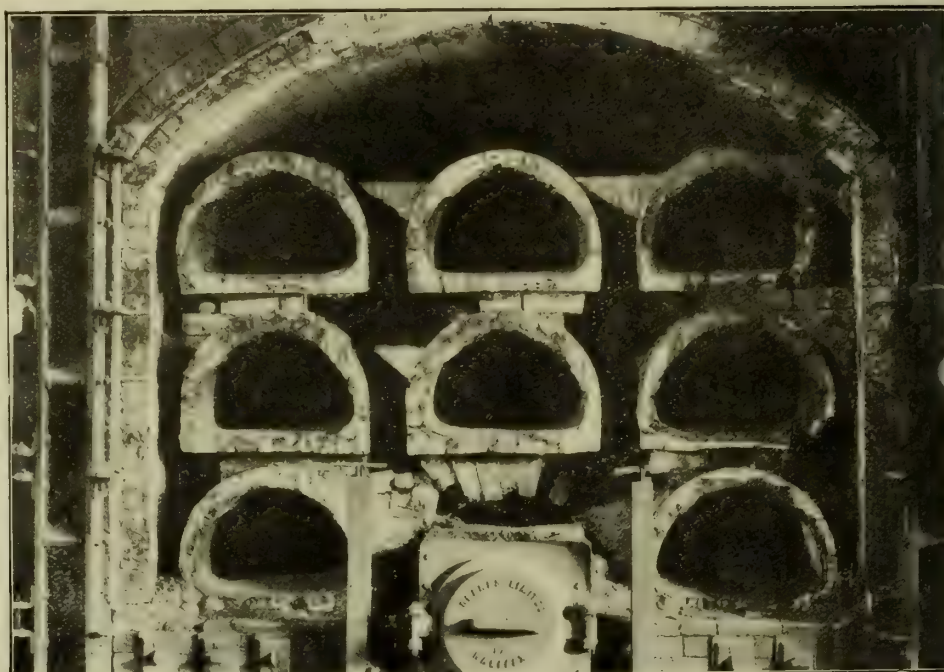
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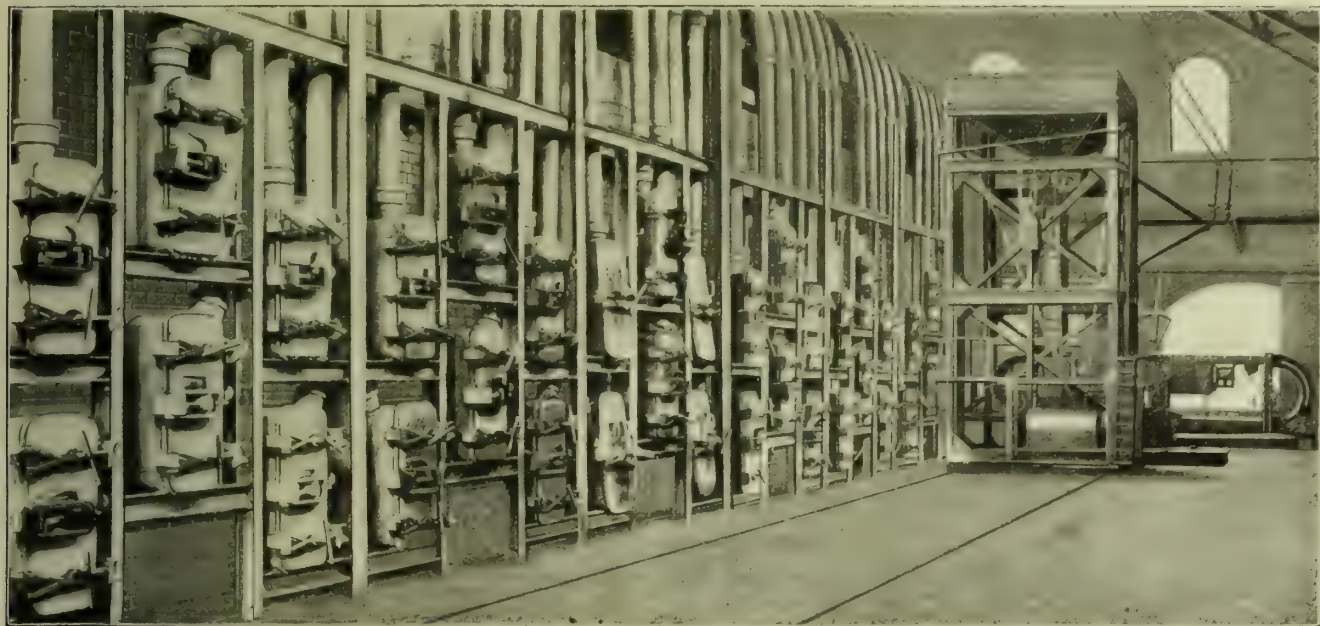
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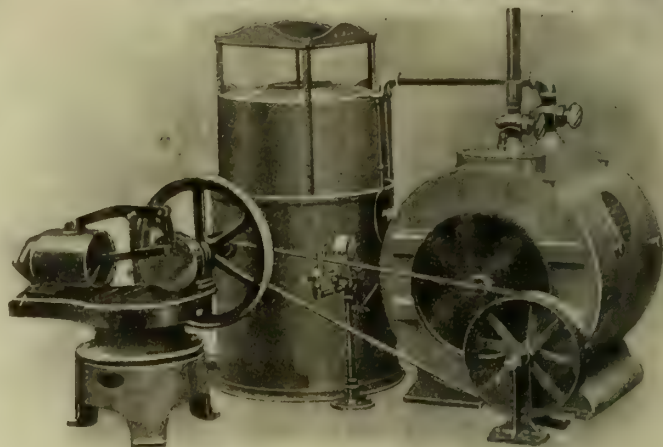
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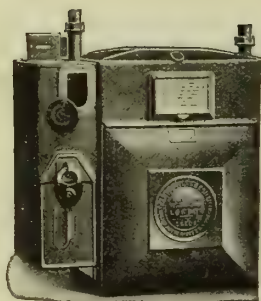
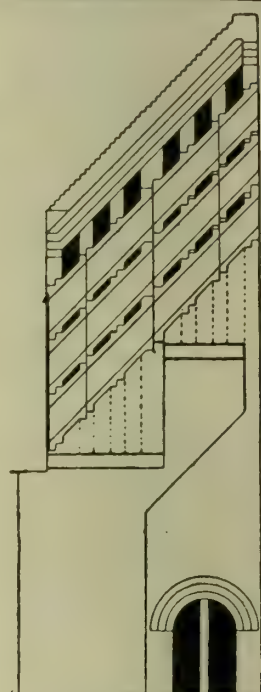
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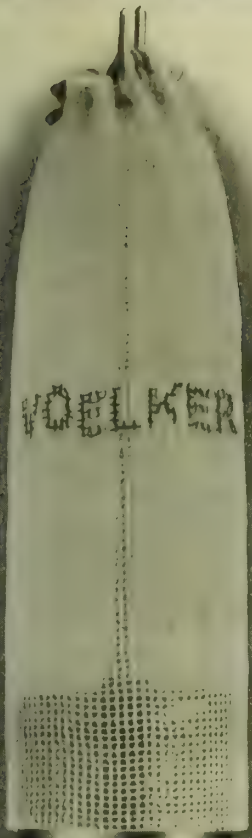
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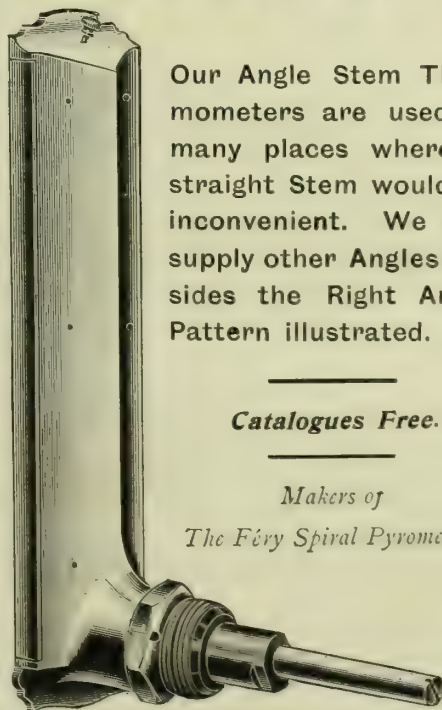
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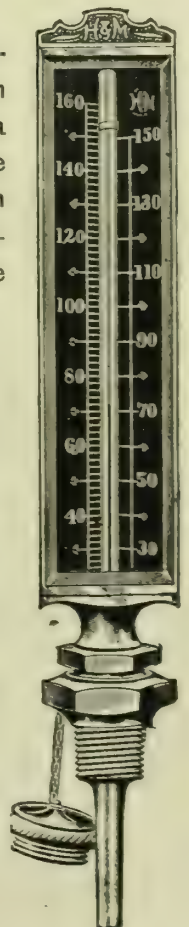
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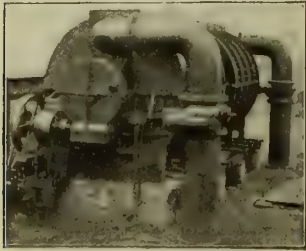
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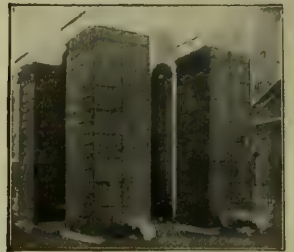
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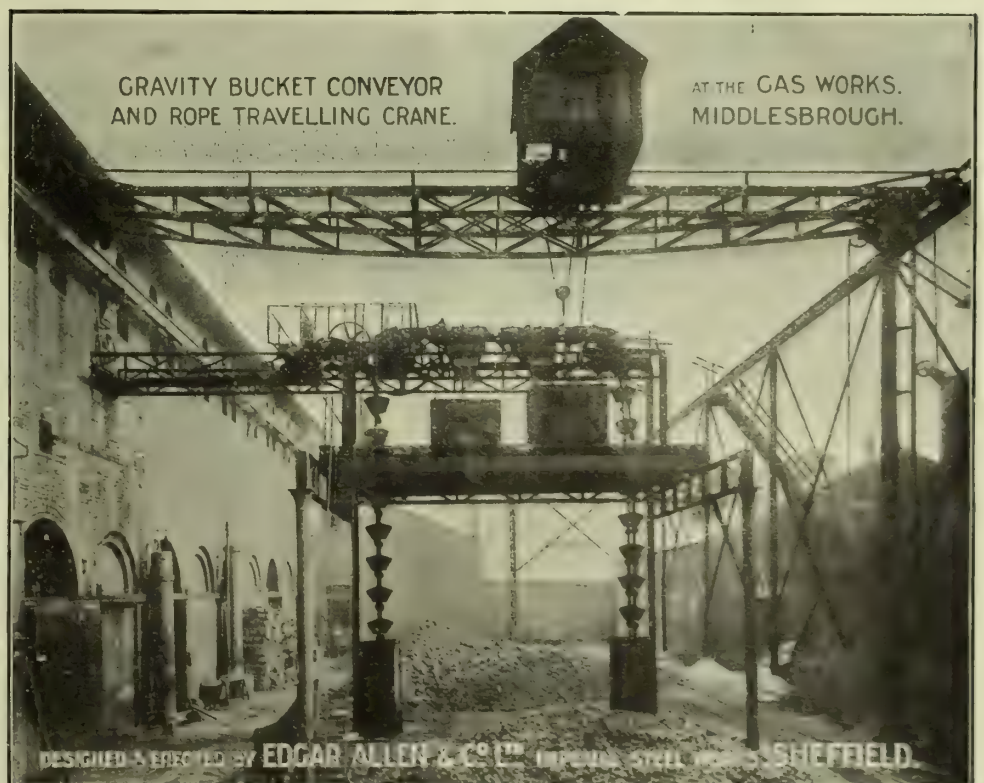
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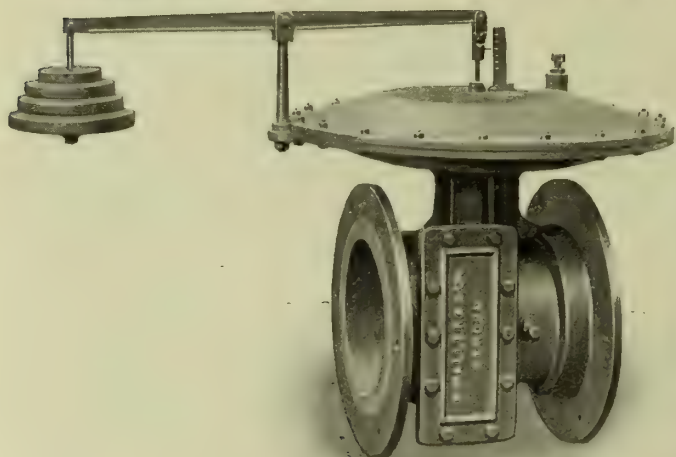
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VOL. CVIII., No. 2433.—TUESDAY, DECEMBER 28, 1909.

1909.

A Retrospect.

MEMORABLE in the history of the nation will be the year now drawing to a close, on account of the internal friction in regard to the fiscal proposals of the Government. From the time of the introduction of the Budget by the Chancellor of the Exchequer to the day of its reference to the country by the House of Lords, the political world was in a perpetual ferment. The facts that the question of rejection or acceptance of the principles underlying the Budget has been referred to the great electorate, and that the only process by which this could be done was by dissolution of Parliament and a General Election, do not appear to have had the slightest detrimental influence upon the conditions of the country, but rather the reverse. All throughout the parliamentary session, capital and property have been sensitive to the prevailing influences. To many people, it appeared that the predominant party in the Legislature were fast slipping under the rule of those in the Cabinet whose leaning is palpably greater towards Socialism than the old Liberalism. Socialism has captured the Trades Unions; and the progress in influence that Socialism and Communism have been making in the deliberations of the national government has been a striking feature in the history of latter times. If there is success in the aims of the movement of which so much has been seen, the effect can only be the creation of an artificial condition of things, to the everlasting disadvantage of the country. There are people who fail to see, or affect not to see, the drift of these movements, and who deliberately narrow their comprehension by party prejudice. This is to be deplored. Without evincing any political bias here, it may be said that the established tendencies and ambitions of the two great parties of the State could be well maintained on separate lines, with benefit to the country, without playing into the hands of political and social extremists.

Trade has not been brisk during the year; but towards the end, there were signs of an improvement. November showed an excellent increase in both imports and exports, though exports for the year to the last returns show a decline. On the eleven months ending with November, there had been an increase on imports on 1908 of £27,629,999, but a decrease of £3,228,456 on exports; while re-exports showed an increase of £10,251,501. Looking over the constituent figures, it is remarked that in the eleven months exports of 60,151,000 tons of fuel only realized £33,972,000; while in the same period of 1908, 59,808,745 tons realized £38,380,105. Political and trade conditions had influence in the Money Market; and the year witnessed some notable fluctuations of the Bank rate. In January it was at 3 per cent.; in April, 2½ per cent.; and with intervening periods of seven days in October, it rose from 3 to 4 and then to 5 per cent. In the Stock and Share Market, there was the usual record of oscillation. The first few days of the year, a cheerful mood pervaded affairs; but this was not sustained. The troubles in the Near East, agitation in the American market, fears in the Railway market of a coal strike, the Morocco affair, the clouds in the home political arena, and the general uncertainty that appeared to brood over home affairs, were among the disturbing factors of the year. The South African market had a period of sunshine; but generally the condition of affairs in the markets was typical of the weather—a few days' brightness was certain of being succeeded by a spell of gloom. Business in the Gas market was in its movements largely in sympathy with all other markets—sometimes it was good, sometimes bad; sometimes it was well distributed, and sometimes very restricted. Gaslight stocks maintained their improved estimation as an investment; and there was further ascent in price early in the year on the announcement of the reduction of the price of gas, and the increased dividend that would follow.

In other directions, comparing prices at the beginning and the close of the year, there is not any specially significant feature—there are movements up and down, but of no remarkable amount, and in some cases prices have remained absolutely stationary. Brentford, Brighton original, Ilford, and Wandsworth and Putney may be named as having put on financial flesh; but most of the suburban concerns were, as things go nowadays, in very good odour. West Ham increased in price on the amalgamation scheme (confirmed by Parliament) with the Gaslight and Coke Company. Sheffield, one of the heavy stocks, has shifted back a bit; but there is nothing else among quoted Provincial Companies of striking importance. Farther afield, the same may be said of the Continental Companies—even Continental Union did not suffer to the extent that might have been imagined would be the case from the reverses of the year. The Buenos Ayres, River Plate, and Primitiva Companies were strong on the amalgamation of forces; in fact, the South American gas market was generally in favoured condition. There were a fair number of issues of gas stock during the year. Prominent among the sellers by auction have been Messrs. A. & W. Richards—not only of new issues, but of stocks and shares for executors, trustees, and other private owners. For all these, the firm have found a never-failing demand. They report that they cannot say there has been very much variation in prices as compared with 1908, though, on the whole, they would regard the demand as having been stronger, and at slightly better figures.

A SURVEY OF THE CONDITIONS AFFECTING THE GAS-TRADING CONDITIONS OF THE INDUSTRY.

Coming more particularly to the business of the industry, and the conditions affecting it. The position in relation to the latter is both interesting and, in a measure, critical. There is no inherent weakness; the strength of the industry is fully maintained; and there are the evidences around that the depths of its potentialities have not yet been sounded. What is critical rests in the manner in which the new conditions that have arisen, and that are still arising, are met. The gas industry is being subject to more and more vigorous attack; it has not only to resist attack, but to attack the intruders, who have a perfect right to intrude, if they can do so by fair means. Commercialism is growing more and more aggressive. To blink the fact would be suicidal. The internal affairs of the gas industry—manufacturing operations, products (both primary and secondary), and methods of business, those that cultivate and those that protect—have all to be shaped to the new circumstances. The subjects of coal and the secondary products will be referred to later. But as to the gas business proper—the sale of gas—it has to be recognized that the electricity industry is, in its lighting department, stronger for obtaining new business than it was before the advent of the metallic filament lamp; and that it can offer light now on better terms than before. But, simultaneously, the gas industry has not lagged behind. There has been a growth in lamp efficiency; and more illumination can now be offered per cubic foot of gas consumed than ever before, while the units of light now range from a few candles per point to thousands. All requirements and all tastes can be catered for. The industry has witnessed progress in the means provided in this direction during the year. But in competition we have to meet the living fact that, when a competitor can offer his goods at a lower rate than before, there is an attraction for some people to change their custom; and the consumer can use the fact to the furtherance of his own interests. The cultivation and protection of the lighting business therefore demands that still greater attention should be paid to the consumer. There has been enhanced recognition of this during the year; and this, and the new enterprise of gas undertakings, have not been very pleasant for our electrical friends. Many gas undertakings have adopted free maintenance—cleaning and adjusting consumers' burners free of cost, and charging only for the

materials used in maintenance. The subject was discussed at the Southern District Association meeting in November; and some interesting experiences were put on record.

Shop, factory, and street lighting, high-pressure gas distribution questions and developments have been prominent. There is a demand for high-power sources of illumination; and the industry has to comply, or lose the business. District high-pressure supply, in favourable localities, is a means to keeping the end of gas supply up in the competition with the flame arc lamp. Demonstration of this is made in the high-pressure gas supply in Fleet Street and the neighbourhood. The street is lighted by Keith high-pressure inverted lamps. From the principal line of mains, the Gaslight and Coke Company have had to make several branch extensions so as to meet the requirements of factories and other business premises and further installations of public lamps. Instances of the application of high-pressure gas lighting have been published—for shop lighting as well as illumination of public buildings; Alexandra Palace being a case in point. Efficiency for street lighting in comparison with competitors has been attested by Professor Drehschmidt, and others. A report of exceptional merit was made by a deputation of the City of London Corporation, who visited the Continent to investigate the lighting in vogue in some of the principal cities. The result was distasteful to electricians. The inverted gas-burner—high-pressure for main streets and low-pressure for side streets—appealed to the investigators as the means of lighting *par excellence*, with the condition attached that, wherever possible, there should be central suspension. Though this introduces complication in street lighting, there is no difficulty. Inverted lamps for street illumination, particularly in South London, have taken the fancy, owing to efficiency, of many local authorities who are not influenced by the possession of municipal electricity supplies.

Herein has been a matter of much irritation during the year. In many towns, the local authorities with electricity stations have thrown questions of economy and efficiency to the winds, spending money on the conversion of street lamps to electricity with no stronger reason than that the electricity stations belong to the towns concerned. In other words, the community, according to these authorities, is to be mulct in additional expense without obtaining improved service, for the sole purpose of putting more business in the way of the electricity undertaking. This is how the principles of economic administration are being widely violated. This peculiarly improvident attitude of some local governing bodies has brought them into dire conflict with the Local Government Board, who have refused loans until the local authorities can show (which they fail to do) advantage to the ratepayers from the change. Tested by Hastings, ratepayers are not pleased with the result of the conversion from ordinary incandescent gas-lamps to metallic filaments. A big scheme of conversion, despite the reproof of the London County Council, is that of the Marylebone Borough Council. Many other authorities are also persisting in carrying out their conversion schemes by making provision annually for initial payment from the rates. The ratepayers want educating as to the doings of their masters, who in most cases decline to enter into the questions of comparative costs (as at Finchley), and in some cases are even afraid of comparative demonstration (as at Plymouth). Beckenham left the matter to public judgment; and the Carpenter inverted gas-burner scored over electric metallic filaments. Gas likewise won in open competition at Bradford. The Gas Companies' Protection Association are asking for information as to what is being done by local authorities in this matter of unfair and preferential treatment, so that a good stock of evidence may, on suitable occasion, be laid before the proper authorities. Something clearly has to be done, and the quicker the better. The criticism does not apply to those local authorities who are not burdened by electricity undertakings. The ratepayers in such places are well off.

Not only, however, in public lighting, but in the lighting of public buildings are local bodies pursuing the policy to which attention has been directed. From a report to which we gave circulation this year, it was seen that a Committee of the Local Government Board have expressed it as their well-considered opinion that there is no justification for the conversion of the illumination of public institutions from gas lighting to electric lighting, in view of the modern developments in the former, and their economy. Remarkable is the considerable extension that is being made in the application of automatic means of lighting to street gas-lamps; and, almost without exception, reports are favourable to

both efficiency and economy, so much so, indeed, that in "The Times," "Daily Telegraph," and other daily papers, popular references have been made to the "passing of the lamplighter." While treating of lighting matters, we may just append the remarks that the price of monazite sand has further fallen; and that prospecting has revealed the fact that the deposits in Brazil are widespread, and not limited so much as was at one time thought to be the case. There is promise of a metallic filament mantle being placed on the market at an early date, the invention of Herr Reeser; but questions connected with manufacture and exploitation have delayed an immediate entry into the trading stage. Among the things to be thankful for is the fact that the fertility of the Chancellor of the Exchequer in inventing fresh sources of revenue has not extended to the taxing, as in Germany, of gas mantles and electric lamps.

From all quarters during the year, reports have been consistent as to great increases in the addition of consumers—more particularly prepayment—and for heating and cooking. The heating business has been booming this season; and we have it placed on record that, in London, the demand for gas-fires has never been so heavy as has been experienced in the opening of this winter season. Manufacturers have not known such a busy winter season for the past seven or eight years. The seven lean years have passed; we hope the seven fat ones are in store. The improvement of efficiency of gas-fires is becoming better known. They are in these times advertising themselves. Prejudices are dying a natural death. The medical profession are being forced to acknowledge that their views, if at one time they had partial foundation, have now had their supports knocked away by progress. But there has been evidence that the architectural profession stands sadly in need of a little educational work to eradicate false motives. The makers of the fires have applied themselves assiduously to improvement on scientific lines; and while themselves adopting research in laboratory and testing-room, they are broad-minded, and accept gratefully the suggestive results of investigation from whatever quarter they come—be it the Fuel and Gas Engineering Department of the Leeds University, or the privately conducted research of the gas expert. The work of the smoke abatement enthusiasts is also having effect. They are the friends of the gas industry. Gaseous fuel and electricity for heating purposes, they recognize, serve their cause, and occasion no labour to the user; while of the two, gaseous fuel is the cheaper and the more efficient, inasmuch as 6 cubic feet of gas are approximately equal in thermal value to a unit of electricity. In gas cooking-stoves, there is not much room for improvement; but their popularity remains undiminished, and the cooking appliances of the electrical industry still occupy, and bid fair to continue to do so, the sphere of novelty. As novelties, and not as articles of practical utility, they are accepted. In water-heating by gas, there is encouragement in expanding adoption through the recognition of the convenience.

In industrial centres, the applications of gas to manufacture are developing apace; and one of several illustrations that came before us in the course of the year is found in the statement made, as to extended use, at the last meeting of the Sheffield United Gas Company. In the power business, the competition from producer gas, suction gas, and electricity has been unceasing. But the gas-engine has not stood still. There has been much recent publication on it; and it has been shown that considerable strides have, during recent years, been made in mechanical efficiency. A resolute attack is being made by a Committee of the British Association on the problems that have to be solved to attain to yet greater efficiency, and which problems have not yet been systematically dealt with by individual inquirers. A positive line of investigation has been mapped out by the Committee; and reports on their future work will be anticipated with much interest. A notable development (which has yet to be proved on a large daily working scale) is the Humphrey gas-pump, which has lately excited considerable attention in engineering circles. In connection with power supply, we were invited by Mr. W. A. Tookey, in a special contribution to our pages, to accept the principle of a limitation to the field of town-gas application, on the ground that other forms of power—such as suction gas—have all of them their special fields, which town gas cannot touch commercially. But with all deference, the suggestion was rejected. Town gas can accept no such limitation. Ambition and work are directed to putting gas into the distribution mains that can be sold commercially for all objects. To whatever

purpose gas can be usefully applied, there it has a legitimate sphere, and one within which business may be sought.

Suction-gas plant has not been heard of so much during the year. It has been referred to on sundry occasions in our columns, but mostly in the way of criticism. Its novelty is wearing off; its weaknesses, difficulties, and drawbacks have become better known among manufacturers. And they are preferring constancy in more ways than one, so long as town gas suppliers are willing to supply on reasonable terms. They have also gained experience in the question of costs, and find that the fuel cost per brake horse power is but an indefinite basis on which to depend, and that it is not by any means a comprehensive figure. They find, too, that the inspectors of factories are paying more rigorous attention to the location of such plants, and insist (for the protection of workpeople) on adequate ventilation where the plants are situated. Complaint has also been made by Dr. Collingridge, the Medical Officer of Health of the City of London, of the abominable nuisance occasioned by the washings from gas-producers; trouble having been caused in several cases by the odour of the effluent which contained sulphuretted hydrogen. True, the odour can be practically eliminated by the use of permanganate of potash. Nevertheless, manufacturers do not take kindly to these additional troubles that are absent from a town gas supply to an engine. Before the Scottish Junior Association early in the year, Mr. Henry O'Connor delivered an instructive lecture in which he dealt with this form of power competition. A large scale installation of gas-engines, aggregating 1000-horse power, installed at the Shad Thames pumping-station of the London County Council, and supplied with gas by the South Metropolitan Gas Company, was described in our columns during the year. Some attention, too, has been given to the installation of private gas-driven plants for generating electricity.

We have dealt at some length with these questions of current moment, all bearing upon the commercial side of the gas business. Though "at some length," the review is only a cursory one; the number of influences, advantages and disadvantages, bearing upon the gas business to-day are so numerous. But they emphasize the importance of the work of a gas undertaking lying outside the pale of gas manufacture and gas office; and there cannot be too much insistence upon the commercial work relating to gas supply being placed in the hands of a responsible and adequately remunerated officer, in all but undertakings of very limited dimensions. The times have changed; and changes of the kind demand an alteration of practice. Such responsible heads of the commercial gas department have been appointed in many places. The suitable man for the work is one possessing several qualifications: Tact and judgment, alertness, and one with a scientific and practical knowledge of his business, and with an aptitude for keeping knowledge abreast of all development in gas, and not only in gas, but in the camps of the competitors. The latter is important. The responsible head of the commercial gas department must never allow himself to rest under the stigma of having been driven into a corner through want of knowledge. These are matters that have impressed themselves most forcibly on observant minds during the year the events of which are being scanned. In prosecuting the commercial work of the gas industry, there have been a few local exhibitions during the year; and the Gaslight and Coke Company fitted up a bungalow at the Shepherd's Bush Exhibition. An innovation is the Gas House of the South Metropolitan Gas Company in a developing part of their area. Show-rooms, too, are on a more elaborate and attractive scale than formerly. But the largest amount of work, and the best all round, has been by getting into personal contact with consumers present and prospective, and by means of advertising in the general and local press. All such enterprise is not only welcome, but needful.

THE BUSINESS OF THE YEAR.

As to gas-consumption results, experiences have been vastly divergent in the year as between one district and another. Price no doubt has a part in this; but examination of the records leaves little doubt that local conditions in regard to building development and depression of particular trades are the dominating factors in the situation. It is true that the inverted incandescent burner continues to exert a reducing influence upon consumption per customer; but, on the other hand, all round, new connections for lighting, heating, cooking, and industrial purposes, are being made

without any interruption. The shifting propensity of some householders has resulted in many "empties" in certain districts in London; and these, combined with depressed trade, have caused the consumption returns of the more important London Companies to only about maintain a constant level. The figures might have been worse had not the weather been generally damp and cheerless, almost through the year. But for the past half year, we shall not be surprised to hear that there has been a better showing in the matter of increase than for some time past. In the suburban areas, generally speaking, the consumption position was good, though not in all cases; in the others, the percentage increases continued on the high ground to which they had reached in preceding years. Farther afield, though the rates of increase were not commonly of a large order, the companies showed, as a rule, satisfactory progress; but many municipal authorities in the big industrial areas presented rather bad records, particularly in the textile districts, thus continuing the tale of depressed business portrayed in the Board of Trade gas undertakings returns for 1908-9 issued and reviewed in our columns quite recently. There have been two sets of these returns issued during the year—the department having made a successful effort to ensure that the complaints of dilatory compilation and publication should cease. It is not asked that the record made by the last issue should be beaten; but it is hoped it will be maintained. We will not draw attention to the figures in the returns, as they have been so lately discussed. Returning for the moment to Metropolitan Gas Supply, it should be said that the Gaslight and Coke Company made during the year further marked strides in that financial rehabilitation that set in with the accession of Mr. Corbet Woodall to the Governorship and the infusion of new blood into the administrative work, and with the greater freedom accorded by the administration to the technical staff, under the headship of Mr. T. Goulden. Lower priced gas, higher dividends, and the workers brought under a co-partnership scheme, are of the fruits of achievement—all contributing parties to prosperity are sharing in them. In the South Metropolitan Company, the two great events of the year were the first appearance before the proprietors of Mr. Charles Carpenter as Chairman, and the remarkable increase in the production of gas per ton of coal carbonized, which alone made a striking difference in the Company's financial showing.

Looking farther afield, the reports from abroad (save from South Africa) indicated that the gas business was flourishing almost everywhere. Australia showed that a big step had been made in the return to more prosperous times in trade generally, in which changed condition the gas undertakings participated. A remarkable instance of the recuperative power of a gas undertaking was presented in an article by Mr. P. Holmes Hunt, in which it was seen how the business of the Metropolitan Gas Company of Melbourne fell off by no less than 45 per cent. between 1891 and 1897, through the then prevalent cloud of depression over Australia. But by 1908, there had been recovery by about two-thirds of this. Towards the end of this year, however, Australia had to suffer the trials and set-back of a coal strike; but fortunately, at the time of writing, a settlement is well within sight. Speaking of supply abroad, the notable amalgamation just effected of the interests of the Buenos Ayres (New) Gas Company, the River Plate, and the Primitiva Companies in Buenos Ayres should be mentioned. Among other features of the year in home gas supply have been the very general reductions in the price of gas throughout the country—and as having achieved in this respect a distinguished position in London gas supply, the Wandsworth and Putney Company may here be specially mentioned for their current ordinary price of 1s. 11d. per 1000 cubic feet—the continued annexation of territory by gas companies, particularly provincial ones; and the consolidation of gas supply by the amalgamation of small concerns to larger ones. In this there is advantage all round, especially to the consumers in rural areas. Another feature is the increasing application by gas companies to Parliament for electricity supply powers. Two or three failures of gas supply had to be noted during the year—at Long Sutton, at Wigton, and a partial one at Sunderland. These are extraordinary occurrences in the gas industry. At Wigton, the cessation was brought about through the bursting of a water-main, and at Sunderland through an error of a water turn-cock. A more convenient position will not be found than this for referring to the question as to gas companies having been much exercised over the instructions of the Board of

Inland Revenue to their surveyors not to make them any allowance for depreciation in respect of income-tax. The matter has been much debated at meetings, and in our "Correspondence" and other columns. One peculiar feature is that what is denied to gas undertakings in this regard is to be allowed to electricity concerns. There is to be resistance; but no movement has yet taken place in making common cause in the matter.

Generally speaking, the conditions of industry in the year have been favourable to the purchase of materials. Contracts for gas coal were entered upon betimes in the spring; and, market quotations notwithstanding, the prices at which the contracts were finally settled were, as a rule, below those ruling in the year preceding. On the whole, however, market prices have been fairly well maintained—more owing to internal troubles than to those factors that usually influence the markets—and at the close of the year the figures show a little hardening compared with the beginning. This may be due to two or three causes. There are symptoms of improved trade; and there is the knowledge that the Coal Mines (Eight Hours) Act has been the cause of a restriction of output in certain of the coal-fields—more particularly South Wales. The Act has proved a veritable storm fiend. It has twice during the year brought us to the very brink of a national war between coal-masters and men; and it has caused several small local trials of strength. The Miners' Federation have been restless in this matter during the year. Recourse has been had by the South Wales miners to legal procedure to get an interpretation as to whether the extra hour's work on sixty days per year is within the determination of the masters without reference to the men. The men contended that the Act in this regard is merely permissive, and that it is within their option as to whether they work the extra hour. The matter has been carried to a higher tribunal than the Court of the Rhondda Stipendiary, who pronounced in favour of the masters; and his judgment has been upheld. In Scotland, there was a difference between masters and men as to the principle of a higher irreducible minimum wage per man per day. There were other points in dispute, but that was the chief issue. The parties were inflexible. A poll of miners throughout the country was taken to bring pressure to bear on the Scotch owners; with the result that 518,361 miners acquiesced in a national strike, as compared with only 62,980 against. The Scotch masters, rather than precipitate the country into a war that would have brought untold injury, in greater or less degree, to the whole nation, made terms with their men. It was feared there might be trouble when the Act came into force, on Jan. 1 next, in Durham and Northumberland; but at the eleventh hour there has been a settlement of terms between the Durham owners and miners. The London and Suburban Gas Companies using the River Thames are now, in common with other coal users, threatened with a tax, under the new Port of London dues, of 6d. per ton of coal; but the proposed schedule of dues is subject to inquiry and the hearing of parties opposing. Technically, in connection with coal, a feature of the year has been the research work on the gas-making properties of fuel at the Karlsruhe experimental works of the German Association of Gas and Water Engineers, and at the Federal Coal-Testing Laboratory at Zurich. Dealing with coal reminds also of the agitation in which gas undertakings took part as to railway demurrage charges in Scotland; and of the big inquiry before the Railway Commissioners as to railway charges for the conveyance of goods to and from the Birmingham Gas-Works. The results of the inquiry were gains by the Department on several points by agreement and concession; but, on the main question, the Railway Companies were adjudged to be within their rights. The discussion and the issue showed that what is legal in these matters is subject to a great deal of individual adjustment in respect of consideration for special services rendered either by the railway companies or at the gas-works.

Bye-products did not, as seen by the accounts of gas undertakings issued during the year, show up at all well; and had it not been for the lower price of coal and oil, and the improvement that many concerns achieved in their gas-manufacturing results, so causing coal and labour to cost less per unit of output, the bye-products position would have made the financial position of most concerns one that would have been anything but gratifying. However, the prices of coke during the year have not fluctuated greatly; and the prices of sulphate of ammonia at the beginning and the end of the year have resemblance. Tar and pitch are higher in

value now than they were in January. But the opening and closing prices for other products do not exhibit any remarkable variation. One matter in connection with bye-products has been forcibly brought before us during the year through the available channels of information—especially the returns obtained through the Census of Production Act, Messrs. Bradbury and Hirsch's sulphate of ammonia report, and the report of Mr. R. Forbes Carpenter, the Chief Inspector under the Alkali Works Regulation Act—and that is that the products from competing sources of supply are increasing largely, and that their prospective competing potentiality is considerable. This being so, as the late President of the Institution (Mr. Thomas Glover) and others have insisted, everything possible must be done to cultivate present sources of demand, and to encourage the opening up of new ones. The supply of coke in small quantities locally for domestic use has been tried, and found successful. A system of dry quenching of coke—"Charco"—was introduced during the year; the principal claimed merit of the system being the superior character of the resulting material for domestic fire-places. As to sulphate of ammonia, the Sulphate of Ammonia Committee continued their propaganda work; and they are striking out on new lines. They are with continental producers devoting attention to stimulating greater demand from distant parts of the world. But home producers should realize that it is folly to be niggardly where propaganda work is concerned. If it is worth doing at all, it is worth doing well. India, it is expected, will become a considerable consumer of sulphate of ammonia for sugar cane cultivation. It is largely employed for the purpose in the West Indies and Japan.

Tar cannot shift from itself the term of reproach among producers, "a drug in the market." From all quarters, there come reports of beneficial and satisfactory use for road-surfacing purposes. That use has extended considerably. Yet the market value of tar does not improve much. The use of tar for such an object as road-surfacing could hardly be expected to go forward without objection. The Thames Conservators consider the washings from tar-surfaced roads will prove detrimental to the river and its tributaries; fishermen in the Isle of Wight assert the destruction of rainbow trout through the same cause; and elsewhere—litigation is now proceeding—one cow is declared to have succumbed to the effects of drinking from a stream polluted by washings from tarred roads. The utilization of tar for heating purposes was again broached during the year; and there was a fair amount of ventilation of the subject at the meeting of the Société Technique. The Commercial Sections of the District Associations—the Southern one commenced operations during the year—unostentatiously did much good work during the twelve months. Advantage was taken of the meeting of the Institution of Gas Engineers to hold a conference of all the sections; and it is believed that the result will be the placing of the sections in still stronger position for effective work by the exchange of ideas and information throughout the country in matters of commercial interest and importance. Before quitting commercial questions and bye-products, just two or three words about the British Coalite Company, who are still developing financial responsibilities but comparatively little business; and what business has been done has been of a most unprofitable order. The gas industry is interested in the concern and the system from the two aspects of low-temperature carbonization and competition in the matter of products. The farther the gas industry has receded from low-temperature carbonization, the more prosperous it has become. The latest information about the Company appears in the last and this issue. At that we may leave the venture for the present.

A BLOT ON THE SCENE.

A full harvest of discontent, anger, and reproach has been reaped during the year in connection with the promotions, unsound to the very core, of certain City schemers. It is with profound regret that it has to be written in the history of an industry with, formerly, an unblemished name among investors, that it has been made the scene of so much jobbery. The revelations as to the methods of these promoters have been many in the course of the year. Scandalous tales were unfolded in the Amman Valley, Ticehurst, Rawcliffe, and other cases. There has been a crop of concerns before the Courts, issuing therefrom in the hands of receivers. Shareholders are angered at having been the victims of these cute deceivers. Nevertheless, there have

been fresh promotions; and a feverish anxiety has been displayed by the professional company sharpers to rake in still more money from the pockets of an innocent but unwise section of the public. Unfortunately, the Gaslight and Coke Company did not succeed in their appeal to the Courts in the matter of supplying lists of shareholders to company promoters, who purchase small holdings of shares in prosperous gas undertakings for the express purpose of taking advantage of the broadly-worded section in the Companies Clauses Consolidation Act, 1845. The Court held that it was not within its province to go into the motives of these mercenaries. More's the pity. Counteractive measures have therefore been necessary; and there have been widely circulated warnings to holders of shares in sound concerns to avoid new gas promotions until assured of their genuineness. One of the promoting rogues—the man Darby—who had been wanted by the law and had avoided its vengeance for a time, was arrested, and awarded three-and-a-half years' penal servitude. His confederates had previously met their deserts. There is complete agreement with the remark of the Attorney-General (Sir W. S. Robson, K.C.), at the annual meeting of the Bar, that "an attempt will have to be made to deal with the question of the Company law serving the purposes of fraud."

MUNICIPAL ADMINISTRATION.

Municipal administration of trading concerns was much in evidence during the year; and largely in connection with the devotion of the profits of lucrative gas undertakings to the aid of the rates. The unsoundness of the principle has been argued again and again; and the correctness of all local government work, other than trading enterprise, being a ratepayers' charge proportionately on a common basis, has been preached. Some alarm was aroused among those authorities who are the worst offenders, on Parliament last session introducing the principle of a limitation of gas profits in aid of the rates at Salford and Oldham (water as well in the latter case), together with the prohibition of free gas for public purposes. The Salford Corporation were so incensed at this interference with the licence in this matter that they withdrew their Bill rather than have to relinquish their freedom in robbing the gas consumers. A Bill of which they gave notice for the coming session has also since been withdrawn, in order to give an opportunity for discussing completely the position with the outside authorities concerned in last session's victory. Many municipal authorities will not—some few do—see that municipal service through trading enterprise should be rendered at the lowest possible price to the community. At Manchester, Mr. J. G. Newbigging, the Corporation Chief Gas Engineer, stood up boldly in defence of his department and of the gas consumers; making the startling announcement that between 1844 and 1909, no less than £2,918,585 had been transferred from gas profits in aid of the rates—a sum that considerably exceeds the total capital expenditure (£2,781,635) on manufacturing and distributing plant. There is no question that it is now felt by the Parliamentary authorities that more rigid control is requisite over municipal finance. This feeling has been engendered by the tremendous growth of the municipal debt, and the amount of the rateable burden, even in those cities and towns where profits of trading concerns are dipped into to succour the municipal exchequer. Meanwhile assessments of all private trading enterprises continue to ascend—where fairly, there is no objection; but valuations made on the part of assessment authorities are too frequently found on the side of attempted extortion.

At the same time, joint-stock enterprise is not allowed to exercise the right of the most humble ratepayer to cast a vote for representation. For this reason, we are glad to see an ever-increasing number of gas company representatives securing seats on the local governing bodies. The ill-fated Mercantile Companies Franchise Bill was introduced into Parliament during the session; but its introduction is about the last that was heard of it. Just one other matter in connection with municipal finance. A Select Committee of the House of Commons considered the question of the availability of municipal sinking funds as sources for exercising by local bodies new borrowing powers; and the finding was that, if properly safeguarded, the proposal was financially unobjectionable. There is a great weight of importance attaching to the words used—"if properly safeguarded." Birmingham gave an opportunity for having a tilt at that objectionable—and to officials personally very much so—practice of discussing in public every small increase of which

their Committees think them deserving; but the Gas Committee of the premier Midland city had to give way on this point of reform before the pressure brought to bear on them in the Council. Several feelers in various parts of the country were made regarding the views of ratepayers in the matter of purchasing gas-works; but gas undertakings find protection nowadays in the uncertainty, in the lay mind, as to the future of the gas industry in face of electrical competition. It is well. But it is not where municipal ownership of electric supply has led to the introduction of the system of boycotting gas for public purposes, which is a matter that has, with other questions affecting municipal administration, had consideration in earlier parts of this retrospect.

IN PARLIAMENT—CHANGING CONDITIONS.

Though the number of gas promotions in Parliament in the past session was not large, the enactments effected will have a most important bearing on the future of the gas industry. What has been done reflects the changing conditions of the latter, and the changing applications of gas. During the year we have had authoritative figures from Great Yarmouth, Norwich, and Felixstowe, showing that something like 50 per cent. of the gas distributed is consumed during the hours of daylight, and other computations are that 70 to 80 per cent. of the gas used for lighting is now consumed in incandescent burners. The figures are very significant. Illuminating power as a standard of the quality of gas is doomed. It may take time to effect the change, but come it will. The Gaslight and Coke Company, in the settlement of opposition to their Bill, providing for the annexation of the West Ham Gas Company—the first step in a greater project which will vastly alter the geographical face of the Metropolitan Gas Supply—and the reduction of the standard for their illuminating power from 16 to 14 candles, agreed with the County Council to the insertion in the Bill of a standard of calorific power, with penal testing. The dual test is the objectionable feature; but the agreement being made without the intervention of Parliament—without any compulsion on the part of Parliament—it will not be taken as a parliamentary precedent; and the Governor of the Company has protested strongly against it being so regarded. No doubt there will be attempts to make use of the introduction of the test, as was ineffectually done in the case of the Coatbridge Provisional Order. The terms of standard and penalties have been frequently brought to notice; and they do not require reiteration here. There is no doubt that the innovation will assist in hastening the abandonment of the illuminating power standard and the installation of a calorific one, suitable to the conditions of every undertaking. Statements by Professor Frank Clowes in "The Times," and by his Chief Assistant (Mr. J. H. Coste) in a paper before the Society of Chemical Industry, show how near the advisers of the County Council are to the passing-point from one standard to the other. That is hopeful. Complete freedom from illuminating power would tend to make more vigorous the attempts to adapt carbonizing processes to realizing the maximum quantity of marsh gas or methane in the constitution of the gas. The conditions that are favourable to the production of methane have, during the year, been discussed in the "JOURNAL" by Mr. Thomas Holgate. In considering the question of a calorific power standard on the available evidence, it has been suggested in the "JOURNAL," that gas undertakings should clearly refuse to work to a standard exceeding 500 B.Th.U. gross per cubic foot, or be penalized for gas which is not below 450 B.Th.U. gross.

In several Company and Local Authority Acts and Provisional Orders during the session, the illuminating power and testing of gas were fully dealt with. Where there were opponents they soon found their position untenable—Committees making it clear that they were not going to depart from the now well-established practice. The Bury Corporation were allowed to include in their Act a 12-candle standard. In a number of the Bills and Orders of which notice has been given for the coming session, the question will be discussed; and a move of distinct importance is found in the Bill promoted jointly by 47 Gas Companies, under the auspices of the Gas Companies' Protection Association, for the substitution of the "Metropolitan" No. 2 burner for the standard ones at present in use. While on this subject of illuminating power, we may here introduce a reference to the Memorandum issued by the National Physical Laboratory as to the proposed international unit of light, in reference to which reasons were subsequently

advanced in our columns as to why it should not be adopted without very serious consideration as to its merits. A distinct success, for which there has been long fighting, was gained in the past session by the insertion of stand-by clauses in the Heywood and Mountain Ash Acts; and in the same measures, unremunerative slot supplies were also provided for. The Alliance and Dublin Company obtained a many-featured Act; but a peculiar bargain was struck between them and the Corporation in connection with the illuminating power standard and burner, that the price to the consumers during the next triennial period should be governed by the cost of coal—in short, what was done constituted an undesirable (although temporary) amplification of the sliding-scale. Among the several gains, the Company had the old sulphur compounds clause ruled out of their restrictions. Incidentally, it is of interest to notice that the information came to hand recently that in only four States in America are there any regulations in regard to sulphur; and in two of them—Wisconsin and Massachusetts—there has lately been some relaxation. In dealing with municipal administration, mention has been made of the question of the limitation of profits appropriated to the rates in the case of municipal gas undertakings—a matter that on the Salford and Oldham Bills was dealt with respectively by a Committee of the House of Lords and by the Local Legislation Committee of the Commons. The Bury Corporation voluntarily agreed that in their case a moiety of surplus profits should be utilized for price reductions; the other part being handed over to the rates. The revived Daylight Bill came before a Select Committee, who, in view of the difficulty of reconciling several conflicting interests, recommended that legislation on the matter should not proceed. The promoters of the idea have not, however, abandoned their quest. Cincinnati (Ohio) has resolved to set the clock one hour ahead from May 1 to Oct. 1, commencing next year.

LEGAL MATTERS.

There have been no gas cases of really first-class importance in the Law Courts this year. The most important ones have had reference to valuation; and primary position in this respect must be given to the appeal of the Edinburgh and Leith Gas Commissioners. The two main issues in the case were whether or not, in arriving at the valuation of the undertaking on the revenue principle, the whole of the expenses of management, or only the portion applicable to a tenant, should be allowed as a deduction from the gross revenue; and whether or not, in allocating the total valuation over the three areas in which the undertaking lies, there falls to be taken into account the value of the land occupied by the gas-mains. As to the first issue, the Commissioners contended that the landlord's expenses of management should be allowed, as well as those of the tenant, and that the value of the land in which the mains are laid should be added to the structural cost of the whole undertaking. The Court was with the Commissioners on the first point, but against them on the second one. In an appeal to Quarter Sessions against their assessment, the Peterborough Gas Company were unsuccessful. Several Companies have on appeal to the Assessment Committees succeeded in composing their differences. The question of the supply of shareholders' lists to Company promoters has been dealt with in a previous place. At Dublin there was an attempt to make the Gas Company liable for an explosion of gas resulting after some cooking-stoves had been disconnected. The disconnection was made by one of the Company's men; but he was not then acting with the Company's authority, and, moreover, the jury found there was no negligence on his part in performing the work he was asked to do by someone acting on behalf of plaintiffs.

The Liverpool Gas Company were unfortunate in falling foul of two widows who had stumbled over excrescences in footpaths for which the Company were responsible. The Company were held liable for small amounts of damages for the injuries occasioned. A gas-main was damaged by a steam-roller at Uttoxeter; and the Council had to pay the expense of the repairs, as well as the law costs. The Bristol Gas Company had a passage of arms with the Tramways Company over the extra expenses incurred in connection with the gas distribution system by reason of the existence of the tramways. The Tramway Company are to bear the extra expenses. There were two or three gas workers' compensation cases, but of a character so insignificant as to be hardly worth mentioning. There were four instances of embezzlement—one at Margate, a second at Brentford, and

collectors at Sunderland and Chester were found erring. But over these cases a veil may be drawn. Those concerned have suffered, or are suffering still, the awarded punishments; and these stand as a warning. The case in which Mr. William Ewing has preferred a claim against the Greenock Corporation is still pending. In like position is the action in which a farmer is making a claim for the death of a cow, alleged to have been occasioned through drinking from a stream polluted, so it is suggested, by the washings from a tar-painted road. There was, as usual, a crop of cases in connection with illegal connections, stealing gas, and prepayment meter robberies. Some of the sentences passed were exemplary. Looking abroad, the Dessau Retort Company succeeded in getting a confirmation from the German Courts of the judgment of the Imperial Patent Office upholding their patents.

THE LABOUR OF THE INDUSTRY.

There is not much to be said regarding the industry's labour. The line of employment in the industry keeps as level and as high as in most industries; and, as a matter of fact, the industry under its changed circumstances employs more labour than it did under the old order of things. The conditions of employment, too, in regard to pay and privileges, are good. Comparatively speaking, it is a remarkably safe industry; the small number of compensation cases and the small number of fatalities—having regard to the extent of the industry—are the evidences. We hear, too, of few strikes in the British gas industry, which is indicative of an absence of discontent. At Castlebar, there was a strike of stokers during the year, resulting in the town being in darkness; but we have to go abroad for other instances. There were strikes of gas workers at Stockholm and at Rio de Janeiro; but the great strike in Italy overshadowed the others. At the bottom of it were socialistic demagogues and selfishness. Milan, Genoa, Alessandria, and Modena suffered. The strike was resolutely met by the Union des Gaz. The unreasonable demands of the men—demands that were as amusing as they were irrational—were firmly rejected; and the Union des Gaz issue from the struggle all the better for the fight and the understanding with their men.

From strife to peace. The co-partnership system has made big strides during the year. A list of co-partnership companies was published in our issue of Feb. 23 last. To that list we have to add Cardiff, Enfield, Grantham, Ilford, Watford, Wellingborough, and Weston-super-Mare. Then a bonus scheme has been adopted at Carmarthen; and employees are assisted to invest money at the Southend Gas-Works. At Watford, the men asked for a scheme of profit-sharing; and the Directors arranged to get one into operation before the end of this year. That is what it will come to more generally; if not, then Socialism will grow apace. The Gaslight and Coke Company's scheme was successfully brought into operation during the year; and, with it, the whole of London's gas supply has been placed in the hands of co-partnership gas-workers. At the co-partnership dinner of the South Metropolitan and South Suburban Companies, held under the Chairmanship of Mr. Charles Carpenter, Mr. Charles Hunt made the suggestion as to whether, with co-partnership in all the London works and so many of the suburban ones, it would not be possible to enlarge the annual gathering so as to make it representative of all the co-partnership gas companies in and around London. From all quarters where co-partnership lives, good reports come as to its influences and results. There was not a single exception. At the South Suburban works, a bust of the great pioneer of co-partnership in the gas industry, Sir George Livesey, was unveiled; and an announcement has been made that Mr. Pomeroy's statue of Sir George for the South Metropolitan Company will be exhibited at the Royal Academy next year, and will be erected at the Old Kent Road works in the summer. Only from half-a-dozen places or so did any news come of applications being made for an advance in wages of the workers of one grade or another. These were all in connection with local authority undertakings (probably we do not hear of applications in connection with gas companies' works); and were not of great moment. Refusals in most cases, and compromise in one or two; and the affairs dropped out of sight.

We will only notice two or three general labour points. The Board of Trade issued the regulations governing the procedure of the newly established labour arbitration courts. The gas industry is not very likely—and more especially the

co-partnership section—to trouble these arbitration courts. The President of the Board also published his unemployment insurance scheme, which he suggests should be compulsory and contributory—contributions to be from masters, men, and the State. Revolutionary Socialism, represented by Mr. Will Thorne, the Secretary of the Gas Workers' Union, says that the whole cost should be borne by the State, as in the case of old-age pensions; and he advises gas workers, if the scheme develops, to resist deductions from their wages for the purpose of insurance. Most honest gas workers can do without an insurance scheme of the kind. A report that was issued by the Royal Commissioners on the Poor Law, dealt in one part with the question of labour and machinery, and stated that the Commissioners could not find that machinery caused contraction of labour, but only displacement. An important general matter in regard to labour has been the question of the maintenance of representatives in Parliament by compulsory levies on the members of Trade Unions. It has been declared illegal through the Courts up to the House of Lords; and so anything that is done in this way now can only be by voluntary contribution. The importance, from the Trade Union leaders' point of view, of the levy being compulsory is attested by the carrying of the matter to the final tribunal. Uneasiness has been created in the unionist ranks; and already the Joint Board representing the Parliamentary Committee of the Trades Union Congress, the General Federation of Labour Unions, and the Labour Party, have held a meeting to discuss the situation. Counsel's opinion is to be taken, to ascertain the exact legal position and the best way of dealing with the question generally. It is held by the leaders that, if there cannot be parliamentary representation, there must be a reversion to strikes. But at the present time it seems to us that labour has both parliamentary representation and the power to strike in their hands; and there is no hesitation in making use of both, as occasion dictates.

SPECIAL TECHNICAL EDUCATION.

Diverting thoughts now from matters commercial, administrative, and legislative to those of technical concern, educational matters first claim passing mention. Steps were early taken to give effect to the decision, at the close of 1908, to establish a Livesey Memorial Fund, and to devote it to the endowment of the Chair of Fuel and Gas Engineering at the Leeds University. It was not, however, until the June meeting of the Institution that the President (Mr. Thomas Glover) was able to announce that £10,000 had been reached; and in our issue for July 27 there was published a complete list of subscriptions, amounting to £10,189. There has been no recent information as to whether or not the fund has been finally closed. Early in the year Dr. H. G. Colman gave a series of lectures on gas manufacture at the Leeds University, and Mr. Walter Hole a series on Gas Distribution—both being well attended by students. Arrangements for lectures in the coming term have been made; and in dealing with the subject lately, it was shown in our columns that the projects of Dr. Bone and his colleagues are being framed with the view of making the department of educational service to as large a section as possible of those who are qualifying for official positions in the gas industry. At the Institution meeting in June, there were given, in two papers, the results of research that had been conducted in the laboratories of the department. Most other technical centres at which gas manufacture, distribution, and chemistry have part in the curriculum, have been well patronized by students. So were the examinations in gas manufacture and supply. A large number of students gained certificates; but the examiners—Mr. W. Doig Gibb in Gas Manufacture, and Mr. J. H. Brearley in Gas Supply—were not at all pleased over the large proportion of candidates who presented themselves palpably unprepared for examination. Several gas-works provide facilities for the technical instruction of their men; this being a matter that has frequently come to the front in the course of the year. Technical education had place in various presidential deliverances; and Mr. Corbet Woodall gave expression to his views in an address to the Southern Junior Association. Consider all this, and then the amount of encouragement offered by the Ramsgate Corporation for an accomplished assistant in the Gas and Water Department at 30s. a week!

WORK OF THE TECHNICAL ORGANIZATIONS.

Scientific education and the work of the Junior Associations combined must have effect in gradually elevating the

character of the work of the technical organizations generally. Looking back over the work of the year—at the proceedings of the Institution, at the quality of the papers before the Junior Associations, and considering also the transfers from the junior organizations (on official promotion) to the senior organizations—it is apparent that there will soon be, insensibly it may be, a change come over the proceedings of the technical organizations. To scan only hastily the great variety of subject-matter that has occupied the consideration of the organizations during the year would occupy more space than we can devote to it. But certain features may be lightly touched upon. It was an excellent meeting that the Institution held in June under the presidency of Mr. Thomas Glover, whose address was of a far-sighted character. He urged greater consideration of the competition that has arisen in the bye-products market, and preparedness for meeting both the immediate and the more remote consequences in the matter of the curtailment of present markets. He also brought before the members the results of the working of his 3 feet deep chamber settings at Norwich, which the members had an opportunity of inspecting on their visit later in the week of the meeting. Carbonization, conveying, and financial questions occupied a large part of the proceedings on the same occasion; and there was also much interest evinced in the papers from the Leeds University, detailing the progress of the gas-heating research, and giving an account of investigations on calorific value and mantle efficiency. The District Associations contributed largely to the technical pabulum of the year; and the output of the Junior Associations was somewhat remarkable. Some of the papers could indeed with advantage have been curtailed. But at the same time, it has been pleasing to see the broad and enlightened view taken of the affairs of the industry by the members.

The Society of British Gas Industries had a successful year, under the presidency of Mr. Thomas Newbigging. The value of co-operation, and the relations of engineers and contractors, were subjects upon which the mature wisdom of the President was brought to bear in his addresses to the members. In collaboration with the Institution, a model set of contract clauses (which are generally voted as acceptable by the contracting parties) have been formulated. In connection with the subject of gas-heating (which is very much to the front now) a paper of exceptional merit on the smoke nuisance was contributed to the proceedings of the Society by Mr. C. E. Brackenbury. The Illuminating Engineering Society publicly inaugurated its work with an eloquent and instructive discourse by Professor Silvanus P. Thompson. Within view of our readers were brought the proceedings of the French, German, American, and Victorian Gas Associations. Perhaps we may be allowed to single out from the technical literature from abroad the meritorious research contributions to the American Gas Institute from the Illinois Gas Association upon the compression and transmission of gases. But with all this technical organization and discussion, the question has been asked, so far as the home industry is concerned, Is existing organization complete and effective for all purposes? The matter was discussed in the "JOURNAL" for July 20. The President of the Institution (Mr. James W. Helps), speaking at the autumn meeting of the Midland Gas Association, stated that he was not at all satisfied that the organization of the industry was what it ought to be; and he hoped to make a suggestion during his year of office to the end of increasing the usefulness of the Institution. In concluding this hasty glance at the work of our technical organizations, let us apply to it simple but expressive words from the presidential address of Sir J. J. Thomson to the British Association: "There were never any signs of an approach to finality in science. As we conquer peak after peak, we see in front of us regions full of interest and beauty. But we do not see our goal; we do not see the horizon. In the distance tower still higher peaks, which will yield to those who ascend them still wider prospects."

CARBONIZATION—TECHNICAL DEVELOPMENTS.

In the forefront of technical consideration throughout the year has been the question of carbonization. Economy lies not only in direct actual savings, but in increasing product from any source of useful output. While in the utilization of gas, work has been successfully directed to the production of greater efficiency from appliances, vigour has been applied to the realizing of a greater yield of gas per ton of coal carbonized. The simplest means of doing this are avail-

able in the heavier charge, and the longer duration of carbonization. The paper of the year upon this subject was contributed to the Institution meeting by Mr. J. Ferguson Bell. From all quarters of the country have come reports of the successes from the application of the method—of resulting economy in coal, of increased makes of gas per ton, and of other beneficial concomitants. The final of the classical writings of the late Mr. William Young on the subject of carbonization were published by us early in the year. They dealt with a projected system for the better conservation and more economical utilization of heat in carbonization, in connection with which was combined a process by Mr. John Hammond for partially purifying coal gas by conjoining the production of caustic ammonia for the purpose of manufacturing sulphate from ammoniacal liquor. The vertical retort maintains a large place in the thoughts of gas technicians; and added attention was bestowed upon the rival intermittent and continuous systems by the installation of the Dessau bench at Sunderland, the Woodall-Duckham benches at Kensal Green and Burnley, and by the description of, and results secured from various coals carbonized in, the Glover-West settings at St. Helens. The features and results are present in the minds of all interested readers; and they need no recapitulating here. There was much controversy among our Continental friends as to the relative advantages of the admission of steam into vertical retorts and the production of water gas in some independent plant. Views in this country rather side with the disputants who hold the latter opinion. Coke-oven and chamber setting work were kept well to the front in our pages; Dr. Lessing's account submitted at the Gas Institution meeting as to the position occupied by chamber work on the Continent forming a valuable contribution to the literature of the subject through the compendious treatment of the facts. Chamber settings for gas-manufacturing purposes have not as yet found favour in this country, excepting the chambers of restricted scale that Mr. Glover has put in at Norwich. The reasons are too extensive for review in a retrospect. Following on Mr. F. W. Bywater's 1908 Institution paper, a Committee has been formed, with Sub-Committees representing various interests, to consider the subject of refractory materials. One of the Sub-Committees represents the gas industry. Mr. W. R. Herring has suggested that the Committee should collect data as to the causes affecting the durability of retorts, so as to enable a fair and impartial judgment being arrived at regarding the relative merits of British and German retorts. Controversy was reopened on the subject during the year by the announcement of Mr. Charles Carpenter that the South Metropolitan Company had given out an order for retorts to Germany, on the score of quality, and not of price. The Refractory Committee set to work at the close of the year collecting information that would assist them in their labours.

It cannot be said that new constructional work at home has been of large magnitude during the year, though our pages have, as usual, been enriched by illustrated descriptions of reconstruction and extension work. We will not enumerate them; they cover all parts of plant from retort-settings—horizontal and vertical—to the new gasholder tank at the Bradford Road works of the Manchester Corporation, to accommodate a $10\frac{1}{2}$ million cubic feet holder, the $3\frac{1}{2}$ million Gadd and Mason spiral-guided holder at Newcastle-on-Tyne, and the 1 million four-lift spiral-guided holder at Montreal. The plants described have also included some instances of Continental work; one highly interesting article coming from Melbourne. We must not omit to acknowledge the immense interest that attached to the unique series of illustrated articles contributed to our columns by Mr. Maurice Graham, during the progress of his trip round the world. They brought British gas men into closer touch with the men, the practices, and the difficulties of the gas industry in far-off lands in a manner that had never been done before.

Associated with processes other than carbonization, it is of interest to note the use of a pulsometer (whereby water is saved) for quenching coke, as well as the "Charco" system of dry quenching, both of which were described in our columns. There has been renewed interest in purification. Revived was the question of purification by means of ammonia in the posthumous articles of Mr. William Young, in which system Mr. John Hammond is concerned. The greatest novelty in actual being is the Feld plant at the East Hull Gas Company's works for the elimination of sulphuretted hydrogen and the recovery of sulphur as a bye-

product. The functions of the plant, as Herr Feld showed in a special article in these columns, have been extended to the extraction simultaneously of ammonia and sulphuretted hydrogen, with the oxidation of the latter into sulphuric acid. There has also been described the "Burkheiser" process of purifying the gases of dry distillation with the simultaneous production of sulphate of ammonia, without adding any acids. The proposals are attractive; but there is a desire for further actual working information. This outline of work shows the active quest for greater economies in the processes of gas manufacture.

In regard to the distribution department, glancing through the records of the year, it is noticeable how largely the use of steel mains is spreading, and how considerably, throughout the world, high pressures are being made use of in the conveyance of gas. American tests on the corrosion of steel and wrought-iron pipes led to the conclusion that good modern steel is more resistive than wrought iron. One feature of parliamentary work has connection with gas-mains, owing to the unreasonable depths to which road authorities, in view of the steam-roller, seek to enforce the laying of pipes. An instance is found in the Aldershot Act of the session. Much information on the subject of electrolysis has come to hand from America during the year.

OFFICIAL CHANGES.

The official changes of the year have been numerous; and to chronicle them all in this retrospect would be an unnecessary work, in view of the fact that they are so easily referred to in the indices to the quarterly volumes of the "JOURNAL." Thankful are we to be able to say that the vacancies that have occurred, and have made places for promotion, are not all due to death. Several well-known men have relinquished office after long careers of loyal service, and thus have opened the way to promotion in the official ranks. All who have secured appointments that have bettered their place in the work of the industry, however high or however low, have our heartiest congratulations and good wishes. A popular appointment in engineering circles was that of Mr. W. Doig Gibb to the Chief Engineership of the South Metropolitan Gas Company; a fit successor to his work at Newcastle being Mr. T. Hardie. Upon Mr. Henry Sutton Reeson was conferred the Chief Distributing Engineership of the Gaslight and Coke Company. Mr. G. Thornton Andrews succeeded his father at Swansea. A number of gentlemen who had previously occupied junior positions gained places of full responsibility. Gas officials should make good Directors; so thought the Board of the Brentford Gas Company when they selected Mr. D. Milne Watson, the General Manager of the Gaslight and Coke Company, for a place on the directorate, so thought too the Board of the Ilford Gas Company when they welcomed their late Engineer (Mr. A. A. Johnstone) to their counsels. Among the resignations of the year were: The veteran Mr. Charles Nickson, from the Superintendentship of the Manchester Corporation Gas Department (his successor being his well-tried assistant, Mr. F. A. Price); and Mr. G. F. L. Foulger (under circumstances well known), from the Chief Engineership of the Distributing Department of the Gaslight and Coke Company. Other retirements from engineership or secretaryship were: Mr. C. E. Ball, of Ilfracombe; Mr. Alexander Bell, of Dalkeith; Mr. William Cash (appointed Director of the Bournemouth Company on resigning the Secretaryship, to which Mr. H. A. Plumb succeeded); Mr. John Laycock, of Keighley (retained as Consulting Engineer); Mr. Henry Morley, of Cardiff (succeeded by Mr. H. D. Madden); Mr. W. A. Padfield, of Exeter; Mr. W. H. Pearson, of Toronto; Mr. J. W. C. Pennington, of Colwyn Bay; Mr. C. P. Poole, of Madeley, Salop; Mr. E. C. Riley, of Swindon (G.W. Railway); and Mr. William Smith, of Bolton (who is succeeded by his son, Mr. William J. Smith).

THE CEASELESS HAND.

There is a disposition to postpone to the end the most regretful parts of the annual task. Through the portals of the vast and mysterious eternity, there have passed, during the year, some who have been near and dear to many of us, and several who have occupied places in the administrative, technical, and manufacturing work of the industry both at home and abroad. We will not stay to discriminate position, or give precedence in mundane rank. Death levels all men. Mention of some of the names will suffice to those who knew the men to, in memory, place them in the scenes of former activity—scenes in some cases (through retire-

ment) not of the immediate past. Here is the roll in alphabetical order: Mr. G. Hampton Barber, Mr. Thomas Bull, Mr. Josiah Chandler, Mr. John Clark, Mr. T. J. Cotton, Mr. John H. Cox, Mr. A. C. Craven, Mr. James S. E. Drory, Mr. R. S. Field, Herr Adolf Graetz, Mr. John Hutchinson, Mr. George Keyte, Herr Aug. Klönne, Mr. Matthew Leaf, Mr. F. H. Lester, Mr. Joseph Mackay, Mr. George Malam, Mr. John Marsland, Mr. John Meiklejohn, Mr. D. Coates Niven, Mr. James Pye, Mr. Alfred Richards, Mr. George Smedley, Mr. John Tindall, Mr. W. A. McIntosh Valon, and Mr. J. Walker. Among those who held prominent positions on directorates may be mentioned Sir John Baker, Sir J. Colomb, Sir Edward Lawrence, Mr. Richard Laybourne, Mr. J. Spencer Phillips, Alderman S. Lee Rymer, and Mr. Howard Charles Ward. Loved in life and memory by all who knew her, Lady Livesey was laid to her final rest with Sir George in January—only a few weeks separating the two in life.

ACCIDENTS, AND OTHERWISE.

Considering the extent of the British gas industry, fatal accidents in it are comparatively few and far between. But the year has been marred by some terrible disasters abroad. There was the Messina earthquake with all its tragic consequences, among them being the death of the Manager of the gas-works, his family, and a number of the workmen, together with the partial wrecking of the works and distribution system. There was the lamentable explosion at the Geneva gas-works, whereby several lives were lost, and a tremendous wrecking of gas-works property occurred; but we are still awaiting the official report, which, it is hoped, will clear away assumptions, and give the industry a positive explanation as to the cause. At Hamburg, there was the great fire, spreading appalling destruction to life and property around, through the accident to the new 7,060,000 cubic feet holder built on the raised tank plan with vaults beneath. The information to hand is all fresh in memory; and here again the official inquiry is being awaited with interest. Injuries to workmen were occasioned at Adderley Street works, Birmingham, and at Hanley Gas-Works, through mishaps in the course of purifier operations. It is time consideration was given to a method of clearing residual gases out of purifiers before being opened. We should then hear less of gassings and casualties than now. All told, we only had to record ten other fatalities on gas-works or in pipe-laying operations. Other accidents on home gas-works were so trifling as not to be worth mention. The Factory Department of the Home Office issued a memorandum recommending that the employees in works where water gas is made should have special training in first aid, consisting primarily in the prompt administration of oxygen and warmth and in artificial respiration in cases of danger. During the year, only one fatality was reported in our columns in which water gas was directly involved. That was at Lausanne, where a workman was poisoned by carbon monoxide while engaged cleaning out a superheater. The destruction of the Clacton Flour Mills (causing an estimated loss of some £8000) was attributed to a suction-gas plant; and intelligence of one or two cases of poisoning through such plants reached us.

The explosion in the Grange Road, Bermondsey, when three lives were lost, was occasioned by a concatenation of favourable contributory conditions: A water-main was broken, the support was washed away from a gas-pipe, fracture followed, and a derelict sewer served as a store for the accumulation of an explosive mixture. The question of responsibility has been discussed; but in the result the London County Council, the South Metropolitan Gas Company, and the Metropolitan Water Board have joined hands in settling the financial matter. Most gas explosions are caused by gross carelessness. A post office employee descends a shaft, in which he has previously noticed gas, with a lighted candle. Consequently an explosion occurs near Blackfriars Bridge; and the whole world hears of it. An owner of a house near Hayes smells gas for days; the warning goes unheeded. An explosion occurs; and the whole world receives intimation of it. Nine or ten gas explosions were recorded during the year; unfortunately, with fatal results in two or three cases. A steam-roller working at Plymouth caused a gas-leakage, one effect of which was the death of a woman. A big explosion was caused at Manchester through the fusing of electric wires and gas-pipes; and a round dozen electric light box explosions were recorded in our pages in the course

of the year. But these probably were only a few of the actual occurrences. A couple of chandeliers were responsible for suffocations, which remind of the excellent work done in free conversion of these unsafe antiquities by the South Metropolitan Gas Company. There were 45 cases of suicide by gas and even one of murder in the course of the twelve-month. This state of things Dr. Waldo, the City Coroner, attributes to the increased difficulty in the way of purchasing poisons. Other cases recorded of gas poisoning number 35; and these may generally be said to be due to carelessness and defective fittings.

THE FUTURE.

This ends our review of the year now nearing its close. The impression that rests upon one, as a general survey is made of what has been written, is that the industry is largely gaining in strength by its own internal and technical progressiveness. The industry itself is old; but its methods and services are distinctly modern. And the daily accretion of experience of those modern methods and services accentuates perception as to the destiny of the industry. This being so, let one and all engaged in its work go forward with the fervent desire to do the best possible to contribute to the well-being of its future. With the sense of individual responsibility upon us, supported by activity, much can be done. In the spirit of these thoughts, sincerely do we wish all our readers

HAPPINESS AND PROSPERITY IN THE COMING YEAR.

Advantages of Co-Partnership.

It was an excellent address that Mr. W. H. Lever, M.P., recently delivered to the Woolwich Chamber of Commerce on the subject of profit-sharing; and his remarks assume even greater value when it is considered that he spoke from actual experience. Theory is all very well, and, of course, for the starting of new ideas, there is nothing else to be obtained; but now it is to established successes that co-partnership looks to secure still wider adoption. In the first place, Mr. Lever divides the forces that go to production into three—Capital, Labour, and Management, and not merely the two former, as is often done. The three, he rightly points out, must, if any good is to be done, work together, to one common end, on lines of enlightened self-interest, and not on the lines of narrow personal selfishness. To this end, he adopted in his own business a scheme of profit-sharing consisting of the issue of partnership certificates which would receive dividends at the same rate as the ordinary shares of the Company, less 5 per cent. Thus, if ordinary shares received in any year 10 per cent., the certificates would get 5 per cent. If a workman wishes to be on exactly the same footing as the ordinary shareholder, he can go and buy 5 per cent. preference shares on the market, pin his preference share certificate to his partnership certificate, and the 5 per cent. he gets on the preference shares, added to the dividend he receives on his partnership certificate, will make him rank for dividend the same as the ordinary shareholder, but with the advantage of better security. Mr. Lever created £500,000 partnership certificates; and though they do not represent cash, he has been assured by brokers that they would readily sell at par value, with the conditions attached to them, if they were on the market and saleable—which they are not. The rule which has been followed is to issue an amount equal to 10 per cent. of a man's or woman's salary or wages of these partnership certificates each year. Both sexes are qualified to become partners when 25 years of age, after five years' service with the firm. The certificates can be cancelled through wilful misconduct, or if the holder voluntarily leaves the Company's employ; and for these two reasons only. If his health breaks down, and he leaves, or if he arrives at the age of 65, partnership certificates are then exchanged for preferential certificates; and, assuming that the partnership certificates have been receiving 10 per cent., the preferential certificates receive 5 per cent. for the remainder of the holder's life. If he dies, they are transferred to the widow for the remainder of her life. If a man dies while in active service with the firm, his partnership certificates are transferred to the widow on the basis of preferential certificates. This scheme Mr. Lever believes promises well for the employer because it gives to the employee freer scope for the exercise of his abilities, and makes him a better man; the worries and cares of management ought also to be relieved by it; while to the employees it offers a ladder by which

to raise themselves out their present troubles and difficulties. No hint at any failure so far, in any direction, is to be found in the address; so that Mr. Lever's scheme may be regarded as one more instance of the successful application of profit-sharing principles to industrial undertakings.

"Good-Bye."

Though at the conclusion of the final meeting of shareholders in the West Ham Gas Company on Tuesday last, the Chairman (Mr. J. Lister Godlee) bid those present "Good-bye" so far as that Company is concerned, he did not do so in any other sense; for he is in hopes of meeting them often in future at the half-yearly gatherings of proprietors in the Gaslight and Coke Company—of which he has been elected a Director. On the 31st inst., the West Ham Gas Company will cease to have a separate existence, and will become part of the undertaking of the Gaslight and Coke Company; and last week's meeting was held in accordance with a previous promise that the Board would take an opportunity of laying before the shareholders an account of the proceedings during the intervening period. There were no accounts to be presented; and there was no dividend to be declared. A statement of accounts for the present six months will, however, be prepared by the officials in due course, and distributed by the Gaslight and Coke Company together with a statement as to the proposed dividend. The nature of the information which the Chairman was able to give his audience was such as they have been well accustomed to—namely, that during the past five months the business of the Company has made steady and satisfactory progress, the sales of gas having been nearly 6 per cent. more than those in the corresponding period of the previous year. But it may be said that the chief interest of those present centred in an interesting account of the origin and early days of the undertaking, which was given them by Mr. Godlee. From 1846 to 1909 is a far cry; but this is the length of the existence of the West Ham Gas Company. An Act of 1856 incorporated the Company, which had then a capital of about £14,000, with £13,000 more borrowed; while the capital to-day is £1,441,000. In 1860, the quantity of gas sold was 53 million cubic feet; and this figure has now increased to 2007 millions. Along with this growth, the price of gas has naturally been reduced; so that there has been gain all round. The Chairman stated that he wanted the proprietors to feel proud of the Company; and this is a desire about the attainment of which there should be no doubt, when the brilliant record of the undertaking is considered. It is gratifying to note that a full share of credit was given to the officials for the part they have taken in making the undertaking a success; and the proprietors will rejoice with the Board that the financial arrangements have permitted of tangible recognition of these services being made. The complimentary remarks which were passed with regard to the work of the Board—particularly that of the Chairman—were also unanimously felt to be thoroughly well deserved.

Wiping Out Competition in Buenos Ayres.

From Saturday next the gas supply of the City of Buenos Ayres will be under one administration; debenture holders and shareholders of the three great Gas Companies—the River Plate, the Buenos Ayres (New), and the Primitiva—having agreed to amalgamate. By the Chairman of the last-named Company (Mr. H. E. Jones) there has been, at the meetings for some years past, insistence on the policy of consolidation being the correct one; and in the extremity of their difficulty with the Municipality, the other Companies have subscribed to the wisdom of this. The several meetings—there were five of them—at which the debenture holders and shareholders of the Companies unanimously passed the provisional agreements were held last Tuesday; and, as far as possible in our reports of the proceedings, we have abstained from reiteration of information given at the preceding meetings. Gas supply in Buenos Ayres has been in a constant state of disturbance as long as the oldest administrator of any one of the Companies can remember; and (to meet the demands of the Municipality) the only course to a peaceful solution of many differences, including a cheaper supply of gas to the citizens, lay in the economies to be achieved by supplanting competition by a common and single interest. The history of competitive gas supply has repeated itself in Buenos Ayres; the competition has not been to the advantage of the citizens. It has,

though carried on in friendly manner, caused the service of gas to be a more costly matter than it need have been if the greater outlay—waste, we might say—necessitated by competition had not been incurred. But competition has come to an end; and, under the new conditions, it will be supremely interesting to watch the developments of the future. The debenture holders and shareholders in all the Companies have had their interests fully safeguarded in the scheme for the fusion of interests. What has been done is as popular with them as it is in the stock markets, where there has been a good appreciation of the prices of the stocks and shares. It is recognized on every hand that certainty for at least twenty years takes the place of the old uncertainty; and this is worth much. Of the consolidated Company, Mr. A. E. Bowen (the Chairman of the River Plate Company) is to be Chairman; while the Chairman of the old Primitiva Company (Mr. H. E. Jones) and the Chairman of the Buenos Ayres Company (Mr. J. C. im Thurn) will be Vice-Chairmen. At present the management will continue much as now; but eventually centralization of the executive and technical work will no doubt take place, with consolidation of staffs. Some of those holding office at present will ultimately have to go; but we feel sure there will be liberal compensation in store for them. The Secretary of the enlarged concern will be Mr. J. M. Macmorran, the present Secretary of the Buenos Ayres (New) Company.

Coalite Working Costs not Known.

Before such ardent worship of the coalite process, and such fervent belief, as was witnessed by the shareholders of the British Coalite Company when Sir William H. Preece, K.C.B., F.R.S., was addressing them last Tuesday, all criticism if it be not favourable must pale. No profits have as yet been earned by the Company, no profit and loss account of working has as yet been made up, and the long period since the Company started has been devoted to transforming the plant, and to experimental work only. But such is human prescience that Sir William was able to say that the Company "have turned the corner," and are "about to enter the profit-making stage!" Happy thought; unhappy will be the Directors if they have to appear before the shareholders a year hence with a balance-sheet showing conclusively that the process is an economic failure! The experimental and development stage will not be a creditable excuse much longer. The Chairman's explanation of the apparent loss on the sales of coalite and bye-products, when the receipts are compared with the cost of coal, &c.—amounting to £16,326—was a work of art. If we construe his words rightly, the accounts are merely a chaotic representation of the financial position of working during the experimental and constructional period; and the statement of receipts and expenditure must not be taken to be in any way a profit and loss account. That is the interpretation of a statement in Sir William's address; and to it there has to be added another appearing in the final part of his reply to shareholders' inquiries. He said: "I was asked if we are making a profit at Plymouth; but the fact is we have not yet made a profit and loss account in connection with any of the works." Whence then comes the confidence for the statement that the Company are about to enter the profit-making stage? According to Sir William's admission, the Directors and their technical advisers cannot know whether or not they have in hand a profitable system. We have before said that figures that have been published regarding the working of the system are incomplete; and Sir William in what he says supports the assertion. But why has no profit and loss account of working been made out yet? seeing that the Chairman asserts that coalite is being produced at the rate of 400 tons a day, which represents the carbonization of a much greater quantity of coal than that. Surely that is a sufficient scale of working upon which to have tested the financial aspect of working.

Coalite Gas and Gas Undertakings.

The Chairman's speech was constructed in a manner that did not hang well together. He is very sanguine; but no profit and loss account of working has been evolved. He excuses the position, and discounts his confidence, by declaring that the coalite industry is still a new one, based on novel scientific principles. Novel and scientific principles! An excellent phrase truly for a meeting of fuel consumers, but not for expert fuel producers. Perhaps Sir William has not heard of the use of small iron retorts

in the early days of the gas industry, and of the carbonization in them of light charges of coal at low temperatures. But though there has been all this delay, we have his word for it that no difficulty has arisen that has not been easily surmounted. Why then so much delay? A shareholder appeared to be mystified over finding that the offer such as that represented by the Plymouth terms had not been widely "considered," and adopted by gas companies generally. Another shareholder put the pertinent question as to why the Gaslight and Coke Company "were allowed to make carbo, if it was so much like coalite. Moreover if carbo could be supplied, why not coalite?" The Chairman skipped with remarkable agility over these awkward points. The process has been well considered by gas companies; and interesting efforts were made to land some big fish to freshen up things a bit before this meeting of shareholders. But there was failure of the effort. The Plymouth and Hythe installations sum up, as they did some time since, the only gas-works on which there are installations of the plant. If gas undertakings must use small iron retorts, low temperatures, light charges, and short-hour carbonization, there is absolutely nothing to prevent a reversion to the conditions of the early days of the gas industry. Sir William's short answer to the shareholder might have been that there is really nothing in the way of gas companies turning out material, if they feel so disposed, precisely similar to that produced by the Coalite Company. As the Chairman confessed, the Gaslight Company, "with their existing plant," are able to obtain something that is not very unlike coalite when burned as a fuel; but in saying this he went too far, and so added "it is infinitely inferior." It was stated by one speaker at the meeting that the Plymouth terms are still open to gas companies. If this be so, what has induced the Board to alter the decision of a year ago? when the then Chairman (who has since retreated from the Board) stated that—such, before the shareholders, was his confidence in the process—no other gas company need apply for the provision of plant on the Plymouth terms. It is not a case of gas companies wanting the Plymouth or any other terms. It is a case of the Coalite Company wanting gas companies to take up their system.

An Extraordinary Idea.

If gas engineers are so bold as to think they have nothing to learn from Sir William Preece about coal carbonization, and about the best quality of gas they require, they are, in the opinion of Sir William, much mistaken; for he says that coalite gas is something with which they can improve the quality of ordinary gas, it is something that can be put into the gasholders at 25 per cent. less than gas undertakings can produce a lower quality of gas for (where are the proofs of this?); and—pray ponder over this—the Company will soon be able to produce at Barking sufficient gas to develop power, and, "we hope, to supply local consumers with gas for the enrichment of their own gas." If the shareholders understood what Sir William meant by this, they know something as to gas affairs with which we are not acquainted. Even if the local "consumers" wished their gas to be enriched (which they do not), how Sir William is going to get the coalite gas to the consumers, and how the consumers are going to apply it, are mysteries; but the explanation will perhaps make interesting subject-matter for next year's address to the shareholders.

Quality of Coal Important.

There is one thing certain about the coalite system, and that is that just any variety of coal is not going to give satisfaction to the consumers of the resulting partially carbonized material. The coalite seems to vary. One shareholder stated that he had, on two or three occasions, reported to the Secretary the "stony" character of the coalite supplied to him, but he was glad to say the difficulty had been "to a great extent" (which does not mean entirely) removed. Another shareholder spoke approvingly of coalite; but he, too, had noticed some time ago a tendency to issue "splinters." Shareholders might be a bit careful over their expressions. In his reply on this point, the Chairman acknowledged that there had been considerable variation in the quality of the coalite manufactured; but this was due quite as much to the difference in the quality of the coal as to the differences in the mode of carbonizing it at the different works. This means that there must be care in the selection of the class of coal used in producing coalite. However, "we are gradually finding out these difficulties," which may be interpreted to mean that

Sir William anticipates the discovery of a few more. In this, probably, he is not far wrong. But Sir William's speech fell very flat. It was far too thin for the purposes of a Company in the position of the one over which he presides and prophesies, though the Stock Exchange has been using it in an effort to rally a little interest in the shares of the Company and of the parent Syndicate.

New Mining Arrangements in the North.

It might have been thought that South Wales, having had six months' experience of the Mines Eight Hours Act before it came into force in the North of England, would have settled all the points that could arise as to the operation of this product of an up-to-date beneficent Government. Some questions have been settled—in one way or another. But different difficulties arise under different conditions; and from discussions which have been going on in Northumberland and Durham, it is clear that those fields are confronted with troubles of their own. On the first of next month, the Act comes into force in these districts; and early last week it was stated that there was little hope of the owners and miners of Northumberland coming to any settlement as to arrangements for working under it. Fortunately, wiser councils prevailed later on; and at the close of a meeting between the parties on Wednesday, it was announced that a provisional agreement had been adopted, subject to confirmation by the county, and that there would be a special meeting of the Council of the Northumberland miners, when the terms of the agreement would be laid before the delegates. In Durham, it seems, the owners' representatives and the Executive Committee of the men signed an agreement without the county being consulted; and this led to some feeling of dissatisfaction on the part of the men. But it may be hoped serious friction will be avoided—especially if, as Mr. John Wilson, M.P., says, "the balance of advantage is very largely in the men's favour."

A Municipal Superannuation Suggestion.

A suggestion which will have a close personal interest for a large body of employees—and an ever-growing body, too, it may be added—is contained in a paper which was read at the recent meeting of the Institution of Municipal Engineers. The author was the President of the Institution, Mr. John T. Pegge, the City Engineer and Surveyor of Durham; and what he had to say on the subject will be found set forth in another column. It is not the first time, if we remember rightly, that Mr. Pegge has constituted himself the champion of the municipal employee in this way; and no doubt there is a great deal of truth in what he says. Nevertheless, it seems somewhat doubtful whether such an universal scheme of superannuation in connection with municipal servants is likely to come into force in the near future. The principles which he advocates in his paper are (1) the payment of full wages during certified illness up to sixty-five years; (2) half-wages during life after sixty-five, unless previously retired; and (3) half-a-year's wages at death, paid to the legal dependants. He also remarks that "in any scheme provision should be made for an employee's continuance of service from one authority to another"—thus, of course, making the system a national one. It is pointed out by Mr. Pegge that what is being attempted is no innovation, and that in addition to pensions already granted to various public employees, great bankers and other high financial companies apply the system to those in their service. All this may be admitted; and yet it may be said that, if Mr. Pegge's national scheme is adopted, the municipal employee will be envied by many of those whose life-work is in connection with private undertakings.

Illegal Levies.

During the past two years or so, there has been before the Courts, in one form or another, the question of the legality or otherwise of the maintenance of Members of Parliament by Trade Unions out of their funds; but the point has at last been settled by the House of Lords, who have unanimously decided that the Amalgamated Society of Railway Servants were wrong in their contention. In other words, they declared to be illegal the rules of the Society which had relation to the formation of a fund for the support of Members of Parliament. In this judgment, the House of Lords are affirming the decision of the Court of Appeal, who had arrived at a contrary conclusion to Mr. Justice Neville.

In the first instance, that is to say, Mr. Osborne, the Secretary of the Walthamstow Branch of the Society, was refused an injunction to restrain the Society from making compulsory levies for purposes of parliamentary representation; but this decision has now by both of the higher tribunals been held to be wrong. No great amount of upset has been caused by the judgment of the House of Lords. The Labour leaders themselves have taken the matter so calmly as to lead to the supposition that the decision did not come quite as a surprise to them. There is really nothing extraordinary in this; for there is pretty general agreement in the fact that the Trade Unions were not originally started with the idea of becoming political organizations. It is only of later days that efforts have been made to increase their sphere of action in this direction—which entailed either additions to, or alterations of, the rules. These new rules were, it is true, registered; but, being otherwise invalid, this was not sufficient to give them validity. Lord Macnaghten pointed out that there was nothing in the Trade Union Acts from which it could be inferred that the Unions were meant to have the power of collecting and administering funds for purely political purposes. Therefore, it may fairly be assumed that the only method of bestowing such power is by the passing of a further Act; and this is what the Labour Party already have in view. It will be time enough to consider this Bill when it happens to come along; but meanwhile, on the matter as it at present stands, cordial agreement may be expressed with the remark in Lord Atkinson's judgment, "that it would be unjust and inexpedient to compel members of Trade Unions by altering the rules to contribute to the promotion of a political policy of which they might disapprove, or else be expelled from the Union and lose the benefits from the money subscribed." Voluntary levies are obviously the fairer method of procedure.

Personal.

Mr. HENRY FOWLER, formerly Gas Engineer to the Midland Railway Company, has now been appointed Chief Mechanical Engineer—i.e., head of the Locomotive Department—one of the highest engineering positions in the kingdom.

Electrical Misrepresentation.

"Meteor" of the "Electrical Times" is a good hand at misrepresentation and at displaying great personal ignorance on gas matters. Included in his notes this week in the columns of our contemporary is the reproduction of a photograph after the roadway had been opened by workmen the other day near Blackfriars Bridge, to deal with the escape of gas from a large main, through a fault developing owing to the great disturbance of the subsoil in connection with the passenger subway construction there. Under the picture is the line "The Gas Explosion at Blackfriars." The picture shows heaps of soil the result of the excavation necessary to deal with a main of such large diameter as this one. From the descriptive line, one would imagine the soil had been blown out of the ground by the explosion; whereas the explosion itself took place in the Post Office system and the neighbouring electric light culverts and boxes, through the use of a lighted candle by a Post Office man, though (according to the reports) aware of the presence of gas. Immediately after the explosion, and until workmen came on the scene, the roadway was undisturbed. In a note on the occurrence, "Meteor" remarks: "The accompanying photograph shows the effects of the recent explosion near Blackfriars Bridge. The picture is not all that it might have been; the original mound of earth would have been far more imposing." The statement, and what is intended to be inferred, are deliberately untrue. Dealing with the terrible fire in South London, which is ascribed to electrical origin, "Meteor" does not fail to mention that the premises were equipped with gas as well as electric light; and a few sentences lower down he remarks: "The gas men were still *sawing away* pipes after eleven. When one remembers how assured is the doom of a large building with *persistently flaming gas-pipes* all over it, it seems deplorable that *no means of rapidly isolating from the street mains can be devised*." We will not comment on this lest we hurt "Meteor's" feelings. In another note on the Board of Trade gas undertakings returns, he says: "The advocates of gas proclaim its incontestable superiority for street lighting. If they can gain any support for this view from the fact that during the past twelve months the number of public gas-lamps has dropped by 10,000 odd, they are welcome to it." In our issue a fortnight since, the correction of this mistake in the returns appeared, in these words: "In the preceding returns, there was an error of 10,000 in the public lamps credited to the companies, whereby there appeared to have been an abnormal gain for one year. The figure for both companies and local authorities should have been 690,264; and this has been increased during the year to 700,696—the difference representing an addition of 10,432, of which 4964 have gone to the account of the companies, and 5468 to that of the local authorities."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 907.)

SHORT and sweet was the week which ended with Christmas Day, so far as the Stock Exchange was concerned. As a general rule, this period is dull and apathetic, only awaiting the prospect of a revival of business when the inevitable festivities are over. But last week took a turn of its own, and developed a tendency so distinctly cheerful and buoyant as fairly to arouse the markets from their soporific preparations. A gratifying point was that the strength lay in the high-class departments—Home Government and Railways—which had had a rather poor time the week before. Of course, business was not at high pressure, and the weight of operations was not sufficient to tip the scale of prices largely; but such as it was, it was a force in the improving direction. It was scarcely marked at all on the opening day; for business was very quiet, and there was not much movement. But the gilt-edged division showed great steadiness, and Railways even made some very fair advances; while certain of the more sensitive markets kept up nicely. The favourable tone was considerably accentuated on Tuesday, and business became more active. Home Government issues were strong, Consols advanced $\frac{1}{8}$, and Railways advanced as good traffic returns inspired courage. Other markets also followed suit, although Americans shrank in obedience to a touch from New York. Wednesday was another cheerful day. The gilt-edged division, aided by easier conditions in the Money Market, were still in good demand; while Railways kept edging-up still. Consols gained another $\frac{1}{8}$. On Thursday, things necessarily began to quiet down; and by the close of the day the week was practically almost at an end. The choicer departments continued to hold themselves firm; and there were very few weak spots anywhere. In the Money Market, there was a marked easing from the rates of the week before. Business in the Gas Market was at a holiday level; but there was a nice firm tone about everything that was touched. A noteworthy jump up was made by Brighton and Hove. West Ham now drops out of the quotation; and after to-day it will disappear from our list, as it becomes absorbed into the Gaslight and Coke Company on Jan. 1. The ordinary stock of the latter Company was done at from 103 to 103 $\frac{3}{4}$ —a rise of $\frac{1}{2}$. In the secured issues, the preference marked 104 $\frac{1}{4}$, and the debenture 83 $\frac{1}{4}$ and 83 $\frac{1}{2}$. South Metropolitan was quiet at from 119 $\frac{1}{4}$ to 120 $\frac{1}{4}$; and the debenture made 82 $\frac{1}{2}$. Commercial were not touched. Among the Suburban and Provincial group, Brighton original was done at 220 (a rise of 7), ditto ordinary at 155 (a rise of 3 $\frac{1}{2}$), South Suburban at 119 $\frac{1}{4}$, and Tottenham "B" at 112 $\frac{1}{2}$. In the Continental companies, Imperial marked 175 $\frac{1}{2}$ free and 176 $\frac{1}{2}$, Union preference 138, and European 25. Among the undertakings of the remoter world, Bombay changed hands at 5 $\frac{5}{8}$, Buenos Ayres at 14 $\frac{1}{8}$, Primitiva at 7 $\frac{1}{4}$, ditto preference at 5 $\frac{3}{8}$, ditto debenture at 98, River Plate at 17 and 17 $\frac{1}{8}$, ditto debenture at 100 $\frac{1}{4}$, San Paulo at 14 $\frac{1}{2}$, and ditto preference at 11 $\frac{1}{8}$ and 12.

ELECTRICITY SUPPLY MEMORANDA.

The Tragic Fire in South London—Small Causes and Big Results—Light Reading in the "Daily Mirror"—Electricity Running to Waste—Incompetence in Administration at Reigate.

It is rarely the great festive season of the year passes without some appalling catastrophe that directs our minds to the very antithesis of our cherished ideals of Christmastide. The tale that was unfolded in the newspapers during the past week of the tragic fire at Messrs. Arding and Hobbs' shop, at Clapham Junction—a fire in which several lives were lost, terrible injuries received, property destroyed to an extent estimated at hundreds of thousands of pounds, and through which the deepest misery was scattered in many homes—could not fail to cast a shadow over all who are not devoid of ordinary human emotions. The cause of the fire is the matter in which we are concerned in these columns. The first evidence of eye-witnesses and shop assistants points as the cause to the accidental breaking of an electric lamp, and the fusing of a wire, in the neighbourhood, in a window, of the most inflammable of materials, such as celluloid combs and the flimsy decorations adopted by shopkeepers in dressing their windows at this season. The danger of such materials being placed in proximity to electric lamps has been demonstrated time and again. In spite of this, the electricians are not altogether free from blame for these disasters. Instead of cautioning shopkeepers of the peril, they advertise the absolute safety of electricity as a means of lighting, while they above all people are fully cognizant of the contrary being the case.

As to the South London holocaust, the day following care was taken by an electrician, through a representative of a morning contemporary, to make public the fact that high-pressure gas lighting was also used on Messrs. Arding and Hobbs' premises. But this does not in the slightest degree affect the amply confirmed testimony that the seat of the fire was a window that was only electrically lighted. Moreover, according to one account, in order to make the windows look as brilliant as possible during the Christmas show, a number of extra electric lamps were installed. At the same time, while all present available evidence suggests that electricity really originated the fearful catastrophe, the great

extent of the loss of life and of property must be largely attributed to the exceedingly combustible nature of the goods with which the premises were abundantly stocked. A more pronounced statement as to the cause of the catastrophe must be left until after the inquest, at which we are pleased to see the Battersea Electricity Department, the South Metropolitan Gas Company, the London County Council, and other bodies are being represented, in order, if possible, to elicit the true facts. Two days after the South London fire came the news of the total destruction by fire of the Kyles of Bute Hydro, near Rothesay; and here the origin of the fire is attributed to the fusing of an electric wire in a dark room adjoining the recreation room. The damage caused by the fire is estimated at £30,000. The magnificent pavilion on the Britannia Pier at Great Yarmouth has been reduced to ruin by fire, and the pier itself considerably injured. The damage is estimated at £15,000 to £20,000. The "East Anglian Times" ends up its account of the disaster by saying: "It was thought that the fusing of an electric lighting wire caused the fire; but this theory is considerably discounted now [by whom?], and the origin is at present untraced." It has also since been asserted that the electric supply was not connected up to the pier at the time. However, the first two events are laid (without much opening left for opposition on the ground of want of propriety) at the door of the much-advertised safest illuminant!

The halfpenny morning papers are at times responsible for circulating some striking examples of balderdash. The "Daily Mirror" last week gave its readers something to think about regarding electricity; and more foolish writing—writing that must have excited considerable merriment in many a central generating station as elsewhere—rarely has been seen, though on a subject that appears to present infinite opportunity for wild and freakish statements. Through the metallic filament lamps, electricity companies, we are told in this organ of veracity, are finding themselves with a tremendous quantity of current running to sheer waste; and those in charge of electricity stations are in the position of producing very nearly twice as much current as is being used. If this were true, the nearest lunatic asylum to the generating stations would be the proper place for those in charge of the latter. The "Daily Mirror" representative had been talking to an "experienced" electrical engineer. That experienced person, assuming the newspaper representative fairly mirrored what he said, if he has any employment (and there is a great want of lucrative positions just now in the electrical industry), ought to lose it quickly, both in the interests of his employers and the electrical industry. This electrical engineer is reported to have said: "The situation at present is that the companies are turning out current that they cannot sell." That is a categorical statement; but we have not noticed that any electrical engineer has written to contradict this libel on their competence to confine production to demand. But it is held to be in consequence of this fictitious condition, that strenuous efforts are being made to secure new customers for cooking, heating, and labour-saving appliances. In this connection, there is the loose and extraordinary statement that "a cistern large enough to give two ordinary baths full can be kept boiling by means of electricity at a cost of 25s. a quarter. If the "Therol" water-heater is referred to here, the statement is untrue. There is something for which to be thankful. "This glut of current is splendid for the public." Through it there is the prospect of brighter streets, and greater illumination in shops, at a cost almost next to nothing—that is to say, on a reduction of business the electricity stations can supply at a lower price. But the glorious benefits do not end at brighter streets and shops. There is introduced the pretty little piece of fiction that the new type of lamp effects a saving in cost of from 50 to 70 per cent., which, it is said, will enable the smallest of houses to be lighted electrically for a very modest sum. "A workman could run five lights in his house for something like £2 a year," said the electrical engineer to the willing recipient of his twaddle. What would those five lights be like in respect of illuminating power, how many of them could the household use at one time, and what would be the number of hours of their running at £2 per year?

In a second article, in the "Mirror," there was a "fairly tale" by an electrical expert which the gullible newspaper representative took in as gospel. This "expert" went in for domestic electrification on the large scale; and he, as a result, declares that he managed to cut down his household expenses by some hundreds of pounds a year. Lucky electrical expert! How he is to be envied! There are not many professional electricals who have some hundreds a year to spend on their household expenses. But wealthy as he is, and despite the great saving, he had a complaint to make, and that was that he had to have duplicate wiring in his house before he could get heating and cooking by electricity at 1½d. per unit; and this second wiring meant an initial expenditure of about £100—that was for one house. Naturally (though the £100 was compensated over and over again in the "some hundreds" saved the first year) he thinks that one wire should suffice for the whole of the electrical service, and that the electricity supply company should make an estimate on the average of the past few years—we suppose a benevolent one on the side of the consumer—as to the lighting units to be charged at the higher rates, deducting them from the units to be charged at the lower rate for other purposes. There is, experience shows, too much speculation about that kind of thing. Points of lighting and hours of use of lighting have a way of increasing; and the average of the lighting units based on the past would soon be exceeded, and

running well into the cooking and heating priced units if there were no check upon the consumer. Consciences do not suffer from any particular tension in such cases. This electrical expert excelled himself in his parting statement to the "Mirror" representative. "If," he remarked, "the companies would merely say 'We will light, heat, and cook from your existing circuit,' they would materially increase their revenue, as householders would be only too glad to abolish the use of coal and gas, and obviate the necessity of a larger staff of servants." Why couple-up gas with coal in this foolish manner? The popularity of gas for heating and cooking is largely due to precisely the same causes as are put forward for electricity, convenience and labour-saving, with the three others—and not unimportant ones—that gas is more economical, more efficient, and does not fail at the most inopportune time.

The Reigate Corporation are in a pretty mess over their electricity supply business; and they show a particular facility for going from muddle to muddle, each fresh one being of greater magnitude than the predecessor. The undertaking is one of those in which the late Mr. F. Hastings Medhurst was concerned, and on which the Corporation entered lightheartedly, and have ever since—over some eight-and-a-half years—been taking in aid of the undertaking an average of £1476 a year from the ratepayers, together with some respectable payments for public lighting. Without taking account of any excess payment for public electric lighting over gas lighting on modern lines, the amount lifted direct from the pockets of the ratepayers is nearly equal to an additional 2d. in the pound on the rates. In the period named, the cost of generation and distribution has amounted to £25,161; while the income has reached £32,848—leaving a gross income of £7687. Interest and repayment have absorbed £20,237; leaving a net loss of £12,550. Some special articles on the subject have appeared in the "Reigate and Redhill Chronicle," which articles place clearly before the ratepayers the financial condition of the municipal speculation. The writer seems to think that the dismal results have been brought about by, on the part of the Corporation, "a glaring weakness, want of ordinary business capacity, and a proper grasp of the responsibilities." We are not acquainted with the members of the Reigate Corporation; but, if we take a wider survey of the municipal electrical position, we find much the same condition of affairs electrical in other places, and we do not think that the want of financial success is due in all these various cases to the wholesale poverty of ordinary business aptitude and acumen that is attributed to the governors of the district of Reigate.

It appears to us that upon municipal trading being entered into, and financial failure being the result, that a species of demoralization supervenes, which causes town councillors to endeavour to conceal the dismal facts, and try all sorts of expedients to get themselves, without too much publicity, out of the disagreeable meshes in which they have got entangled; and should anyone dare to impugn their acts and knowledge, they simulate a great personal injury. Therein are the real seats of trouble; and things in consequence go from bad to worse, until there is an exposure like that there has been at Reigate. Disclosure was made at a Local Government Board inquiry, as to overspendings of capital, of the succession of losses, of prices for both private and public lighting being on no definite or sufficient basis. Stay, if we say all that was revealed at the inquiry, the palliating argument just advanced will be partially spoilt. The Local Government Board would not listen to any more loans being granted (except the sum needed to discharge overspendings) until an expert had been engaged to look into the financial difficulties of the concern. The Corporation held back in the matter of appointing an expert; they pleaded with the Local Government Board; and they alleged that they knew as much about the matter as any electrical expert could tell them—in fact, investigation by an expert was the very last thing the Corporation desired. What did they fear? An expert, it is understood, has, after months of procrastination, been appointed. Meantime the Corporation have resolved upon taking steps, in their own way, for patching up the fortunes of the concern—by raising prices, disallowing discounts, and by charging meter-rents. Six months' working under this order of things, has resulted in the income being less by nearly £130 than it was in the corresponding half year ending September, 1908; and what is more, the question of the legality of the meter-rents has been raised, and Counsel has given an opinion that what the Corporation have done in this regard is *ultra vires*. What they are going to do in the matter remains to be disclosed; the old policy of reserve having been adopted. But altogether the Corporation are in a pretty fix. What a difference from the roseate hue of the picture drawn eight-and-a-half years ago!

Obituary.

The death took place yesterday week, at the age of 83 years, of Mr. HENRY GIBBINGS, formerly proprietor of the gas-works at North Tawton, Devonshire. Mr. Gibbings carried on business in the town as a draper and outfitter, and was one of the promoters of a scheme for the introduction of gas lighting. He was one of the Directors of a Company formed for the purpose, and ultimately bought the undertaking from the Company. In his hands, the business developed considerably; but owing to advancing years, he recently sold it to the Devon Gas Association.

LUNGE'S "COAL TAR AND AMMONIA."

SECOND ARTICLE—AMMONIA.

THE portion of the fourth English edition of Professor Lunge's standard work on coal tar and ammonia which deals with tar was reviewed at length in the "JOURNAL" last week (p. 807). The remaining portion, referring to ammonia, occupies less than one-third of the whole work, and rather more than half of its second volume. Except for the sake of symmetry, it probably would have been better from the standpoint of users of the book to have published the whole of the matter relating to tar in one volume (which, though bulky, would have been less so than the single-volume previous edition of the whole work), and the portion of the present edition which refers to ammonia as a comparatively small but handy separate treatise. In most instances, the tar and ammonia industries are under different works management, and those technical men who constantly wish to consult a standard text-book on ammonia rarely require to have in their hands at the same time a lengthy treatise on tar and its products. Now that the enlargement of the original work has rendered it necessary to split the present issue into two volumes, a good opportunity has, we think, been missed by the publishers of dividing it in a rational manner according to the two principal subjects with which it deals.

The first chapter relating to ammonia describes the sources from which ammonia is obtained, and there are about thirty pages devoted to the formation of ammonia from the nitrogen of the atmosphere. In considering these processes, the author follows the late Dr. Ludwig Mond in dividing them into three classes—viz.: (1) Processes which aim at the combination of nascent hydrogen with nitrogen at high temperatures, or with the assistance of electricity, or in the presence of acid gases; (2) processes in which primarily nitrides are formed which are afterwards transformed into ammonia; (3) processes in which primarily cyanides are formed. With the first and second classes of processes, no great measure of technical success has yet been secured. The third class, however, includes the cyanamide or lime-nitrogen process of Frank and Caro, which was described by Dr. Frank in his paper before the London Section of the Society of Chemical Industry in 1908 (see "JOURNAL," Vol. CIV., p. 414). This and some other processes of the same class have attained, or are about to attain, great commercial importance; and some of the statements in earlier pages of Professor Lunge's book which speak disparagingly of the success of attempts to fix the nitrogen of the atmosphere (and which have been reproduced from earlier editions of his book), certainly need revision in the light of the modern developments of these processes that he duly records.

Sundry minor sources of ammonia are next referred to—including its derivation from sewage, from animal substances, and from vinasse or molasses residues. Then comes the more important subject of the production of ammonia from peat, which is effected practically by charging Mond producers with peat from which only a small proportion of its natural moisture has been removed. Readers of the "JOURNAL" will remember that the promoters of the Central Ireland Electric Power scheme intended to utilize this process for the recovery of ammonia from Bog of Allen peat used in Mond producers for the generation of gas at a central electricity supply works (see "JOURNAL," Vol. CIII., pp. 179, 772). After a short reference to the recovery of ammonia from shale as carried on in the Scotch oil-works, the author proceeds to deal with the production of ammonia from coal.

The first sub-division of this section relates to the production of ammonia in the manufacture of coal gas. The results of this production are summarized by the statement that "good gas coal should yield from 0.16 (as a minimum) to 0.25 parts of ammonia to 100 coal; 0.20 being a good average. But many (especially small) works get only 0.10 to, at most, 0.15 per cent. of ammonia." This generalization is, we think, based mainly on the working of Continental gas-works, which carbonize German coals, rather than on the results obtained in gas-works where English coal is carbonized. The present edition of the work includes a description of Feld's processes for the extraction of ammonia from gas and also an illustration of his washer. The second sub-division of the section dealing with the production of ammonia from coal refers to the treatment of coal or shale with steam as carried out in various producer processes, and in particular in the Mond process. We fancy the quotations by the author from various reports on the extent of the use of this process refer to all gas producers of the Mond type, though many such producers are not equipped with ammonia-recovery plant. It is only when an installation of Mond plant is of considerable size that it pays to recover the ammonia from the gas. Indeed, Professor Lunge speaks dubiously of the economical success of attempts to introduce ammonia-recovery in plant consuming less than 50 tons of coal per day. The third sub-division of this section deals with the recovery of ammonia from coke-oven gases, which has increased to a considerable extent in recent years in this country, and still more so in Germany. The fourth sub-division relates to ammonia from blast-furnace gases, which is recovered only in certain districts in Staffordshire and in Scotland, where splint coal is used in place of coke in the blast furnaces. The fifth sub-division—viz., on ammonia from producer gas—is of little importance apart from the Mond process, where the recovery of ammonia is, the author says, purposely made a principal feature. This process was fully dealt with by him under the

second sub-division, as already mentioned. The sixth and last sub-division refers to the at present somewhat academical problem of the recovery of ammonia from coal smoke.

The second chapter of the portion of the work referring to ammonia deals with the composition and analysis of ammoniacal liquor and the properties of its constituents. A good deal of new matter has been introduced into this chapter, mainly from the reports of the Alkali Inspectors, since the publication of the last edition. The author's exposition of the "ounce" valuation of the strength of ammoniacal liquor is deficient in clearness; and as the practice of stating the strength of liquor in "ounces" is likely to continue for many years to come, it is a pity he has not explained its basis more fully and clearly. The fact that it is not followed in Germany is not sufficient reason to justify an inadequate recognition in a text-book for English readers of its use and meaning in this country. This chapter contains all the necessary information in regard to the properties of ammonia and its technically important salts.

The next chapter has reference to the working up of ammoniacal liquor. A couple of pages of new matter have been introduced, on the removal of the cyanides from gas liquor before distillation; and, incidentally, reference is made to the use of ferrous sulphate for the extraction of the cyanides from crude coal gas. The inference which the uninformed reader would draw from these pages is that methods of cyanogen recovery which have been in use on certain English gas-works for many years are of quite recent origin. It is stated that the average quantity of sodium ferrocyanide obtainable per ton of coal carbonized amounts in coke ovens to about 1.1 lbs., and in gas-works to about 1.6 lbs. Descriptions of some more modern types of plant for the manufacture of concentrated ammoniacal liquor, liquor ammonia, and anhydrous liquid ammonia are given, in addition to, or in place of, the descriptions of older plant which appeared in earlier editions. In regard to plant for the manufacture of sulphate, there is not much new matter of importance, though a summary is given of most recent patents relating to such plant. In the section dealing with the prevention of nuisance from ammonia works, attention is rightly called to Skirrow's observations on the large quantity of phenols which are ordinarily lost in the spent liquors from these works. He estimates that 0.37 to 0.55 lb. of phenols is lost in these liquors per ton of coal carbonized, as against 0.53 lb. of phenols recovered from the tar. Thus nearly half the phenols produced in the retorts is lost in the spent liquor. The problem of how to deal with the sulphuretted hydrogen evolved in the working up of gas liquor is fully treated, and references are included to recent reports of the Alkali Inspectors in which the question is referred to. The chapter ends with some statistics as to the production of ammonium sulphate in this country and abroad—for the most part commendably up-to-date.

The last chapter of the work relates to technically important ammonium salts other than sulphate. These are described, and the processes for their production referred to in sufficient, though not great, detail. At the conclusion is an appendix of tables for the reduction of specific gravities to standard temperature, and for comparing the degrees of different hydrometers, and of the Centigrade and Fahrenheit thermometers.

The portion of Professor Lunge's treatise which relates to ammonia is, as a whole, very satisfactorily carried out, and the references to all important recent modifications of processes have been included in the present edition. There are many misprints and faulty expressions throughout the two volumes; but they are perhaps rather more conspicuous in the portion which relates to ammonia than in that which has reference to tar. Considering that Professor Lunge has not been resident in this country for many years, it would be ungracious to lay stress on his occasional lapses into German styles of expression and composition, though we think some of those which occur should not have been passed by the publishers' reader.

A pleasing incident occurred at the Bedford Gas-Works on Wednesday last, when a very enjoyable evening was spent; the occasion being the celebration of the silver wedding of Mr. and Mrs. Dann. The staff and employees, to the number of upwards of a hundred, assembled at a repast; and a well-selected programme of music (made up entirely by members of the Company's staff and employees) was gone through. In an interval, a presentation was made by the Secretary (Mr. S. W. Adams) on behalf of the staff, and by the works foreman (Mr. Joseph Taylor) on behalf of the employees. The gift from the staff consisted of silver pepper-ettes, salts and mustard, and a handsome silver tray, suitably inscribed, and a pipe from the men for Mr. Dann, and an ebony silver-mounted toilet set, with initials, for Mrs. Dann.

It has already been announced in the "JOURNAL" that Professor Harold B. Dixon, M.A., F.R.S., will give two lectures to juveniles, at the Royal Society of Arts, on "The Chemistry of Flame." The first will be delivered on the 5th prox., when Professor Dixon will tell his audience what were the old ideas about flame, and explain how chemists found out that air was necessary for fire, and that one portion of the air was used up in burning. He will then describe the properties of oxygen and the burning of hydrogen and carbon, and show how flame gives light. In his second lecture, on the 12th prox., he will demonstrate what happens when air is mixed with gas that is burning, and will explain Davy's experiments on flame, and the passage of flame through an explosive mixture of gases; closing with some remarks on the incandescent gas-burner.

IMPROVEMENTS AT THE ILKLEY GAS-WORKS.

THERE has lately been carried out at the gas-works of the Ilkley Urban District Council an interesting scheme of improvement which was formally inaugurated on the 24th ult., when the whole of the new plant—comprising retort work, coal and coke handling machinery, mechanical stoker, &c.—was seen in operation. It enables coal to be taken from the yard and carbonized, and coke deposited in the yard, without manual labour.

On entering the gas-works, a large dormer jutting out of the retort-house roof, with an elevator, immediately attracts attention. It is shown in fig. 1. The coal is brought to the works by carts and tipped into a receiving hopper of 25 cwt. capacity, the top of which is level with the ground. This hopper has an outlet and reciprocating tray feed, delivering coal automatically into a breaker, the supply to which can be regulated from the yard level by means of the hand-wheel seen in the illustration operating the slide door of

the coal-hopper, and also by adjusting the stroke of the tray feed. The breaker is of the two-roll type; the rolls and gearing being of cast steel. The claws are fixed on square shafts turned down at the ends; and the shafts revolve in brass-bushed bearings formed in the cast-iron frame of the breaker.

The coal passes through the breaker into the boot of the elevator, and is picked up by the buckets and deposited in the storage hoppers. The elevator is about 53 feet centres, and is fitted with a chain made up of cast-steel and mild-steel links alternately, to which cast malleable buckets, 12 inches wide, and skidder bars are attached at 2-inch pitch. The elevator, breaker, &c., will easily deal with 15 tons of coal per hour. The shoot at the elevator head is made of the swivel type, in order to fill as completely as possible the large storage hopper, which is 24 ft. by 18 ft., and 13 ft. 6 in. deep, with a capacity of approximately 100 tons.

Though the roof principals were at a low level, Mr. Everitt, the Gas Engineer and Manager to the District Council, decided that they should remain as they were, and that the hopper should be built around them; care being taken to protect the principals from coming within the hopper. As the illustration clearly



Fig. 1.—Coal Elevator, &c., at the Ilkley Gas-Works.

shows, the hopper is covered with corrugated sheeting, and is provided along the top with a platform, which is reached from the ground by a ladder placed near the elevator. The bottom of the large hopper is fitted with four sets of double slide doors, with the usual levers, &c., for operating them; and the coal is delivered from it into the hopper fixed on a De Bruwer combined stoking-machine. This is electrically driven, and travels up and down the house on rails laid in the floor; collecting current from bare trolley wires suspended overhead. For the various operations of charging, pushing, traversing, and hoisting, the machine is equipped with three motors, having suitable controllers, within arm's length of the stoker on the machine platform.

Two beds of nine retorts, each 21 feet long, have been erected, forming the first section of the new carbonizing plant. The two new arches are built with regenerators on Brooke's patent system, a noteworthy point of which is the ease with which the heat is regulated and distributed throughout the setting. The bench bracing, mountings, &c., are new; but the old hydraulic and foul mains have been brought into service again.

With regard to the coke-handling plant, Mr. Everitt appears to have solved this problem by designing a reversible conveyor in the floor, in front of the bench, and an inclined cross conveyor, as shown in fig. 2, at the centre of the house, which delivers coke

into the yard. The conveyors are of the type of Messrs. Robert Dempster and Sons, Limited, a special feature of which is that the chain is carried outside the trough, thereby avoiding the wear and tear due to the contact with the coke and water. The conveyor in front of the bench is formed of 7 in. by 3 in. angles and $\frac{1}{4}$ -inch bottom plate; a cast-iron renewable plate being placed in the trough. The chain is of parallel type, and travels on rollers fixed to the angles of the trough. At 3 feet pitch, the chain is provided with special attachment links to which are fixed cast-steel rakes. The contractors claim that these rakes are preferable to ordinary push-plates or drag-bars, as they do not bind the coke on to the bottom of the trough. The return of the conveyor is carried overhead on brackets suspended from the buckstays, and again the chain is carried on the rollers. It will therefore be seen that there is no scraping whatever on this conveyor.

The driving gear, which is made for reversing with open and crossed belts, is fitted at one end of the house, and the usual tension gear at the other. The inclined or cross conveyor is of the same type as the one just mentioned (see fig. 2); the only difference being that the return angle supports are braced to the trough to form a lattice girder which spans the house. The conveyor at present delivers the coke into the yard; but it is so arranged that a small screening plant could be added at any time,



Fig. 2.—Coke Conveyors inside the Retort-House at Ilkley.

if found necessary. As will be seen from fig. 3, Toogood's patent equalizing gear has been utilized, to avoid shocks and to maintain a consistent pull on the chain.

Provision has been made in the corner of the retort-house for a small engine-house; and on entering this there is found a gas-engine and dynamo. The engine, which is of $33\frac{1}{2}$ B.H.P., and of the "National" Company's make, drives the elevator, breaker, and conveyors direct by belts, gearing, and shafting, and also the dynamo by means of a belt. The Lancashire Dynamo and Motor Company, Limited, provided the dynamo, which is of a special type; being so arranged that it can run as a compound machine, and provide current at 120 volts for the stoking-machine, or it can be run as a shunt machine by cutting out the series windings, and generate current at 170 volts for charging accumulators—it being intended at some future date to put down a duplicate generator, and use it for providing current to light the public hall.

As far as can be seen, everything appears to be running easily and smoothly, and the plant generally reflects much credit on Mr. Everitt, who designed it, and on the Contractors—Messrs. Robert Dempster and Sons, Limited, of Elland, who constructed the settings complete with the coal and coke handling and electricity generating plants, and Messrs. W. J. Jenkins and Co., Limited, of Retford, who supplied the stoking-machine.

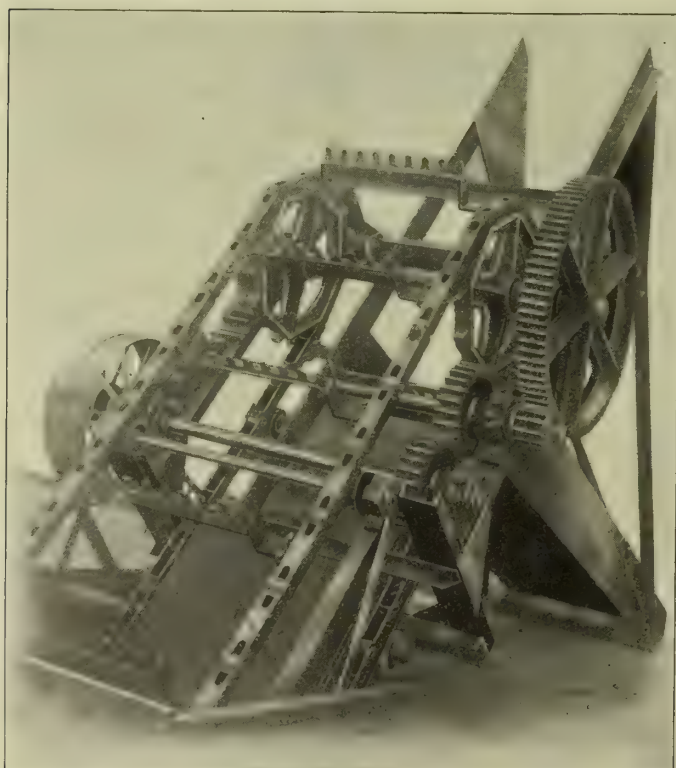


Fig. 3.—Head of the Coke Conveyor at the Ilkley Gas-Works.

STATISTICS OF DUTCH GAS-WORKS.

WE have received, through the courtesy of Heer P. Bolsius, the Manager of the Bois-le-Duc ('s-Hertogenbosch) Gas-Works, a copy of the statistical returns of the working results of the municipal and some of the private gas-works of Holland for the year 1907. These returns have been compiled by Heer Bolsius in collaboration with Heer M. van der Horst, of the Amsterdam Gas-Works; and the information contained in the work is more or less of a confidential character—being intended primarily only for circulation among the members of the Dutch Association of Gas Managers. The present issue continues the series of annual returns which have been produced without interruption since 1899, when the late Heer D. van der Horst, then Manager of the Amsterdam gas undertaking, was responsible (in conjunction with Heer Bolsius) for their compilation.

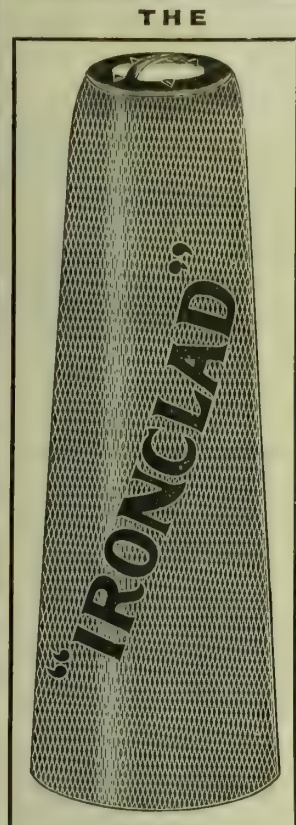
The statistics furnished are of an exceptionally complete character, and to the best of our belief are more comprehensive than those contained in any publication relating to the gas-works of other countries. They refer to 121 cities and towns of Holland, which are arranged in order of population, starting with Amsterdam with its 565,662 inhabitants on Dec. 31, 1907, and finishing with Ravenstein, with only 894 inhabitants on the same date. In 1899, there were only 87 gas undertakings included in the returns, which were at that date of a somewhat less complete character. The names of the managers of the respective works are now given, and the date when the works started operations. There are shown to have been a good many transferences of ownership of works from private companies to the municipalities in comparatively recent years; and at least thirteen towns which now have gas-works appear to have erected them since the beginning of this century. Such growth in the number of towns using gas is an indication of the activity of the gas industry in Holland.

The amount of coal carbonized by each works is stated, and in most cases the amounts of English and German coals used are given separately. The totals for all the works are not indicated; but it would appear at a rough estimate that over 40 per cent. of the coal carbonized in all the works is of English origin. The make of gas per 100 kilos of coal carbonized is stated, and the maximum and minimum make per month and per day. The number of settings and of retorts, and their types is stated for each works, and the largest and smallest numbers of retorts in use at any time in the course of the year. The average charge per retort per diem is also given. Then follow particulars of the water-gas plant and production at those works which have such plant. Eighteen gas undertakings produced water gas during 1907—the Humphreys and Glasgow type of plant predominating, though four other types are represented at various gas-works. For the most part the water gas is carburetted with petroleum oil of the Solar grade, though some works carburet with petroleum spirit or benzol. The consumption of coke and of oil per cubic metre of gas made is given in most cases; but having regard to the confidential character of the statistics, we do not feel at liberty to reproduce these figures. The illuminating power and the calorific value of the water gas and of the mixed gas also appear in many instances, as well as the percentage of carbonic acid in the water gas. This percentage ranges from 2.9 to 5 per cent.

Then follow for each town particulars of the quantity of gas consumed for public lighting, by private consumers (the figures for the last-named being divided to show separately the consumption through ordinary and through prepayment meters), on the works, and the unaccounted-for gas. The latter seems to vary from a minimum (for the larger works) of 1.16 per cent. at Tilburg to a maximum of 6.85 per cent. at Nijmegen. The production of coke and its disposal are next dealt with, followed by similar particulars in regard to tar and ammoniacal liquor. Full details are given as to the number of lamps and the consumption of gas for street lighting, and the number of consumers' meters, and their description, in use.

The prices charged for gas for lighting, heating, and power purposes to ordinary consumers, and for that supplied through prepayment meters and for public lighting are stated separately. Speaking broadly, the larger towns appear to charge the same price to private consumers whether the gas is used for lighting or for other purposes. In this respect, the larger Dutch gas-works seem therefore to follow English, rather than German, procedure. The length and size of the mains of the distributing system, and the average pressure of the supply are stated. The position of the purifiers and the amount of gas purified per ton of oxide used are also given. Then follow particulars of the tests made for illuminating power and calorific value; the details being given in most cases as to the description of photometer, standard of light, and standard burner used in the tests. The "Metropolitan" argand burner No. 2 and the Harcourt 10-candle lamp are now in use in the official testings for several important works, though the "London" argand No. 1 was retained for many others at the close of 1907. The statistics conclude with particulars of the fire insurances on the works.

The compilers have carried through their self-imposed task with the greatest assiduity, and have presented their colleagues with a most valuable review of the working results of the gas-works of Holland. We understand that the similar statistics in regard to the year 1908 will shortly be issued by them.



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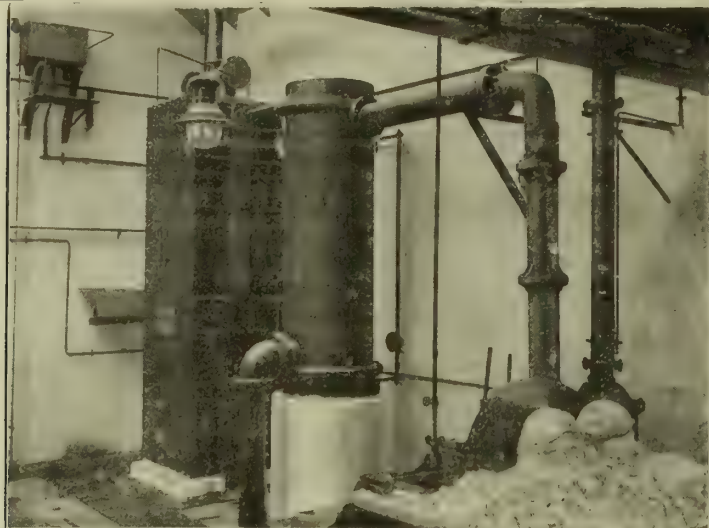
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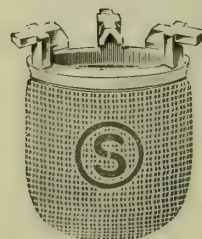
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WATER AFFAIRS.

Review of the Principal Events of the Year.

THE close of another year affords an opportunity of reviewing the principal events in connection with the supply of water which have been recorded in our columns. Though they have been of a less conspicuous character than those which have called for notice at previous similar periods, they are nevertheless of sufficient importance to justify attention being again directed to them.

THE WEATHER.

As there is intimate connection between meteorological conditions and water supply, a few remarks in regard to the weather will not be inappropriate as a commencement to our retrospect. The year 1908 was one of the brightest within memory. The record of the twelve months shows that in all but one there was more than the average amount of sunshine; that, generally, there was a deficiency of rain; and that the temperature, while a little below the normal during the spring and summer, was much warmer than usual in the autumn and winter. There were two heavy snowfalls—the first in April and the second in December. The latter began on the 27th of the month, and continued for three days—culminating on the 29th. It brought the coldest days of the year, and, in many parts of the country, the lowest maximum temperature ever officially recorded. On the 30th of December the maximum shade temperature was 25°, and the minimum 18°. A rapid thaw set in early next day; and for several hours the condition of London streets was almost indescribable. The combined efforts of armies of workmen and a fairly heavy rainfall soon cleared the thoroughfares. During the prevalence of the frost, a water-main burst in Fenchurch Street and rendered useless a number of hydraulic lifts; but a more serious matter was the annual recurrence of the blocking of the leat at Devonport. In 1908 the Corporation had pipes laid to take the place of a portion of the leat. But there was left a length of seventeen miles of open watercourse; and where this was most exposed, snow accumulated to such an extent as practically to stop the flow of water. The work of clearing the leat proved very difficult; but fortunately a thaw came to the assistance of the gangs of men in restoring the service. As in the preceding year, the short spell of frost was severely felt in Liverpool; and when the thaw set in, more than 4000 leakages, mostly from private lead pipes, were reported at the water office or discovered by the inspectors. The extent of the loss of water will be appreciated from the fact that before the thaw the daily consumption was about 28 million gallons, whereas afterwards it rose to upwards of 46 millions. These were the weather conditions which ushered in the year 1909, the characteristic features of which have been a great quantity of rain, and, with the exception of a short spell of intensely hot weather in August, generally a temperature below the normal. Notwithstanding the rain, however, shortage of water was experienced in several parts of the country, especially in the west. In the middle of October, several of the towns in Cornwall were threatened with something like a water famine. The Camborne and Truro Water Companies and the Redruth District Council were greatly inconvenienced; and Penzance and other towns in West Cornwall felt the effects of the drought.

METROPOLITAN WATER BOARD—WORK AND FINANCIAL POSITION.

As in previous years, we will commence our retrospect with the Metropolis, and glance at the year's work of the Water Board. At the first meeting after the Christmas recess, the members were informed by the Finance Committee that the District Auditor (Mr. A. Carson Roberts) had disallowed an item of £59 16s. 4d., the costs incurred in connection with the ceremony on the occasion of the opening of the Walton reservoirs, and had surcharged the amount upon the members of the Committee who had signed the order for payment. Various courses were proposed with regard to the surcharge; but eventually the matter was referred to the Law and Parliamentary Committee. At the same meeting, sanction was given to the expenditure of another £37,850 on the Honor Oak covered service

reservoir, which would make a total of £198,000; and it was stated that it would be the cheapest reservoir ever built. Undaunted by the action of the District Auditor, the Board decided at their next meeting to spend not exceeding £150 in connection with the ceremonial opening of this reservoir, which would take place in May. Before the Board rose for the Whitsuntide recess, they adopted an exhaustive scheme of superannuation (the fund to be contributed to by the officers and the Board), and also decided to establish a pension fund. They likewise had under consideration the question of paying the Chairman, which they have power to do under the Metropolis Water Act, 1902. The matter arose in connection with defraying the expenses attending the "official hospitality" of the Board, which it was thought should not fall upon the Chairman personally. The General Purposes Committee recommended that the salary should be £500 per annum, to commence from the 1st of April this year; and the proposition was agreed to with two dissentients. As, however, only 21 members voted out of the 66 composing the Board, it was thought by some that the vote did not fairly represent the general opinion. An attempt was made to set aside the decision; but without success. It should be recorded that the Chairman (Mr. E. B. Barnard, M.P.) was in no way concerned in bringing forward the proposal.

On the re-assembling of the Board after the recess, Lord Welby, the Chairman of the Finance Committee, submitted the estimates for the year 1909-10. Dealing first with the accounts for 1908-9, he said the income was estimated at £2,852,000 and the expenditure at £2,930,000; showing a probable deficit of about £78,000. The actual result, however, had been much more favourable; for the income was £25,000 above and the expenditure £25,000 below the estimates—leaving a deficiency of £28,000. [On the publication of the accounts later in the year, this figure was reduced to £25,000.] With regard to the year 1909-10, Lord Welby estimated the expenditure at £2,951,000, and the revenue at £2,888,000; leaving an estimated deficit of £63,000. But he made the encouraging remark that if unforeseen contingencies did not arise, and if the Committees continued their careful control over the expenditure as it proceeded, the result would be a smaller deficit than that which appeared on the face of the estimates. At the same time, he expressed the fear that the period of surpluses had passed away, and that henceforth the Board would have to impose upon the rates every year a greater or less charge. This prospect, he said, enjoined a firm control over, and a careful administration of, their finances; for they must expect that the ratepayers, when the Board sent in their bills, would demand proof that their deficits were unavoidable. His Lordship's forecast turned out correct; for, in a letter written to the "Financial News" which was reproduced in our columns a few weeks ago, the Chairman of a Ratepayers' Association called for a searching inquiry into the financial position and management of the Board, in order to ascertain the reason of their being unable to show the profits made by their predecessors, the much-abused Water Companies. And yet, in face of prospective deficits, with their "B" stock falling in market value (it was 92½ at the beginning of the year and it is 88½ now), and prevailing general dissatisfaction on the part of occupiers of non-residential premises at the greatly increased charges imposed under the Act of 1907, the Board have been talking of spending £200,000 on the erection of new offices in Kingsway, while they have an unoccupied site of upwards of 7 acres in extent in Rosebery Avenue. The proposal was, however, at the last meeting before the Christmas recess, referred back, for further consideration, to the Committee who brought it forward. As bearing upon the financial position of the Board, it will be appropriate to record here the announcement by Lord Welby of his retirement, and the recognition of his valuable services as Chairman of the Finance Committee, which he had held since the inception of the Board.

Reverting to the general work of the Board, as the arrangements for conducting the business had all been pretty well settled, it was considered unnecessary for the members to be called together every fortnight. Accordingly, it was resolved early in July, by a considerable majority, to meet monthly in future; and a fortnight later the Board rose for the summer recess. On re-assembling on the 8th of October, another attempt was made to rescind the resolution granting the Chairman a salary of £500 per annum; but it was again unsuccessful—the voting being two to one against it. At the next meeting, the members

had the gratification of learning that the Local Government Board had remitted the surcharge of £59 16s. 4d. by the District Auditor to which reference has already been made. As the amount in question was expended in refreshments incidental to the ceremonial opening of the reservoirs at Walton, it will be convenient to notice here a similar function in connection with the Honor Oak reservoir, which was brought into use on the 5th of May, the ceremony being performed by the Right Hon. the Lord Mayor (Sir George Wyatt Truscott) in the presence of a very large gathering of ladies and gentlemen. The reservoir is the largest of its kind in the world ever constructed at one time and under one contract; and it occupies an area, including the banks, 14½ acres in extent. It was designed by, and constructed under the supervision of, Mr. J. W. Restler, M.Inst.C.E., the Chief Engineer of the Southwark and Vauxhall Water Company, who initiated the undertaking; and it was commenced by the Board, of which Mr. Restler is the Deputy Chief Engineer, after they had taken over the duties of the Company. It affords additional storage of some 60 million gallons, and raises the Board's total storage to 304 million gallons. It was named the "Beachcroft" reservoir, after the first Chairman of the Board, Sir Melvill Beachcroft, who is now the Chairman of the London County Council. During the year good progress has been made with the two reservoirs in course of construction by the Board at Chingford and at Island Barn, East Molesey. The former, which was commenced during the spring of last year, will have a capacity of 3000 million gallons; and the latter, which was started in the following October—earlier than was originally intended, with a view of giving work to the unemployed—will be just one-third the size. Both of them were designed by Mr. W. B. Bryan, M.Inst.C.E., the Chief Engineer of the Board.

THE BOARD'S LITIGATION.

It is hardly to be expected that an organization of the magnitude and character of the Metropolitan Water Board can be carried on without litigation; and therefore it is not surprising that our pages have contained during the year records of cases in which the Board has figured more or less conspicuously. At the Hilary sittings of the High Court of Justice, the question which had arisen in the summer of 1908 in regard to the payment of surveyor's fees in connection with the Honor Oak reservoir was before a Divisional Court composed of the Lord Chief Justice and Justices Bigham and Walton. The District Surveyor (Mr. Ellis Marsland) claimed fees amounting to £297 for surveying the reservoir as a covered structure under the London Building Act, 1894. The proceedings were taken against the Contractors for the work (Messrs. J. Moran and Son, Limited); and the result was a decision by the Magistrate at the Lambeth Police Court in favour of the claimant. The Contractors appealed, but without success. The same learned Judges had before them an appeal in respect of the rating of the Board's undertaking. After a long inquiry, the Court of Quarter Sessions for the County of London decided that the works in the various parishes should be rated as an undivided concern, and not separately as contended by the Assessment Committee; but they stated a case for the opinion of the High Court as to whether or not they were wrong in law as to the principle on which the rateable value of the property had been ascertained. The Court decided that they were not, and therefore they refused to send the case back for further calculations to be made. The London County Council were, of course, dissatisfied with the result; and at their meeting on the 30th of March they passed a resolution to the effect that the method of arriving at the rateable value of the Board's undertaking in the various parishes was inequitable to London, and gave instructions that it should be sent to the Board and to the London representatives upon it.

The question of the liability for water supplied to flats was before his Honour Judge Woodfall, at the Westminster County Court, in a test case. The defendant occupied a flat in Cranworth Gardens, Brixton, the water-rate for which had been paid by a house agent. He, however, discontinued doing this, and referred the Board to a firm acting as receivers of the property. As the Board's claim was not met, they proceeded against the user of the water, who denied liability on the ground that he had paid for it in his rent. The Board submitted that under their Charges Act of 1907 "farming" agreements could not be made; and, moreover, they had given notice that any in existence would

be determined at a specified date. The tenant would have his remedy against the person he had paid. His Honour gave judgment for them, but granted a stay of execution in the hope that there would be an appeal. This hope was realized; the question coming before Justices Darling and Bucknill in the King's Bench Division a few weeks ago. It was urged that the notice given by the Board did not determine the agreement between them and the owner, but only intimated that the terms of supply would be revised. In the result, their Lordships decided that the judgment in the Court below was so unsatisfactory that there must be a new trial, to allow of all the points raised being properly dealt with. Another test case turning upon an agreement had reference to the supply of water for a fire hydrant at the King's Theatre, Hammersmith. The agreement was originally made with the West Middlesex Water Company, and it was submitted by the Board that though, under their Act of 1907, it was determined so far as regarded the "domestic" supply to the theatre, it remained in force in respect of the hydrant, the supply being from a high-pressure main. The County Court Judge held that the agreement was still in force, and he gave judgment for the Board, but granted a stay of execution. The case came before Justices Darling and Bucknill on appeal early in the Michaelmas sittings; and they came to the conclusion that the agreement was preserved by section 35 of the Act of 1907. They accordingly decided that there was good basis for the claim, and that the appeal must be dismissed, with costs. Leave to further appeal was, however, granted. A few weeks ago, the Board were the defendants in an action brought by the Conservators of the River Thames to obtain a declaration of the rights of the parties as to the quantity of water drawn by the Board from the river through the intakes of the old Southwark and Vauxhall Water Company. After being before Mr. Justice Phillimore for two days, the case was ordered to stand over in order that the pleadings might be amended. The last case to call for notice raised a question of much more importance than those just referred to. It was an action by the South Suburban Gas Company to determine whether the Board were entitled, under the Act of 1907, to charge them 5 per cent. on the rateable value of their property, as in the case of an ordinary domestic supply, for water used on their works, or whether the Company could demand a supply by meter, as for trade purposes. The case occupied Mr. Justice Neville for two days, and resulted in judgment in favour of the Board. It affected them more than the Company, inasmuch as the supply to the works had been cut off, by request, at Michaelmas, 1908. But if the point urged had been conceded, the decision would have applied to all business premises, and would thus have greatly affected the Board's revenue. His Lordship's judgment established the principle that it is the character of the user, not the nature of the premises supplied, which regulates the charge to be made for water.

WATER SCHEMES COMPLETED.

Turning from the Metropolis to the Provinces, it will be of interest to notice briefly the more important schemes of water supply to which reference has been made in the "JOURNAL" during the year. Perhaps the first place should be given to the Jubilee of the Loch Katrine water scheme for the supply of Glasgow, which was opened by the late Queen on Oct. 14, 1859. At that time the population of the water supply district was 439,900, and the average daily supply from Loch Katrine 14,675,000 gallons; whereas last year the population was 1,117,229, and the quantity drawn from the lake 60,817,000 gallons. At present a scheme is being carried out to include the waters of Loch Arklet, for which the Corporation of Glasgow obtained parliamentary powers in 1885. The matter has been in abeyance pending the settlement of a claim by the Duke of Montrose for compensation for the land to be taken. It was put at £26,500; but he has been awarded £19,090 only. The level of the loch is to be raised 22 feet, and its area enlarged from 207 to 561 acres. The alteration will add 10 million gallons daily to the quantity of water available for the city, and bring it up to 75 million gallons. While dealing with the supply of water north of the Tweed, it will be convenient to record that the Corporation of Aberdeen decided in September to apply for parliamentary sanction to a scheme for taking a supply of water from the River Avon, in two instalments, each of 10 million gallons per day, at the cost respectively of £1,068,500 and £443,500—together, £1,512,000.

Crossing the Border, and coming South, we have to notice in the first place an event which practically marked the completion of the scheme for supplying water to Carlisle from the Geltsdale Valley, which has cost the city something like £288,000. The event referred to was the turning of the water into the great reservoir at Castlecarrock, which has a top-water area of 43 acres, a maximum water depth of 33 feet, and a capacity of 170 million gallons at the draw-off level. The scheme had been in progress for twelve years; and, as "JOURNAL" readers may remember, it had been the cause of much anxiety to all concerned with it. Its satisfactory completion was consequently a source of considerable gratification. A few weeks previously, the annual visit of the members and officials of the Hull Corporation to the water-works was taken advantage of to perform the opening ceremony in connection with a new reservoir which had just been completed at Keldgate, near Cottingham, at a cost of £43,000. It was designed by the former Water Engineer (Mr. F. J. Bancroft, now of New Barnet), and it has a top-water level 140 feet above Ordnance datum; its capacity being 10 million gallons. Early in the year, the announcement was made that the water-works undertaking at Cowpe, on which the Corporation of Bacup had spent considerably over £200,000, was practically complete; the reservoir having been filled to within a few inches of high-water mark. About the middle of July, a numerous company assembled at Clipstone, near Mansfield, to participate in the opening ceremony and inauguration of the new water-works constructed by the Corporation for the supply of the borough and the adjoining districts served by them under agreements. The works were designed to furnish 750,000 gallons a day; and it was estimated that their total cost, including land, would be less than £30,000. In carrying out the undertaking, the Corporation were advised by Messrs. Hodson, of Loughborough, their Consulting Engineers, who have also prepared a new water scheme for Wirksworth. As evidence of the extending use of ferro-concrete in connection with water-works, it may be mentioned that a covered reservoir for filtered water, having a capacity of 1½ million gallons, has been completed for the Corporation of Cowes.

During the year, schemes of water supply or extensions of works have been completed for Bury (the Scout Moor reservoir), Elloughton and Brough, Liss, Llandudno, Raunds, Penrith, Sheffield (Rivelin tunnel), Shrewsbury, Skipton, and Telscombe. Considerable extensions have been in progress in connection with the Camborne Water-Works; and a storage reservoir having a capacity of 4 million gallons has been almost completed. Early in the year, a commencement was made with a huge steel water-tank for the supply of Calcutta by gravitation. The special feature of the tank, which forms an important constituent of a scheme of improved water supply for the city, as devised by the Chief Engineer to the Municipality (Mr. W. B. MacCabe, M.Inst.C.E.), is that it will stand at an elevation of 90 feet above the ground level, and be supported on steel trestles. As this will be the largest steel water-tank in the world, it is pleasant to be able to record that the contract for its construction has been secured by Messrs. Clayton, Son, and Co., Limited, the well-known gasholder builders, of Leeds, at a price of £91,367. Towards the end of October, the Mayor of Lincoln (Mr. W. S. White) laid the first pipe of the rising main which is to convey the new water supply from Elkesley to the city—a scheme which will involve the outlay of £190,000.

NEW WORKS AND EXTENSIONS.

New works and extensions of those already existing have been proposed for Chesham, Chichester, Diss, Haydon Bridge (Hexham), High Wycombe, Hitchin, Instow, Lurgan (Ireland), Lymington, Paignton, Petersfield, Plymouth, Richmond (Surrey), Ryde, Saxmundham, Swansea, Warrington, and Yarmouth. Local Government Board inquiries have been held during the year with reference to the water supply of Ballymena, Bedale, Bolton, Brixham, Chesterfield, Dartmouth, Dover, Hope (Chapel-en-le-Frith), Kinver, Leyland, Lincoln, Londonderry, Northampton, Paignton, Preston, Ruddington, Saltash, South Moulton, Spalding, Twineham, and Wellington (Salop), as well as on the subject of the supplies in the Cornish villages and in the rural districts of Devonshire. A good deal of discussion has taken place during the year on the subject of increasing the water supply of Exmouth, more especially in connection with the boring now in progress at Dotton. The District Council's

proposal to go to Parliament last year for additional powers was rejected; but they are making another attempt, and so far have been successful. While referring to borings, mention may be made of the increase in the number of artesian wells sunk during the year. From some of those within the City of London, made as the result of the high charges of the Metropolitan Water Board, from 6000 to 8000 gallons per hour are being pumped from depths ranging from 400 to 550 feet. One in Moorgate yields 2000 gallons per hour from a depth of 450 feet. A well at Slough was completed towards the end of September, after three years' boring; water being found in abundance at 1100 feet. This was an exceptionally interesting piece of work, inasmuch as it was the first successful tapping of a water supply from the lower greensand formation; at least four boreholes having previously been carried down to great depths in the London basin, but without result. In view of the success of the borings in the City, a Special Committee was appointed to inquire as to the powers of the Corporation in regard to supplying water by this means; but they reported that it was not expedient to take action, and the Corporation adopted their report.

WATER LEGISLATION.

It will be convenient to refer here to the new works, extensions of limits, and increases of capital which have recently been sanctioned by Parliament. It is unnecessary, however, to deal with them at any length, as the work of the unusually protracted session in connection with water supply has lately been reviewed. Taking Companies first, the Aldershot Gas, Water, and District Lighting Company obtained authority for the construction of a well, two pumping stations, and a covered service reservoir, and also for raising £200,000 of additional "C" stock. The Bungay, Clevedon, and Donnington Water Companies were granted powers of incorporation; and the Frimley and Farnborough Company were permitted to extend their limits of supply, use certain lands for the purposes of their undertaking, and maintain and extend the works constructed thereon. Permission to carry out additional works was given to the Grantham, Pontypool, Pontypridd, and South Lincolnshire Water Companies; the last-named Company being allowed to purchase the undertaking of the Fen Water Company. An important Act was that obtained by the South Staffordshire Water Company, as it gave legislative sanction for works which had been constructed, as was supposed, under powers they already possessed, and authorized others, as well as the raising of further capital. Extended limits and more money were given to the West Gloucestershire Water Company; and the Worksop Water Company obtained sanction and confirmation for works already constructed, and authority to raise more capital. Additional works were proposed in the Bill; but they were abandoned. With regard to the Local Authorities and other bodies who have obtained parliamentary powers, their Acts were noticed as recently as the 30th ult. It may be mentioned, however, that the Corporation of Cardiff obtained an Act (only recently Royal Assented) authorizing the construction of an impounding reservoir and other works in the county of Brecknock; that the Risca Urban District Council were empowered to acquire the undertaking of the Western Valleys (Monmouthshire) Water and Gas Company, and supply water and gas in their district and in adjacent places (the construction of the existing water-works being confirmed); and that a Water Board was constituted for the urban districts of Stourbridge, Lye, and Wollescote, in Worcestershire, and Amblecote, in Staffordshire, with power to acquire the Stourbridge Water Company and construct additional works. The first meeting of the Board took place on the 19th of October. Extensions of limits and authority to construct additional works were granted to the Llanelly and Watford Urban District Councils; the enlarged limits in the latter case being as much of the Council's district as is not within the area of the Colne Valley Water Company. A Bill was introduced for the constitution of a Water Board for the county of Glamorgan. Among the proposals of the Bill was the acquisition of five water undertakings and the sources of supply of certain local authorities. After a long inquiry, the Bill passed the House of Commons, in spite of an attempt made by Mr. Keir Hardie to have it rejected. It went up to the House of Lords and was again considered for several days towards the end of July; but in the end their Lordships unanimously rejected the measure, though they appeared to be of opinion that the county would at some future time

require a comprehensive scheme for the provision of an increased water supply. In the course of the proceedings on this Bill, Mr. Pretyma obtained an order from the House instructing the Committee to inquire whether the promoters had made provision for the supply of water at reasonable rates to the agricultural community within the area, and to any person or persons from whom any existing or natural supply was or might be withdrawn owing to the works authorized. A similar instruction was ordered in respect of the Oldham and Aldershot Bills. In the House of Lords, a Bill was introduced by Lord Desborough to determine the rights and liabilities of persons supplying water under the authority of Parliament in certain cases; but it never got beyond the second reading. The Provisional Orders applied for were mainly to authorize the construction of works and the raising of additional capital. They related to Bradfield, Gravesend and Milton, Hungerford, and Kingswood; the last-named place being taken up by a new Company. This application, as well as that of the Gravesend Company, was opposed—in the former case successfully. The Board of Trade, however, granted the Orders in the other cases, subject to certain necessary modifications and amendments; the most important being the change, in the Gravesend Order, of the basis of the charge for water from rack-rent to rateable value, and an alteration of the authorized scale involving a reduction of charges in the case of the smaller consumers.

LEGAL PROCEEDINGS.

Turning to the legal business of the year, several interesting cases have come under the consideration of the Courts. Those in which the Metropolitan Water Board were engaged have already been noticed; and the rest do not call for comment at any very great length. Early in the year, Mr. Justice Neville had before him an application by the Attorney-General, on the relation of the Bristol Water Company, for an injunction to restrain the West Gloucestershire Water Company from supplying water beyond the limits of their statutory district, or within those limits for use outside. The dispute arose with regard to a large house—Hollywood Towers—with a model dairy, stables, &c., attached, situated partly within the parish of Henbury, in the district of the Bristol Water Company, but very near the border of the parish of Almondsbury, which is within the West Gloucestershire Company's district. This Company's main came to a dead-end near to the property, but was continued for a short distance beyond their limits to a hydrant and overflow, for the purpose of allowing accumulations of muddy water to be run off. Above this, still outside the Company's district, a service-pipe was attached to supply the house. This was the action complained of, and the question for the Court was whether the defendant Company had power to deliver water outside their district. Of course, the well-known Nine Elms gas case figured conspicuously in the arguments. It was submitted for the defendants that there was nothing to preclude them from selling water to anyone they pleased, and for any purpose whatever. The supply was given in the parish of Almondsbury; and though the meter by which it was measured was just beyond the limit, the real place of supply was not there but at the place where the water left the main. In giving judgment, his Lordship said the question before him was what was meant in the defendants' Acts by the words "supply of water." He thought they meant its delivery for use at the terminals (wherever they might be) at which the consumer took possession of it, so to speak, and devoted it to his own use. If water was brought to a point outside the Company's district, and used there, the action would be *ultra vires*. In doing as they had done, the defendants had, in his opinion, exceeded their statutory powers; and therefore he granted an injunction in the terms asked. The defendants appealed, and the matter came before the Master of the Rolls and Lords Justices Farwell and Kennedy. It was again submitted that the real place of delivery of the water was where it left the main; and that therefore the supply was not outside their district. Their Lordships, however, dismissed the appeal without calling upon the respondents' Counsel; holding that if the Acts of a Company provided that water should be supplied only within certain prescribed limits, they could not carry on business beyond them. The question of the "delivery" of water came up in another form early in the year. In a case heard at the Mark Cross Petty Sessions in the summer of 1908, the point at issue was the level at which the water was "delivered;" the

supplying Company (the Crowborough Water Company) being entitled to charge 50 per cent. extra if the delivery was at a greater height than 700 feet. The Company contended that the delivery of the water took place at the cistern in the roof, which was above the 700-foot level; while the defendant argued that it was where the supply-pipe entered the house, which was below it. The decision of the Bench, consisting of four Magistrates, was against the Company; but they agreed to state a case. This was heard by the Lord Chief Justice and Justices Bigham and Walton at the Hilary sittings of the High Court. They said the point was whether or not the Company had supplied and delivered water at a higher level than 700 feet. They had so delivered it; and therefore the Magistrates ought to have allowed the full charge.

The effect of the decision in the Frimley and Farnborough case last year, in regard to the construction of works on unauthorized lands, was not only observable in the parliamentary work of the session—several of the Bills, as already mentioned, containing clauses sanctioning works already constructed—but in the Courts. Early in the month of July, Mr. Justice Ridley heard an application by the Attorney-General, at the relation of the Marquis of Salisbury, for an injunction to restrain the Barnet District Gas and Water Company from constructing or using, upon a piece of land acquired by them at Colney Hatch, "a well or other works for the purpose of raising, collecting, or storing water, and for carrying the same away for the general purposes of their undertaking." It was alleged that the well in question was outside the Company's statutory limits, and that its construction would cause injury to the relator. It was contended, on behalf of the plaintiff, that the Company had no statutory power to sink a well at Colney Hatch, which was $6\frac{1}{2}$ miles from the nearest "authorized works," except as part of such works, which it was not; and, further, that no power was conferred by the Water-Works Clauses Act on people to wander about a district, purchase lands, and construct works to draw water from an unauthorized source. It was submitted by Sir Alfred Cripps that the case was undistinguishable from that of the Frimley and Farningham Company; whereas it was contended by Sir Robert Finlay, for the defendants, that it was of a totally different character. The learned Counsel pointed out that an Act obtained by them in 1904 provided that they might acquire land at Colney Hatch for the purpose of their water-works undertaking, and that upon the land so acquired they might carry out any of the works and execute any of the powers mentioned in, or conferred by, section 12 of the Water-Works Clauses Act of 1847. This, it was submitted, had exactly the same effect as if there had been set out in terms the various things specified in the section mentioned. Putting the matter shortly, Sir Robert said the question for the Court to decide was whether Parliament had or had not authorized the works in respect of which the injunction was applied for. His Lordship said it certainly had not. He nevertheless listened to the argument of the learned Counsel, who concluded by asking him not to grant the injunction, as a special agreement had been come to between the relator and the Company, before the Committee on the Bill of 1904, that permission should be given to sink the well in question. His Lordship decided that the Company had no power under their Act to do this, and if there had been any agreement between the parties the Act had not carried it out. Under these circumstances, he must grant the injunction; but he consented to a stay of execution, pending an appeal, provided the defendants would undertake to stop the work at the well. The undertaking was given, and the notice of appeal duly lodged. It came before Lords Justices Vaughan Williams, Buckley, and Kennedy early in the Michaelmas Term, and at the close of the arguments judgment was reserved. It was given a few weeks later in favour of the Company; but, unfortunately, their Lordships were not all agreed—Lord Justice Vaughan Williams dissenting from his learned brethren. The case has, however, been taken to the House of Lords. A somewhat similar question was raised in an action by the Attorney-General, at the relation of the Seisdon Rural District Council, heard in March by Mr. Justice Warrington. It was an application for a declaration that the South Staffordshire Water Company were acting *ultra vires* in using two wells and pumping-stations at Ashwood and Kingsford, in the parish of Kingswinford, and for an injunction to prevent them from continuing them. The defence was that, by section 9 of their Act of 1893, the Company were, in effect, authorized to

construct and use the pumping-stations in question, though they had not been specifically sanctioned. His Lordship made the declaration and granted the injunction as asked, but suspended it in view of the fact that defendants were applying to Parliament for statutory authority in respect of these works. Shortly afterwards a similar application was made to Mr. Justice Neville, at the instance of the Rural District Council of Lichfield, in respect of a reservoir constructed by the Company. The course taken by Mr. Justice Warrington was explained to his Lordship, and he made an order in the terms arranged. As mentioned when dealing with the water legislation of the session, the Company obtained an Act confirming these works.

Mr. Justice Parker had before him for several days recently an action brought by the Portsmouth Water Company against the London, Brighton, and South Coast Railway Company, to prevent them from taking water from a spring, called the "Railway" spring, yielding 600,000 gallons a day, on their land at Bedhampton, near Portsmouth. The deed under which the land, which was entirely covered by water, was conveyed to defendants' predecessors contained a reservation of all water rights to the vendors, who were the owners of two estates, known as Upper and Lower Bedhampton Mill Estates, which in 1855 and 1877 were conveyed to the plaintiffs. The water by which the mills were operated was fed by various springs, among them being, as plaintiffs alleged, the one now in question. Having purchased the land on each side of the millpond, they proceeded to use the water for the purposes of their undertaking. In course of time, as the result of extensions of the railway line, an agreement was come to under which a cylinder was sunk by plaintiffs where the spring rose, and the water conveyed into a 42-inch main. The rights under the agreement continued until about two years ago, when they were determined by notice. The defendants then proceeded to put a pipe into the cylinder, and carry away the water for their own use. This led to the action. The defendants' case was that there never was a spring at the place in question from which water flowed into the millpond, but if there were, it being on their own land, they had a right to use the water from it. At all events, they said, the plaintiffs had no right to it, either as flowing water or by virtue of the reservation of all water rights to the vendors of the land under the original conveyance. A good deal of evidence was called upon both sides, and at the close of the case his Lordship reserved judgment. This he delivered on the 15th inst. in favour of the plaintiffs (*ante*, p. 824); but he granted a stay of execution to allow the necessary alterations to be made to carry his decision into effect.

In the Court of Appeal, the Lord Chief Justice, the Master of the Rolls, and Lord Justice Buckley heard an appeal from a judgment of Justices Channell and Sutton, in a King's Bench Divisional Court, reversing a decision of the Judge at the Redhill County Court, in an action brought by the Reigate Rural District Council against the Sutton District Water-Works Company (the Contractor for a reservoir being joined as a third party); the question relating to damage caused to highways by heavy traffic. In the Court below, their Lordships thought the Judge had misdirected himself; but his decision was supported by the Superior Court. A dispute between the Corporation of Bradford and Mr. T. E. E. Yorke, in regard to the construction and effect of a conveyance as to the mines near Gouthwaite Hall, in consequence of the action of the Corporation, who had acquired certain of Mr. Yorke's lands for the construction of a compensation reservoir in connection with their Nidd water scheme, was settled by the House of Lords, who dismissed an appeal by Mr. Yorke against a judgment of the Court below reversing one by Mr. Justice Joyce. Early in 1908, Mr. Justice Lawrance and a Special Jury were occupied for eleven days in trying an action brought by Dr. Fergusson, the proprietor of a hydropathic establishment at Malvern, against the Urban District Council, for damages for alleged nuisance in allowing his drinking water to be polluted by sewage escaping from their sewers, whereby an outbreak of typhoid fever in his Hydro. was caused, from which two of the visitors and two servants died. He was successful in his action; but the Council appealed, mainly on the ground that, upon the findings of the Jury, the verdict given was against the weight of evidence. They also submitted that the Jury had been misdirected. The Court of Appeal failed to see any breach of duty on the part of the Council, and they decided that judgment should be entered for them, with costs. The case was, however, taken to the

House of Lords, where it was heard last May. At the conclusion of the arguments, the Lord Chancellor said the appellant had failed to show any ground for interference with the decision of the Court of Appeal; and Lords Macnaghten, James of Hereford, and Shaw concurred. The appeal was accordingly dismissed. In connection with this case, reference may be made to a paper by Professor W. R. Smith, M.D., dealing with the outbreak, read before the Association of Water Engineers at their winter meeting in 1908, and given in the first number of the "JOURNAL" this year.

Among the other legal cases of the year, the following may be mentioned. Two water consumers at Torpoint refused to pay the increased charges of the Urban District Council for water supplied for trade purposes, on the ground that, under the Public Health Act, local authorities were not entitled to levy any charges for water beyond those actually required to cover the expenses of the supply, and that it was illegal to attempt to make a profit out of the water-rate for the reduction of the general district rate. The Bench declined to make an order in either case. A house-owner at Slough was fined £9 9s. 6d. for altering a service-pipe supplying a row of houses in a way to render the water liable to contamination. A question came before the County Court Judge at Bradford-on-Avon as to whether the Wiltshire County Council were liable for a sum of £13 4s. 10d. for water supplied to the Adcroft School at Trowbridge, which was a non-provided (voluntary) school, by the Trowbridge Water Company. The whole question turned on the construction of certain sections of the Education Act of 1902, which constituted the Council the education authority. The defence was that the managers of the school, to whom, previously to the Act coming into force, the water was supplied, were liable. But his Honour decided to the contrary; and his judgment was upheld by Justices Bigham and Walton in the King's Bench Division. In the review of the legal work of the year 1908, it was mentioned that the owner and part occupier of some premises at Earby recovered compensation from the Earby Water Company for damages sustained by him owing to the cutting off by them of the water supply to a hydrant at a weaving-shed, with the result that it was impossible to extinguish a fire which occurred there a few weeks afterwards. The Company appealed, and the case came before Lords Justices Vaughan Williams, Buckley, and Kennedy. The grounds of the appeal were that the verdict was against the weight of evidence, and that, on the findings and the admitted facts, the defendants were entitled to judgment. Their Lordships came to the conclusion that at the time the fire occurred there was no obligation on the part of the Company to supply water, the service having been properly discontinued, and that consequently the appeal ought to be allowed. Judgment was accordingly entered for the Company, with costs of the appeal as well as of the trial in the Court below.

ARBITRATIONS.

Being somewhat in the nature of legal proceedings, brief reference may be made here to some arbitration cases of the year. The first was to determine the price to be paid by the Birkenhead Corporation for the compulsory acquisition of land on the Hafod Elwy and Taincha Estates, Denbighshire, owned by Mr. A. O. Evans, required for carrying out the extensive scheme of additional water supply sanctioned by the Corporation Act of 1907. The price asked by the claimant for 2039 acres was £100,000; and the witnesses for the Corporation valued the property at about £9000. The Umpire (Sir Edward Clarke) awarded £26,518—being £26,168 for land and £350 for easements. In an arbitration in respect of the value of some land required by the Penrith Urban District Council for the construction of a reservoir the questions were raised as to whether the Arbitrator (Mr. C. R. Fenwick, of Leeds) was entitled to award compensation for its special adaptability for the purpose in question, and whether it could be given when there was only one person (the Council) in the market, and that person possessing compulsory powers. These questions were put in a case stated for the opinion of the High Court; and the matter duly came before Mr. Justice A. T. Lawrence. The Arbitrator awarded £1822 if there was special adaptability, and £312 if there was none. His Lordship pointed out that the Arbitrator had not stated a case but arrived at a conclusion; and he held that the award was correct at the higher amount. Early in the year, an inquiry was held in London, before Mr. Pollock, one of the Official Referees, respecting a claim made by the Manchester Corporation

against the New Moss Colliery, Limited, for about £81,500 for damages caused to their Audenshaw reservoirs by the Company's mining operations. After the proceedings had been opened, the parties came to a settlement. It was agreed that defendants should pay £17,500, in three instalments on dates specified, and the costs of the inquiry.

TECHNICAL BUSINESS.

Coming to the technical matters connected with water supply which have engaged attention during the year, the two meetings of the Association of Water Engineers claim first attention. At the summer meeting, held in Durham in June, under the presidency of Mr. Robert Askwith, M.Inst. C.E., the Engineer to the Weardale and Consett Water Company, the members received a cordial welcome from the Mayor (Mr. John F. Boyd, J.P.), who expressed his pleasure at finding that Mr. Askwith, who was an old and valued friend of his late father, and who had worked with him for many years in the interests of water supply, was President for the year; and he wished him every success during his term of office. At the opening of the President's Address, it was announced that the membership of the Association had increased from 332 in 1907 to 365—or 33 in the two years—which it was thought might be regarded as a very satisfactory feature of their progress. The President touched upon various useful topics in the course of his short address—the consumption of water per head, the stamping and insurance of fittings, the new Model Code of Regulations, the prevention of waste, the use of reinforced concrete in construction work, and the employment of suction-gas plant for pumping purposes. The last-named subject was also dealt with in a paper by Mr. D. Hastings Irwin. The other papers prepared for the meeting were: "Steam-Driven Pumping Plant for Deep Wells and Boreholes," by Mr. A. Towler; "The Selby New Water-Works," by Messrs. Percy Griffith and Bruce McGregor Gray; and "Public Water Supply for Fire Extinguishing," by Mr. C. W. S. Oldham. With the exception of the last, all the papers were read and well discussed. In connection with the meeting, visits were paid to the offices and workshops of the Newcastle and Gateshead Water Company, of which the President is the Consulting Engineer, where they were received by the Engineer (Mr. A. L. Forster, M.Inst.C.E.); and to the reservoirs of the Weardale and Consett Water Company, which were inspected under the personal guidance of the President. At the winter meeting, held on the 10th and 11th inst., under Mr. Askwith's presidency, Mr. Oldham's postponed paper was taken first (see *ante* p. 809). The other papers were: "Evaporation from Water Surfaces," by Mr. S. R. Lowcock, M.Inst.C.E.; "A Sterile Boring in the Inferior Oolite (Somersetshire)," by Mr. W. Phelps; and "Ferro-Concrete as Applied to Water-Works Construction," by Mr. Harry W. Taylor, Assoc.M.Inst.C.E. A paper on "Reservoir Outlets" had been promised by Mr. G. N. Yourdi; but, owing to illness, he had not been able to finish it in time for the meeting. It is postponed till the summer meeting, which will be held in York, the home of the new President, Mr. W. H. Humphreys, the Engineer and Secretary of the York Water Company. The Chairman of the Company (Sir Joseph Sykes Rymer) was present, and expressed his gratification at the election of Mr. Humphreys, and said it would be a pleasure to his colleagues and himself to meet the members in the coming summer. A feature of the meeting was the passing of a resolution approving and endorsing the action of the Committee of Municipal Trading Departments in their opposition to the proposed "centralization of the control of their accounts."

Some interesting subjects were considered at the meeting of the German Association of Gas and Water Engineers, held at Frankfort-on-the-Maine in June. Herr Reese, of Dortmund, read a paper on the "Development of Water Supply during the last Fifty Years;" Dr. Steuer, of Darmstadt, dealt with the "Origin of Underground Water," with special reference to the plain of the Rhine in Hesse; and Herr Scheelhaase, of Frankfort, submitted a paper on the "Removal of the Acidity of the Underground Water of the Frankfort Forest." At the annual meeting of the New England Water Association, a Committee presented an interesting report on the depth of laying water-mains, extracts from which were given last week. Early in the year, members of the Institution of Mechanical Engineers had their attention directed by Mr. John Don, of Maybole, to the subject of "The Filtration and Purification of Water for Public Supply," by indicating the principal features of the paper

which gained for him the "Water Arbitration" prize. An abstract of the paper was circulated, and the discussion to which it gave rise extended over two evenings. On the second, the outgoing President (Mr. T. Hurry Riches) presented the prize to Mr. Don, consisting of a certificate, a cheque, and some tools and books, and congratulated him on the work he had done. A few weeks ago, the members had brought under their notice, by Mr. H. A. Humphrey, his new internal-combustion pump, which was described and illustrated in the "JOURNAL" for the 26th of October. The paper aroused a great deal of interest, in view of the highly favourable report made by Professor Cawthorne Unwin on an official test carried out by him of a four-cycle Humphrey pump at Dudley Port. The discussion on this paper, as in the case of Mr. Don's, extended over two evenings.

At the meeting of the Royal Sanitary Institute in January, Dr. Samuel Rideal, F.I.C., read a paper on the "Purification of Water by Ozone," in which he described the installation of plant on the De Fries system in operation at the St. Maur Water-Works in Paris. He characterized ozone as the ideal agent for purifying water, since it leaves behind it only ordinary oxygen, and nothing that is foreign to the water; and he considered it specially suitable for towns drawing their supplies from rivers. In the course of the discussion, the Chairman (Mr. E. B. Barnard, M.P., the Chairman of the Metropolitan Water Board) thought that the ozone process of purification might be of advantage in an emergency, and be very desirable; but he said its adoption would mean £90,000 a year for London. While on this subject, it may be mentioned that just about the date of the meeting the ozone process was put into operation at Chartres, a city of 23,000 inhabitants, supplied with water from the River Eure. At the Health Congress, promoted by the Corporation and the University of Leeds, with the co-operation of the Royal Sanitary Institute and the Royal Institute of Public Health, which was held in July, Dr. Rideal dealt with the subject of the "Chlorine Sterilization of Polluted Waters;" and his paper was discussed with one on "The Sterilization of Water," by Mr. H. C. H. Shenton, and another by Dr. A. C. Houston, the Director of Water Examination to the Metropolitan Water Board. Other papers were on "Mechanical Filtration," by Mr. J. Parker, the City Surveyor of Hereford; and "The Water Supplies of Yorkshire," by Mr. T. Fairley, of Leeds. Mr. C. Clemesha Smith, M.Inst.C.E., the Water Engineer to the Wakefield Corporation, described the methods adopted to prevent plumbo-solvency in his district. These papers came up for discussion in the Engineering Section, the Chairman of which was Mr. C. G. Hensell, the Water Engineer to the Leeds Corporation. As bearing upon public health, it will not be out of place to refer here to the Model Code of Water Regulations issued by the Joint Committee on Water Regulations, and given in the "JOURNAL" for Feb. 2; and to the movement initiated by the Corporations of Lancashire and Yorkshire to retain unrestricted control over their reservoirs to ensure protection from pollution. The value of these huge receptacles was emphasized by Dr. Houston in the annual report of the Metropolitan Water Board, and noticed in the "JOURNAL" for Aug. 17. He pointed out that the habitual use of stored water lightens the grave responsibilities of the Board in regard to the safety of the Metropolitan Water Supply, and tends to create a sense of security among those who watch over the health of the Metropolis.

CASUALTIES.

It is again gratifying to record that the year has passed without the occurrence of many accidents in connection with water supply undertakings. The first was at the new "crib" in course of construction on Lake Michigan for providing an additional supply of water for Chicago. By some unknown means, the structure, which was of wood, caught fire, while one shift was working in a tunnel, and the men in the relief shift were asleep, and the building was soon in flames. The barriers holding the water back were quickly destroyed, and the tunnel was flooded, twenty men being drowned. The next accident was much less disastrous, though it caused considerable inconvenience. It was the bursting of a 24-inch water-main below the roadway at the foot of Putney Bridge, causing a great volume of water to pour down the High Street, and do considerable damage to property. Two skiffs from a neighbouring boathouse were launched, and rendered service to imprisoned householders; while fire-engines were brought into use for pumping the

water from the basements. The accident arose from the fracture of the pipe at a joint; and the damage was very soon repaired. Two iron water-tanks, each 60 feet in diameter and 40 feet high, and of about a million gallons capacity, constructed in 1885, failed at Parkersburg, West Virginia. They were both ripped along a vertical line, and the water liberated by the fractures wrecked a church and a large house, and seriously damaged fifteen other residences; causing the death of two people and serious injury to three or four others. The damage was estimated at about \$50,000. Two accidents occurred to reinforced concrete reservoirs in Oklahoma—one due to an attempt to effect economy by reducing to a minimum the thickness of the inner walls; and the other to the corners of the basins, where the walls pulled apart, not having adequate earth backing, as the strength of the reinforced walls was relied upon to hold the water. Owing to an accident to the 36-inch pipe which is carried across the Wharfe on a stone aqueduct in the neighbourhood of Bolton Abbey, the supply of water to Bradford was interrupted early in the morning of the 19th of July. At a point where the pipe makes a bend upwards, a subsidence of the ground caused one of the joints to draw, and the liberated water led to the displacement of several adjacent sections. Later in the day, the Corporation Water Engineer (Mr. J. Watson) inspected the damage, and the necessary repairs were undertaken.

PERSONAL MATTERS AND DEATHS.

Before bringing this retrospect to a close, a few personal matters which have occurred during the year call for brief notice. Mr. J. F. Bedford, of Leeds, was appointed Water Manager to the Colne Corporation; Mr. E. W. Booth, of Croydon, was selected for the position of Engineering Assistant in the Water Department of the Bolton Corporation, and he accepted it, but afterwards resigned; Mr. Lees Buckley was appointed Secretary and Collector for the Ashton-under-Lyne, Stalybridge, and Dukinfield District Joint Water Board, in succession to Mr. W. H. Rothwell, who had been Secretary since 1878, and was retained as consultant-adviser; Alderman W. J. Burgess retired from the Liverpool Corporation, in which for some years he held the position of Chairman of the Water Committee; Mr. J. Diggle, of Heywood, was appointed Borough Surveyor and Water-Works Engineer to the Hyde Corporation; Mr. G. B. Gibbs succeeded Mr. Sutherland as Secretary of the Sunderland and South Shields Water Company; Mr. J. C. Hawkins, of Cardiff, was appointed Chief Water Engineer to the Paignton Urban District Council; Mr. J. S. Ineson, the General Manager and Secretary of the Ventnor Gas and Water Company, was presented by the Directors with a framed illuminated address, together with a gold watch and chain, in token of their hearty appreciation of his "valuable and faithful services" for twenty-five years; Mr. S. Marsland was appointed by the Metropolitan Water Board Assistant District Engineer of the Kent district; on the 3rd of April, Mr. C. Sainty, the Manager of the Windsor Water-Works, completed thirty years' service under the Corporation; Mr. J. W. B. Simpson, the Accountant of the Chesterfield Water and Gas Board, is now styled Accountant and Commercial Manager; and Mr. J. W. Sutherland, the Secretary of the Sunderland and South Shields Water Company, was presented with a silver salver and a cheque for fifty guineas, to mark the completion of his fifty years' service with the Company.

During the year we have unhappily had to record the removal by death of several gentlemen closely connected with water undertakings—viz., Mr. George D. Bellamy, Consulting Water Engineer to the Plymouth Corporation; Mr. George Crowe, Engineer of the Chester Water Company; Mr. George Frederick Deacon, the well-known Water Engineer; Herr M. Dietrich, the Manager of the Munich Municipal Water-Works; Alderman Thomas Goldsworthy, the Chairman of the Water Committee of the Newport (Mon.) Corporation; Mr. William Goldsworthy, formerly Manager of the Hampton station of the Metropolitan Water Board; Mr. Robert Hodgson, the Outdoor Manager of the Sunderland and South Shields Water Company; Sir Theodore Martin, the Chairman of the Brymbo Water Company, and a distinguished member of the Parliamentary Bar; Mr. W. A. Piercy, the Manager of the South Hayling Water-Works; Mr. R. H. Swindlehurst, the Water Engineer to the Bolton Corporation; Mr. W. A. Valon, the well-known Consulting Gas and Water Engineer; and Mr. Joseph Wren, the Vice-Chairman of the Boston (Lincs.) Water Company.

PARLIAMENTARY MUNICIPAL TRADING RETURN.

FURTHER progress has been made with the publication of the return regarding municipal trading in the United Kingdom which, as "JOURNAL" readers have already been made aware, is being prepared at the instance of Mr. L. G. Chiozza Money, Member for North Paddington. The "further progress" here referred to, of course, relates to the issue of another one of the series of volumes into which it has been found necessary that the return should be divided. The present is the fourth volume to be published, but strictly speaking not the fourth in the series, for it is numbered Part III. Parts I. and VI. were noticed in our issue for June 22 last; while Part II. was similarly dealt with on Sept. 21. Now another part is before us, just about three years after the return was moved for—and, of course, there are still some more to come.

It is necessary to recapitulate here, very briefly, what the return is intended to show, even though we may be unable to state with absolute certainty the reasons which made it appear to the originator of the idea desirable that it should be so shown. The object is to set forth certain trading statistics for the London County Council, the Corporation of the City of London, the Council of each Metropolitan Borough, the Corporations of the Municipal Boroughs of Liverpool, Manchester, Birmingham, Leeds, Sheffield, Bristol, Bradford, West Ham, Newcastle-upon-Tyne, Kingston-upon-Hull, Nottingham, Salford, Leicester, Portsmouth, Bolton, Cardiff, Sunderland, Oldham, Croydon, Blackburn, Brighton, Derby, Preston, Norwich, Birkenhead, Gateshead, Plymouth, Halifax, Southampton, South Shields, Burnley, East Ham, Huddersfield, Swansea, Wolverhampton, Stockport, Middlesbrough, Stockton, and Blackpool, and the Edinburgh, Glasgow, Dundee, and Aberdeen Corporations. It is to indicate the nature and extent and, for each of the last four years for which figures are available, the financial results of reproductive municipal undertakings, including for each undertaking separately "a short description thereof, date and terms of original acquisition or establishment or subsequent extension, how managed, capital employed and how obtained, value of the undertaking, capital paid off and outstanding, loan charges, provision for depreciation, gross income and expenditure, net profit or loss, how profit is allocated or loss met, amount of relief or burden to rates, number and salaries of the chief paid officials, number of workpeople, rate of wages paid in chief classes of labour, and prices charged for products or services supplied or rendered." In a memorandum attached to the return, it is pointed out that the municipal boroughs in England and Wales mentioned above are all those which at the date of the Census of 1901 had a population of upwards of 90,000—with the addition of two (Stockton-on-Tees and Blackpool) which have a smaller population. When noticing Part I., some particulars were given with regard to the form in which the information was asked for and has been supplied in the return.

The municipal boroughs included in the present volume are: Birmingham, Nottingham, Leicester, Derby, Wolverhampton, Norwich, West Ham, East Ham, Croydon, and Brighton. With regard to these ten boroughs, the number of reproductive undertakings which fall to be included are respectively: Birmingham eight, Nottingham six, Leicester seven, Derby six, Wolverhampton seven, Norwich four, West Ham four, East Ham four, Croydon eight, and Brighton nine. Gas supply is included in the cases of Birmingham, Nottingham, and Leicester; and water supply in those of Birmingham, Nottingham, Leicester, Derby, Wolverhampton, Croydon, and Brighton. In all ten boroughs the electricity supply is a municipal one; and in nine of them there are tramways owned (though not in all cases worked) by the Council. In seven instances markets appear; and in all ten boroughs there are municipal baths. Eight of them have working-class dwellings among their reproductive undertakings; while Derby includes cemeteries, Wolverhampton cold stores and an ice manufactory, Norwich allotments, Croydon lodging houses, slaughter houses, and allotments, and Brighton telephones, an aquarium, and an abattoir. Surely there is variety enough here to keep even the most easily wearied student interested.

During the four years mentioned in the return—1902-3, 1903-4, 1904-5, 1905-6—the Birmingham rates received about £200,700 from the gas undertaking, £12,100 from markets, and £500 from workmen's dwellings. In Nottingham, the gas undertaking contributed some £106,000, the electricity works £28,000, the tramways £63,000, and the markets £20,000. In like manner, Leicester benefited to the extent of £144,000 from the gas-works, and £13,300 from the markets. At Derby, the markets have handed over to the rates £10,000. The Wolverhampton water-works have contributed £2670 (all in the year 1902-3), and the markets and fairs £16,700. The Norwich markets have handed over £9000, and the working class dwellings and allotments £19 (in the year 1905-6). It will be remembered that in the statistics issued by Mr. J. Carter, the Borough Treasurer of Preston, a few weeks ago, out of a representative list of 94 towns and boroughs, Norwich tied with East Ham for top place in regard to the amount in the pound levied for rates—the figure shown in each case being 9s. 11d. These statistics referred, it should be pointed out, to the year 1909; and so are much more recent than the period to which the present Blue-Book relates. As, however, the latter document shows that Norwich has only four "reproductive undertakings"—that is, electricity, markets, baths, and dwellings—and

of these a small profit has only resulted on two, while the electricity undertaking has shown a surplus since it was acquired, it seems one must look elsewhere than in the direction of municipal trading for an explanation of the high rates. The West Ham rates have received £15,000 from the tramways undertaking; and those in East Ham, £1750 from the electricity works (all in the year 1905-6), and £5250 from tramways (also in 1905-6). From the water undertaking at Croydon £4800 has been handed over, from the electricity works £4000, from the tramways £2000 (all in 1902-3), from the working-class dwellings £76 (in 1905-6), and from the allotments £92 (in 1902-3). The Brighton rates have received £25,000 from the water undertaking, £3250 from the electricity works (all in 1903-4), £3050 from the trams (in 1903-4), and £2000 from the markets.

These are merely the "rate relief" figures extracted from the 200 pages of tables and statistical information of which the Blue-Book is composed. They show that out of the sixty-three "re-productive" undertakings owned by the ten municipal boroughs whose returns are included, not more than twenty-six during the four years mentioned contributed any sum to the reduction of the rates. In only three of the boroughs is the local gas undertaking in the hands of the municipal authorities; but the profits taken from these for the benefit of the rates reach a figure which seems to about double the receipts from all the other twenty-three undertakings put together. Next in order are tramways, with £88,000; markets, with £83,000; electricity, with £37,000; and water, with £33,000. Of the total number of undertakings included in the return, some twenty-five are of such a nature that it may be assumed they were started quite apart from any question of profit-making—such as workmen's dwellings, baths, cemeteries, and abattoirs, and other things of a similar character.

It does not appear that the member at whose instigation the returns are being compiled expressed any desire that the figures relating to the different boroughs should be summarized in one table; and thus it would take a long time to arrive at the total amount of capital involved in the number of undertakings dealt with. It must, however, manifestly be enormous; and when the results from the three gas undertakings, at Birmingham, Nottingham, and Leicester, are deducted, the figures cannot be very helpful to him for the purpose of demonstrating the success of municipal trading from a profit-earning point of view—which it is surmised (perhaps wrongly) was one of the principal points in mind when the return was ordered by Parliament. While, however, referring thus to the profit-making side of the question, it may be well to repeat the remark made when noticing the last preceding volume of the series—that we do not regard the extent of the rate relief as any adequate test of the success or otherwise of municipal trading enterprises. It is not, in fact, the standpoint from which the question should be even mainly judged—for if it is wrong to speculate in risky concerns by which the ratepayers may become heavy losers, it is little better to take from the consumers for the benefit of the general body of citizens the profits of undertakings in connection with which risk to the pockets of the latter is non-existent.

Inspecting Gas Examiner for the London County Council.—At the meeting of the London County Council last Tuesday, the Public Control Committee recommended that an inspecting gas examiner be appointed in the chemical and gas-testing department, and that his duties be to inspect the several gas-testing places in London, make non-statutory tests of gas and statutory tests in cases of emergency, and perform, under the direction of the Chemist, other work falling within the province of the Council as the controlling authority. The Committee also recommended that Mr. B. R. James, a relieving gas examiner, who has been employed temporarily on the work, should be appointed as from the 1st prox., at the commencing salary of £162 10s. a year. The recommendation was adopted with discussion.

Cost of Working a Gas-Power Plant.—At a recent meeting of the Royal Scottish Society of Arts, in Edinburgh, a paper, entitled "Some Recent Developments in the Use of Producer Gas for Power Purposes," was read by Professor R. Stanfield, of the Heriot-Watt College. It was stated, in connection with the working of a gas-power plant of about 30 B.H.P. capacity, that the total cost, including fuel, wages, maintenance, depreciation, interest on capital, rent, taxes, &c., amounted to less than $\frac{1}{2}$ d. per actual horse power per hour. There seemed to be no doubt, the author considered, that the use of gaseous fuel, for power and heating purposes on a large scale, was steadily but surely advancing, and the time was not far distant when large plants would be erected near great industrial centres to supply a cheap gas.

The Spelling of the Name of the Inventor of Gas Lighting.—Questions have been raised from time to time in regard to the spelling of the name of the inventor of gas lighting, which some have asserted should end with a "k" and not with an "h" as is usual. If we remember rightly, the former spelling is the one adopted in the "Dictionary of National Biography." An article in the "Engineer" for the 17th inst. sets the matter at rest. It is entitled "Some Recollections of the Soho Foundry, its Men and Methods;" the author being Mr. Charles H. Wall. In the course of it, he gives a facsimile reproduction of an autograph letter dated Dec. 20, 1805, and bearing the signature of "Wm. Murdock." The text of the letter shows so clear a distinction between "h" and "k," that no room is left for further doubt as to the spelling which the owner of the name adopted.

SOME ASPECTS OF TECHNICAL EDUCATION.

By NORTON H. HUMPHRYS, Assoc.M.Inst.C.E., F.C.S.

THOSE who are in the habit of attentively following our technical literature, or of attending public functions connected with our industry, must have had the matter of Technical Education very much on the brain during the last few months. It is not one of the many new features of the Nineteenth Century, but is as old as our industry itself, though now coming to the front in a change of clothes. An enormous amount has been written and spoken on the importance of higher technical training, for some time in regard only to responsible heads or controlling powers of gas undertakings; but latterly the subject has tended to filter downwards, until now it appears to be generally accepted that even the office boy might know a little more, to his own advantage, and to the benefit of the concern he is serving. When we look for what has been done, however, we are reminded of Falstaff's tavern bill—5s. 4d. for sack, and $\frac{1}{2}$ d. for bread.

The average gas-works employee is certainly much better educated than his grandfather was—that is to say, in a general way. He can write a fairly legible, if not a good, hand; he can figure; and he is not a stranger to a few of the "ologies." He has also benefited by the traditions of the elders, gathered while he was a boy at home—assuming that he is a member of a gas family. But apart from general advancement in education, and from the fruits of practical experience, he is not in a much better position as regards facilities for specializing in his own particular line than was his grandfather (say) fifty years ago. No inaugural address has been considered complete without a page or a paragraph dealing with the subject; and it would be difficult to turn up a volume of our special serial or other literature that did not contain pointed references to the need for better or more thorough technical education. Yet it is only recently that a Chair of Gas Engineering has been inaugurated at a University, or the classes especially devoted to the technical training of employees have taken tangible shape. There have been, in isolated cases, some endeavours in the direction of classes or courses of lectures; but they were the exception rather than the rule.

When there is much talk and little do in connection with any project, careful examination usually elicits the fact that there are difficulties, possibly of a formidable nature, that are not evident at first sight. The commencing exercises are proverbially easy; but the asses' bridge is encountered in many other things beside Euclid. The great hindrance to the advancement of technical education in our industry, has been the lack of some detailed explanation as to the meaning of the term. It has been nothing but a blessed Mesopotamia to many. There has been plenty of generality, but nothing definite—such, for instance, as a full scheme or syllabus of the course of study to be taken up by a beginner. The Council of the Institution of Gas Engineers, with the aid of gentlemen who have some experience in setting questions and examining students, whose services and assistance they could readily secure, might do something towards remedying this defect. As it is, the young beginner has had to blunder along in the dark. If he had the good fortune to be the son or relative of a gas engineer, or an articulated pupil, he may have obtained some useful advice based on individual experience; but many of the older generation could scarcely set out a scheme suited to present-day needs, or give a connected account of how they acquired their own knowledge. Like Topsy, all they could say was that they "grewed" into it. In the lack of assistance of this nature, there is nothing other than the desultory perusal of books, or attendance at the local mechanics' institute or science and art classes, to take up subjects such as chemistry, building construction, drawing, &c. Many of these are rather matters pertaining to general than to special technical education as generally understood. What is needed is reliable and competent advice as to a proper course of study, having regard to the student's present standard of general education, his environment in life, and his future prospects.

There are now in our chief cities excellent facilities in the form of evening classes, not only as regards general but also in special technical lines of education; but in towns of 20,000 inhabitants or less, the opportunities, even to-day, are very meagre. Every student does not enjoy the advantage of residing at or within easy distance of some large centre. There are many, scattered throughout the length and breadth of the land, earning their living in subordinate positions in connection with small gas undertakings, who have neither time nor the means to avail themselves of such advantages. But the small gas-works have always given a good account of themselves, both in the matter of passes at examinations, and in furnishing representatives in the higher walks of the profession. Many who have deservedly attained to the position of shining lights and leaders in our industry, commenced their career in the service of a small undertaking. Given energy and determination, together with some natural aptitude, a small gas-works offers educational facilities that are not readily outstripped, even with the aid of the best modern resources.

The lack of definiteness or clearness as to outlining schemes for study, also extends to the qualifications of the perfectly educated man—if one can imagine such an individual. Following the lines of some earlier utterances on the subject, it would appear that "the more the merrier," and that the acme of perfection might be expected when the whole staff, from the day labourers and office boys upwards, were so highly charged with technical

information that each individual could, if desired, take up any and every department and run it to the best advantage. Artemus Ward, I believe, somewhere describes an army composed of such smart individuals that it was impossible for one to be in any respect less than another, and therefore the lowest rank was necessarily that of a General. We do not know how Lord Roberts or Lord Kitchener would regard such an army from a practical point of view. But it is safe to say that if a qualified gas engineer was called upon to control a gas-works staff of this character, there would soon be some important changes in the *personnel*. Following an example recently quoted, "there would be several vacancies for less educated men."

History repeats itself. In my young days, the junior of an inquiring turn of mind was frequently cautioned against wanting to know too much, and advised that too great a thirst for knowledge would bring him to a bad end. This was simply a bucolic way of reminding the student that, if he would be successful, he must specialize, or, as we say now, that he requires some special technical education. The lad in the office was expected not to take more than a very casual interest in the retort-house; and the gas-fitter's mate knew better than to pry into the secrets of the engine-room. The same thing applied to every department. The works, the office, and the out-door staff were all adjured to mind their own business. "Every shoemaker to his last" was a frequently quoted proverb, and more than that, was generally acted up to, which is not always the case. But later, this sort of thing dropped entirely out of sight. The beginner was told to learn everything and anything, and sometimes, as a consequence, learned nothing. It is possible to extend the area of operations at the expense of the foundation; and when superficiality takes the place of thoroughness, the result is not a success. But, after many years, there is a tendency to hark-back to the old cry. We are reminded that there is such a thing as over-education. At one time the complaint was "ignorance." Now it is recognized that there is such a thing as too much knowledge.

The number of gas-works in Great Britain is limited. Suppose we take it at 2000. Obviously, there cannot be more than 2000 managers of gas-works holding office at any one time; and taking the average tenure of office as twenty years, there will not be more than 100 retiring each year—that is, not more than about 100 vacancies for new comers. Also we must remember that the period for obtaining office is now limited to a very few years. If the candidate is under thirty years of age, he is too young; if over forty, he is too old. Of the total number of qualified candidates for office to-day, not more than 1000 have any reasonable prospect of success. We have all heard about the French officer who said that every soldier carried a marshal's baton in his knapsack; and it is well that the young beginner should feel that he will not be hampered in any laudable endeavour to qualify for an improved position. But he should not be deceived, or allowed to deceive himself, into the idea that the process of climbing is easy and the end certain.

The actualities of the present should not be obscured by the possibilities, or the assumed possibilities, of the future. In the early days of the industry, it was the sole end and object of every ambitious subordinate, whatever his status, to rise to the position of chief; but it is now becoming evident that there are not enough chieftainships to go round. With an appreciation of this fact, the question of technical education tends to move from the general towards the particular, and from one subject to a large number of divisions or classes. Instead of now advising every learner to swallow and endeavour to assimilate, so far as his abilities will allow, the whole of "Clegg" or "King's Treatise," he is recommended to take up a section or even a single chapter. He is assisted to specialize in his own particular department, or in the one that is best suited to his abilities. If there are but comparatively few openings at the top of the tree, there are a larger and increasing number that offer good promise. With the enlargement of the industry there is a corresponding extension in the number and in the importance of the several departments; and the head of one of these departments may occupy a more important position than the chief of fifty years ago.

There may be something to be said in favour of free competition in technical education as in any branch of trade, and of encouraging 1000 or 20,000 to qualify for a position that, as already stated, may not offer more than 100 vacancies a year. The position may tend to the immediate pecuniary benefit of directors and shareholders, as enabling them, under the stress of competition, to secure efficient services for the ridiculously inadequate remuneration that is at times offered in advertisements. It may furnish an effective rejoinder if the manager, after having increased the business and profits some 50 per cent., ventures to suggest that the amount of his salary might be "reconsidered," because no reasonable man, knowing that there are hundreds waiting to jump into his shoes on bread-and-cheese terms, can expect a liberal appreciation of the time and ability he has devoted to the work, or that, in return for giving up the best and most active period of his career to the interests of the company, he will get a reward sufficient not only to cover his present contingencies, but also to leave some provision against ill-health or old age.

If the result is not in all respects satisfactory to the man in office, it is still less so to the unfortunate majority who are unsuccessful; and it does not tend to the real welfare or improvement of the industry. The successful candidate will not be likely

to advertise the industry or recommend it to those who are seeking a means of livelihood; while the unsuccessful, looking upon his technical skill and training as stock-in-trade for which he has failed to find a market, will work in the other direction. The board may announce with some pride that they had 387 candidates for the post, from which it would appear that the successful one must be somebody in particular. But the other 386 are deserving of some consideration. It is interesting to think of the amount of human nature contained in those 387 applications. The perusal of them is not altogether a pleasure. The whole of the applicants are not out of a job; and the majority perhaps only desire to go one better. A considerable proportion are of the character of sporting offers, but not unfrequently tinged with a desperate earnestness. After a fair weeding process, however, there remains a mass of technical ability running to waste. The great need of the present day is not so much in the way of attracting newcomers into the profession, as to find some method of utilizing the abilities of the capable, but unsuccessful because crowded out, applicants. One hears of men with every advantage of influence in their favour who have to wait years for their position; and while this sort of thing exists, the best talent will not be attracted to the profession. The best talent considers that the prospect of being one of the 387 is not good enough.

The surplussage of candidates, as compared with the available vacancies that offer, is, unfortunately, not confined to the gas profession, but is noticeable in connection with any line that affords a prospect of a bare living and a respectable position, and is therefore in sufficient popular repute to become one of the professions. And by the word profession, I understand a calling to which young men enter as articulated pupils by the payment of a more or less substantial money premium. The lament of the 386 becomes louder and louder every year. There are always practitioners and teachers who consider the value of the premium to themselves, but not the position and prospects of the student at the end of the term. And there are numbers of qualified men who kick their heels in idleness or in some trivial occupation for years—the best and most active years of their life—before they can obtain a suitable outlet for their abilities. Many find that it is necessary to throw over their prospects and try cattle-raising or wheat-growing in the Colonies, or, what is worse, drift into the ranks of the unemployed. The popular idea of the unemployed is associated with rags, dirt, and incompetence; but there is silently and unobtrusively growing up among us a new class of unemployed. They do not blatantly advertise themselves, or promote hunger marches or mass meetings; and their needs are not the less urgent because they take no place in the charitable efforts of the public. The oft-used term "the poorer class" needs considerable revision.

I may be reminded that much of this has nothing to do with technical education. But any scheme of education—technical or otherwise—that turns the student loose on the world and washes its hands of him at the end of his scholarship, is a weak, incomplete, and knock-kneed affair. If there was more evidence, on the part of those who hold the purse strings, of a desire to encourage technical skill, by the application of a system more human and more sympathetic than the hard laws of supply and demand, there would be no need for urging the importance and otherwise recommending the same. Candidates of the best order would be glad to enter.

I take it that the object of technical education is to make the stoker a better stoker, the engineer a more qualified engineer, the gas-fitter a neater and more scientific workman, and the whole a better paid, more intelligent, and more contented class, rather than to create aspirants to positions that at the best only a small proportion can hope to attain, and for which, it might be added, some are in no sense fitted. It is strange that education is confined exclusively to the development of the brain. While intellect is developing, muscle is degenerating. We should never be able to do entirely by machinery; and there will always be the demand for the man with the strong arm. It is possible that the philosopher who could teach the best way of using a shovel, having regard to the result accomplished, and the expenditure of force or energy, would be a greater benefactor to his race than one who establishes and endows a technical college.

The Secretary of the Royal Society of Arts (Sir Henry Trueman Wood, M.A.) sends a copy of a pamphlet he has prepared for the information of members and others interested in the Society's work. He says that for some time past the idea of preparing a history of the Society has been under consideration; but it has never come to anything. Pending the realization of such an idea, he has thought that it might be useful to collect a certain amount of information about the Society which has hitherto only existed in a scattered form, or in the pages of the Society's "Journal." The pamphlet contains a short sketch of the Society's history, an account of the trust and prize fund it administers, a history of the examinations it has carried on for the past fifty years, a description and pictures of its medals, lists of the Albert Medallists, and of past and present officials, the Charter and bye-laws, and other general information, including a list of the proceedings of the past session, and a financial statement for the past year. If the experiment is justified by success, the pamphlet will be issued, probably with additions, another year; and it may possibly develop into an annual publication.

AIR GAS LIGHTING :

ITS ADVANTAGES, SOME OF ITS DEFECTS, AND HOW TO REMEDY THEM.

By HERBERT A. CARTER.

THE study of new methods of lighting is one of considerable interest; and there are several growing systems which possess great possibilities. The limited extent of our coal deposits, and the way in which these will in time become exhausted, render investigation of the claims of some of these new systems of primary importance. Among other methods, the introduction of petrol as a means of supplying light has opened out a vast field for the engineer to devote his attention to; and very considerable progress has been made in the way of producing a satisfactory light from this agent, although there still remain certain obstacles in the way of this, which in some of the petrol systems have only been dealt with in a superficial manner up to the present.

The constituents of petrol render it so applicable to the production of gas by means of vaporizing that it is not surprising that petrol lighting, as a whole, is beginning to attract considerable attention, and is being adopted by different authorities for the lighting of very extensive areas. Among others may be mentioned the Royal Engineers quarters at Bordon Camp, Salisbury Plain. The form of generator used in this case was supplied by the British and Colonial Gas Lighting Company, Limited. The apparatus is admirable in its construction, having in view the large area to be lighted, and taking into consideration that petrol lighting is really now only being developed, but that it may in the near future be perfected as an absolutely reliable and economical system, some of the facts here given go far to prove.

The plant just mentioned consists of a battery of carburettors, connected in series; the petrol being supplied to the carburettors automatically in small quantities only as required. Immediately the petrol enters the carburettors, a very rich quality of gas is produced by a process of evaporation which there takes place, at the same time a stated quantity of air is introduced to the carburettors. This air is supplied by means of a rotary blower directly coupled to the carburettors, and driven by a small petrol engine of approximately $\frac{1}{2}$ H.P. The constituents of the gas thus produced are in the proportion of about 98½ per cent. of air to 1½ per cent. of petrol vapour, which is the mixture that all these systems seek to produce; it being non-explosive, on account of the large body of air which it contains and the small percentage of petrol vapour. At the same time, the mixture, or the gas produced, is sufficient in quality and volume to give a very brilliant light when introduced to the ordinary incandescent ramic mantle.

This particular installation contains over 5000 feet of piping, which is carried along the roads and taken into the various buildings, and combines to make a most effective display as an independent system of lighting. It has now been in operation a little over twelve months, giving complete satisfaction; and is an excellent illustration of the possibilities to which this new system of petrol lighting may attain.

PETROL.

Petrol, as is well known, is a mineral oil; and its source of production is practically unlimited. The specific gravity which gives the best results in lighting is '680; this producing a soft, yet brilliant, light, which, at the same time, does not allow of any deposits of carbon or other objectionable matter, which might tend to discolour the mantles, and cause obstruction in the passages of the burners—necessitating less attention and cleaning of burners, and hence ensuring longer life to the mantles.

German engineers have for long recognized the possibilities of petrol; and the light is employed in many German undertakings and in other industrial concerns on the Continent generally, which affords ample reason for its fuller investigation by British gas and lighting engineers. It is only within recent years that it has received any attention from practical persons in this country with a view to its wider utilization; and one feature in its favour is the simplicity of the plant needed in its production as compared with the manufacture of coal gas, even on a small scale, or the generation of the electric light.

THE "LOCO" GAS APPARATUS.

Another well known, and we may say fairly extensively used, system is the "Loco" gas apparatus, which is the invention of Mr. Frederick C. Lynde, Assoc. M.Inst.C.E., of Manchester. This system is at present in operation, and giving very satisfactory results, in almost all parts of the United Kingdom, India, and the Colonies. A unique feature of the plant is the method of petrol feed. This consists of a specially-constructed glass float or globe having a central cavity or chamber, at the bottom of which is a specified quantity of mercury, which automatically controls the flow of petrol introduced at the centre of the bulb through a steel tube of small diameter. The float is balanced in a cast-iron chamber, which contains a small quantity of petrol to give the required flotation; the whole being under the direct control of the mercury seal. The chamber is directly connected to the carburettor.

As the petrol is evaporated in the carburettor, the level of the petrol in the chamber is immediately lowered, and the float, falling with it, opens the mercury seal, and allows just the necessary quantity of petrol to flow into the chamber and replace the

amount evaporated. This description of feed needs no adjustment when once set; and the quality of gas produced as the result of this method of feed is always consistent, and a very good light is assured. In addition to this, the "Loco" machine itself is a really compact and strongly built apparatus, and only occupies a minimum amount of space—approximately, 3 ft. 6 in. by 2 ft. 9 in. It is also a safe apparatus, and can be fixed in almost any position in a building, as it is not necessary to store a large quantity of petrol in any part of the machine, and the petrol tank, which supplies the chamber, can be fixed outside the premises any distance from the machine. Apart from these points, the apparatus itself is mainly constructed upon the same lines as those adopted in most machines of this class.

The Loco Gaslight Company have carried out several large and important installations, among them being Stonyhurst College, in Lancashire, where upwards of 1800 lights are in use, and which has met with the full approval of the Principals of this body. An installation carried out at Illawalla, Poulton-le-Fylde, is a good example of the Loco method of petrol lighting. There are several thousand yards of piping carried through the ground on this estate; the light produced being excellent in quality, and very brilliant at the farthest point from the machine. The Midland Railway Company's locomotive sheds at Ballymena, near Belfast, have also been successfully lit by this method. Messrs. Lever Bros., of Port Sunlight, have introduced the system on their oil-seed plantations in the Solomon Islands, which goes to illustrate the confidence its merits can command. Many machines have also been sent abroad by shippers to South America, Portugal, Russia, France, and India.

THE SAFETY OF AIR GAS.

It may not be generally known that air gas is the safest of all gases, owing to there being so small an amount of vapour in its composition. Further, no purifying process is necessary, either in the generation of the gas or its combustion; it being non-poisonous. Even in the case of petrol, if there should be an escape of gas no danger exists, as the gas becomes still further diluted with air; and if a naked light is brought close to such an escape, no risk is incurred, as the escaping gas will merely extinguish a light, and not ignite, for the simple reason that the gas will burn only in specially constructed burners.

The Simpitrol system of the British and Colonial Gas Lighting Company first referred to, produces a light quite free from sulphur and ammonia, absolutely smokeless and odourless, and in no way can it cause harm to delicate decorations, pictures, or furniture. It has no injurious effect whatever upon animal or plant life. The same may be said of the "Loco" and Praed systems, the latter of which will be referred to later on.

Another great advantage of petrol lighting is the fact that the consumer is entirely independent of outside assistance in the production of the gas, for the whole of the plant can be attached to the residence, and operated by any member of the household; there being no intricate parts in the machines liable to get out of order. The operation of starting the machines is quite simple. In regard to cost, a gallon of petrol can be obtained approximately for 1s.; and, when used by a reliable machine, it will produce an efficient light equalling 1000-candle power per hour at a cost of 1s. 4d. On petrol used for lighting purposes, the Government duty of 3d. per gallon is not payable.

The cost of the electric light varies in different localities from 4d. to 6d. per unit; and it is recognized that a 16-candle power incandescent lamp will use a unit in 16 hours, the cost of which, basing the price on the above estimate, would be 5d. for 60-candle power. Electric light would therefore cost 1s. 6d. for 15 hours; while an ordinary table lamp, burning paraffin, only gives a light of 8-candle power, the cost being about the same as the 16-candle power electric lamp referred to. The cost of acetylene, it may be observed, is six times more than the cost of petrol lighting, and it is claimed by the introducers of this system that, quite apart from its superiority over other systems for its brilliancy, petrol lighting is considerably cheaper than coal gas, electric light, paraffin, or acetylene.

The Praed system is another method which has made great headway, and is most simple. It consists of a small hot-air engine heated by the gas, which the plant itself generates—this being, of course, the same in the other systems referred to. It operates an air propeller, which works in a bath of paraffin to form a seal for the air; thus furnishing a full volume of air, which is passed to the carburettor. Directly connected to the shaft of the propeller is a simple pumping arrangement, which raises the petrol from the storage tank below the machine or carburettor, where it is vaporized; and at the same time the correct mixture of gas and air is passed on to the holder. The holder possesses an advantage in so much that, when filled with gas, it can be left to act as a storage chamber; thus guaranteeing an efficient supply of gas even when the machine is not in use. The petrol enters the carburettor through a small inlet at the top, which is designed to cause the petrol to be reduced to a very fine spray, so atomizing it, and keeping the supply under control. This makes the plant perfectly safe; and there is no danger of a very rich or explosive gas being formed.

Other forms of machines which command notice, and are in successful operation, are those manufactured by the Délaite Safety Gas Company and the National Air Gas Company. The motive power of the former consists of a weight apparatus; and the latter is generally constructed on the principle of the systems already

referred to. In all cases where these different forms of machines have been introduced, no difficulty has been experienced in conveying the gas long distances; and the illuminating power of the light obtained is said to be "far in advance of that produced by coal-gas."

It would be as well to state at this point, for the information of those having little or no experience of gas production by intimately mixing petrol vapour with air, that the petrol itself is the source of light and heat; the admixture of air serving only a secondary purpose. It is possible to produce a gas containing only a percentage of petrol vapour equal only to 1:4; and this can be used for both lighting and heating. But in order to obtain an efficient light, or produce heat for cooking, &c., a much richer gas would have to be used. With most machines this result can easily be obtained by regulating the proportion of air admitted to the carburettor to produce either a weak or rich gas; thus proving that these simple yet effective appliances, in the hands of those of ordinary intelligence, can be regulated and adjusted to produce the desired requirements in regard to either light or heat, while only involving a comparatively small expense.

THE MOTIVE POWER.

Touching, again, on the motive power, the most satisfactory form has been found to be the hot-air engine. This consumes only a small quantity of gas, and is therefore inexpensive to run, and is usually of a simple, yet reliable, construction, and almost impossible to get out of order; while in all makes of this class of engine the wear and tear on the frictional parts has been scientifically reduced to the minimum. For these reasons mostly, it has been adopted by the manufacturers of all kinds of air-gas machines, and has fully justified its adoption. A water-motor, if it is served from a constant source, is also reliable, and can be supplied whenever water power is available. It can be recommended as a cheap motive power in first cost, though it may not work out so very cheap if the water has to be paid for.

With regard to the falling weight to serve this purpose, it is necessary to point out that, unless a considerable fall can be arranged for the weight, it is essential to re-wind up the weight many times according to the consumption of gas; and at least a 30 feet fall is desirable. In many instances this is not practicable, and therefore the hot-air engine has taken precedence over this method.

The burners used are of various types; some being constructed so that the admission of air at the burner is an impossibility; and these should always be used in conjunction with a gas plant where the correct mixtures of air and gas are guaranteed and can be relied upon. Other forms which admit air at the burners are usually adopted where these conditions are not so certain; and in the event of a rich gas being produced at the machine, and conveyed to the burner, it is necessary to admit a further percentage of air, by means of a regulator attached to obtain the required brilliancy of light. This, although not utilizing as much air as is necessary to produce the required brilliancy in coal gas, nevertheless vitiates the atmosphere, and does not give quite as good an illuminant as in the cases where the correct proportions of air and gas are generated at the machine itself.

INSTALLATIONS OF AIR GAS.

Dealing with complete installations of air gas in houses and other buildings, the question of piping, and the running of same to the various points, ought to receive most serious consideration, as in a number of instances in the experience of experts who have been directed to inspect many of these installations, which are very often carried out by local workmen, it has been found that little or no tact has been exercised beyond that required in the case of an ordinary gas installation, with the result that, although the machine has been perfect, the fact that the system of piping has not received the necessary amount of consideration and thought which is requisite to make an air-gas installation perfect, has told against the successful operation of the system, and entailed some extra expense. This matter of piping should always be entrusted to someone of undoubted experience, if satisfactory results are to be expected. It is well known that the gas is very subject to atmospheric conditions, and quickly condenses in the pipes. Therefore, in planning out the runs of piping, great attention should be paid to the arrangement of falls and the application of a reliable system of syphonage.

In an installation of small dimensions, this matter can be easily overcome by due care being taken that the piping is arranged so as to have a gradual fall tending towards the main which is connected with the gas-machine, when a small syphon pipe with a draw-off tap can be fixed. The spread of petrol lighting causes these to be most important points to be observed; and it will be readily recognized that, in the carrying out of a large lighting system, unless due regard is paid to the matter of syphonage the result will be anything but satisfactory. Many firms advocate the use of piping of larger dimensions than the piping used for coal gas, as it has been found where a weak gas has been used that this increase in the dimensions of the piping has been necessary to obtain a good light. Again there are numerous instances where the existing lead pipes have been utilized with considerable success; the only necessary additions being the enlargement of the main from the machine and the assurance that the piping was sound and properly laid. Cases have been known where the amount of condensation in the piping, where it has been necessary to run the piping at different levels within a small radius,

has been such as to prevent the passage of the gas to the various points desired.

Another question is that of the fittings. The ordinary gas-fitting can be generally used, provided that the gas-ways are enlarged to be consistent with the size of the piping to which the fitting is attached. This is a very simple matter, and can be always carried out by a local man, though many firms of fittings manufacturers have laid themselves out for the special construction of air-gas fittings; and it is advisable, wherever practicable, that the fittings should be obtained direct from one or other of these firms. This obviates the occasion of any delay or mistake arising. The extra cost of these fittings over the ordinary gas-fittings is very slight; and the difference in cost should never be considered when an installation is being undertaken.

INCANDESCENT GAS-MANTLES.

It goes without saying that the introduction of air gas has, and still is, helping to greatly increase the manufacture and sale of incandescent gas-mantles, both of British and foreign manufacture. It is very hopeful to note that manufacturers in this country have been most successful in being able to produce a mantle of the required texture and strength which is demanded for the use of air gas. The soft or non-incinerated mantle is the type which lends itself best to the purpose, and gives the most satisfactory results. The necessity for a stronger mantle to use with air gas has opened up new channels in the manipulation and manufacture of the ramie fibre material from which these mantles are made; and at the present time there are mantles on the market supplied by British firms having an average life of nine months. This is a great point, which directly affects the question of the cost and upkeep of an air-gas installation. It is pleasing to note that British firms can successfully lay claim to having produced an article much superior to any foreign manufacture at present known.

When a system of lighting is under consideration, as in many other matters, the matter of cost is of paramount importance; but reviewing the question generally, there need be no hesitation in stating that the adoption of air gas in outlying districts for the lighting of residences, schools, workshops, institutions, and public buildings, and even where the situation is close to a town, is an advantage; and the utilization of air-gas plant at once offers itself as a means to this end, that, properly carried out, and if due regard be paid to the points named, no apprehension need be entertained as to the economical advantages and satisfactory results claimed for the system being obtained.

An installation can be so arranged that, by the addition of a system of switching apparatus, it can be placed under just as effective control as an installation of electricity. The switches can be arranged in different parts of the premises to have control over single or clusters of lights, or a whole section of an installation; and, furthermore, a switch can be arranged at any given point to automatically shut off the supply of gas at the engine, and stop same, without the necessity and trouble of a person having to leave the premises to perform this duty. Among several classes of switches used for this purpose, there is an electric appliance which is supplied by batteries, and can be fixed so that, when the gas is switched on at a given point at the same time, an electric spark is generated at the burner, which immediately ignites the gas, and this at once finds its way to the mantle.

Another important outlet for the utilization of air gas is the adoption of it for the purpose of singeing yarn. Several firms have made extensive experiments in this direction with more or less satisfactory results. It must be pointed out, however, that the progress made in this direction is, as yet, in an initial stage, inasmuch that the calorific value of the gas is not as great as coal gas, unless a very rich gas is produced to meet the deficiency. To illustrate this, we will assume that, should the same quality of gas be used for the purpose of singeing yarn as that used for lighting, the result will be bound to be very unsatisfactory. The 1½ per cent. of petrol vapour contains only 2 thermal units, which approximately gives only one-fifth of the heating power of coal gas. So it would be necessary to generate a mixture of air gas containing at least 7½ per cent. of petrol vapour to produce the same satisfactory results as are given by coal gas. There is, however, one great advantage to be looked forward to by the adoption by the millowner of air gas for this purpose. It is that air gas, giving off no deleterious products, would not affect the quality of the yarn, and would enable a much cleaner and whiter yarn to be secured. The same also applies to the use of air gas for laboratory purposes, and its application to the bunsen burner for the fusing and heating of metals and other substances. These are difficulties which have yet to be overcome; but, when surmounted, they will place the manufacturer of air-gas appliances in an enviable position among engineers.

Although almost all districts in Great Britain and other leading countries are fully equipped with the means of procuring coal gas, there are still large areas where it is impossible to secure this, and the only means of illuminating are the oil-lamp and candle. The introduction of air-gas plants into these districts is always looked upon as a great innovation and improvement; so that the prospects of trade in this direction are very considerable.

Some particulars in regard to the cost of installation will be of interest here. To light up a house in a country district with thirty lights, including the cost of the machine, piping throughout, fittings, and all complete would be about £50. This average holds good also for works, mills, and public buildings, except in cases

where the piping has to be taken for considerable distances, and where a high-class fitting is asked for. Save in special cases, the cost of all machines averages about the same.

Most types of machines have been approved of by the leading insurance companies. At the same time, however, it may be stated that the storage of a quantity of petrol in close proximity to the apparatus is not desirable; and this point invariably receives very close attention at the hands of insurance officials. But as most systems provide for the fixing of the petrol supply tank some distance away from the machine, objections are now seldom met with. One point which occasioned this close attention is that the small engine is usually fixed near to the carburettor or vaporizing chamber; and it being necessary that a bunsen burner should be fixed underneath the engine to generate the required amount of heat, it was thought that this method was dangerous. As, however, the carburettor is usually made of cast iron, and is securely bolted together, and never contains more than a very small quantity of petrol, which is immediately vaporized and passed along with the air into the gasholder, this objection has been overcome. The type of machine which has its storage tank immediately connected is perfectly safe, taking into consideration that the small hot-air engine and burner can be placed some distance away.

A RADIOMETRIC PHOTOMETER.

A patent, No. 22,748 of 1908, has been granted to Mr. Harry Chapman, of Sheffield, for a photometer in which the light from any source, such as an electric lamp or gas-burner, the intensity of which is to be determined, is measured by the rate at which a selected portion of the rays cause the vanes of a radiometer to rotate. The radiometer, which is not described in detail in the specification, is evidently of the ordinary type described in text-books on physics—i.e., it consists of a vacuous glass globe with a rotating vane poised on the top of a fixed vertical needle. The vane is made of light rods carrying at their outer ends discs which are all blackened on one side. When light or radiant heat falls upon the discs, the blackened sides become the hotter; and if the radiant energy falling upon them is sufficient, the vane rotates. A sensitive radiometer rotates when a candle is fixed at a short distance from it, and the speed of rotation increases with the increase in the amount of radiant heat or light which falls on the vanes. Owing to the fact that the radiometer is affected by radiant heat as well as light, it is only possible to use it directly for comparisons of lights of the same kind. Thus, in the patent specification of Chapman's photometer, means are described of compensating for the variation in speed of rotation of the vanes of the radiometer according to the kind of light which is being tested at the time. The method of operating the photometer is to allow the light from the source which is to be tested to fall directly, or by reflection from a mirror, through a small aperture with a cut-off shutter, which may be suitably actuated by clockwork, so that the light is allowed to pass through the aperture for fifteen seconds or any other determined time. The number of revolutions made by the vane of the radiometer in the time during which the aperture is open, is counted. The radiometer is so placed that its wings or vanes alternately cut off and allow to pass the light from the aperture, so that the rate of rotation of the radiometer may be readily observed by counting the flashes of light as seen through an aperture which is provided for the purpose. The apparatus is described with more particular reference to the measurement of the light of electric glow lamps; but it may be adapted for the measurement of the light from a gas-burner or an oil-lamp. The results for two lamps or burners of the same class may be directly compared; but when the kind of light is changed, a new set of schedules or diagrams has to be employed in conjunction with compensating screens or shutters.

Gas and Oil Engines in Australia.—The American Consul at Melbourne, in reporting on the trade in gas and oil engines, says that though the local demand for these engines is well catered for by machinery and other merchants, there would still appear to be a wide field for further business, as gas and oil engines are being adopted in increasing numbers. Though they are manufactured in Australia to some extent, they are mostly imported; the Customs statistics for the year 1907 showing that about £160,000 worth was imported into Australia during that year, of which £110,000 worth came from Great Britain, £40,000 worth from the United States, and the balance from France.

Reports of Gas Associations for 1909.—As announced elsewhere in the "JOURNAL," this work is now ready. It appears about a month earlier than hitherto, owing to the alteration of the date of the last meeting in the year of the Manchester District Institution. The volume contains the collected reports, as given in our columns, of the proceedings at the meetings of the various District Gas Associations held during the year. The technical matter occupies 543 pages, and it is illustrated by 40 diagrams, &c., and a folding plate. Reference to any subject is facilitated by an index; and at the end of the book are given lists of the officers and members of the Associations. The volume, which is the twenty-seventh of the series, forms a useful companion to the "Transactions" of the Institution of Gas Engineers, the issue of which for this year was noticed in the "JOURNAL" last week.

JOINTS OF GAS AND WATER MAINS.

Recent accidents arising from leakages from gas-mains make it opportune to call attention to a paper which M. Gilbert read a few months ago before the Société des Ingénieurs Civils de France. His paper was entitled: "The Laying of Water and Gas Mains from a Financial and Sanitary Point of View;" and he commenced by a consideration of the subject from a hygienic standpoint—showing the risks of epidemics from infectious infiltrations into water-mains through cracks or breakages in the pipes. "For all the parts that go to make up the construction of water-works, including the mains, it is the almost invariable rule to ask for the necessary strength to ensure lasting tightness; but for the laying of the mains themselves, no condition of resistance relative to the duration of the tightness required, is insisted upon. The pipes are nearly always laid end to end, with simple packing round the pipe-joints effecting a momentary tightness, but not offering the necessary resistance and elasticity to provide for any length of time against the disjoinings due to movements of the soil, to water, vibration, and shocks, &c."

WATER LEAKAGE.

The author next refers to the loss of water by leakage. "In addition to the expenses incurred through loss of water and repairs necessitated by cracks in the mains, there must be added the percentage of capital first-cost rendered useless by such leakage and the sums paid for damage caused accidentally. . . . An increase of 1 fr. per metre-run of main on the capital cost will give—capitalizing it at 5 per cent.—a supplementary outlay of 4'32 frs. after 30 years, and 11'47 frs. after 50 years; while an increase of expense of 1 fr. per metre and per year (as often arises from loss of water and repairs to ordinary main leakages) would give 69'76 frs. after 30 years and 219'81 frs. after 50 years. . . . Reckoning only 15 per cent. of water lost by leakage in leading mains, at the price of 0'10 fr. per cubic metre on an amount of 2000 cubic metres of water distributed each day in a pipe system of 20,000 metres, and 0'10 fr. per metre and per year for inspection and repair of leakages in old mains, and 1,000,000 frs. as the capital cost of a water system for a town of 10,000 inhabitants, the loss, capitalized at 5 per cent., is as follows:—

	Per Year. Frs.	After Thirty Years. Frs.	After Fifty Years. Frs.
Loss, inspection, and repairs:			
$2000 \times \frac{15}{100} \times \frac{0'10}{0'10} \times \frac{365}{20,000} =$	12,950	903,404'95	2,846,604'25
Percentage of capital cost rendered useless:			
$\frac{1,000,000 \times 15}{100} \times \frac{5}{100} =$	7,500	32,407'50	86,002'50
Totals . .	Frs. 20,450	935,812'45	2,932,606'75

Thus, there is lost, in 30 years, about the value of the undertaking, and in 50 years, about three times the value."

GAS LEAKAGE.

A similar calculation is then made in the case of gas leakage. "It is known," says the author, "that by methodical repairs to mains, it is possible to reduce the total loss by from 50 to 60 per cent., but that the results obtained are not lasting. As with water, cracks continually recur. Gas engineers reckon about one-third of the total loss of the works to be due to the leading mains; and they admit that the rate of leakage is at its practical minimum when it is equal to 1'5 cubic metres per metre-run of main and per year. If we admit a total loss of 15 per cent. of the make of gas, and 3 cubic metres per metre-run, as an average of the annual loss resulting from the mains, at the price of 0'12 fr. per cubic metre, 0'10 fr. per metre-run for inspection and repairs of leaks in the old mains of a system costing 1,000,000 frs., and having 20,000 metres of mains, we see that the loss capitalized at 5 per cent. becomes:—

	Per Year. Frs.	After Thirty Years. Frs.	After Fifty Years. Frs.
Loss, inspection, and repairs:			
$(3'00 \times 0'12 + 0'10) 20,000 =$	9200	641,801'20	2,022,298'00
Percentage of capital cost rendered useless:			
$\frac{1,000,000 \times 15}{100 \times 3} \times \frac{5}{100} =$	2500	10,802'50	28,667'50
Total . .	Frs. 11,700	652,603'70	2,050,965'50

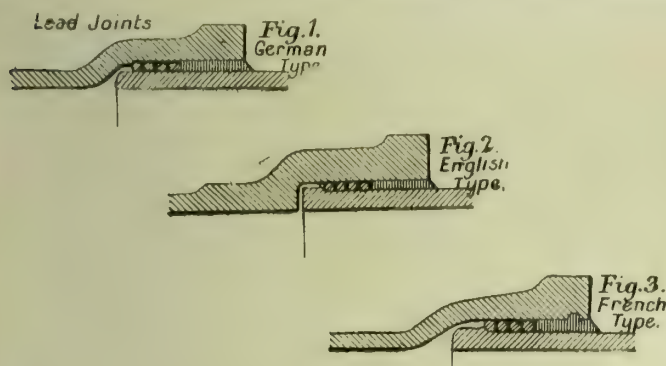
This is a loss of about 65 per cent. of the value of the system in 30 years, and of double the value in 50 years. We could show that these figures are about those of the average loss of several works where repairs to leakage are regularly attended to. The loss is much more significant in systems having 25 to 30 per cent. of unaccounted-for gas."

Accidents caused by leakages from gas and water mains are then mentioned—among the former being explosions in sewers, as at Blackburn in 1892, and in the Rue François-Miron in Paris in 1893-94. As to water, it escapes by cracks in the joints, and is undetected for some time. It softens the ground along the pipe; has a scouring effect; and causes settlements or slippings, which in turn produce further leakage in neighbouring joints. Contamination of water and loss of gas indicate that joints of underground pipes too easily become defective owing to their resistance and elasticity being insufficient, or to their indurability to withstand the effects of settlements, shocks, expansion, or other movements.

There is, therefore, every reason to provide a joint of a really effective kind.

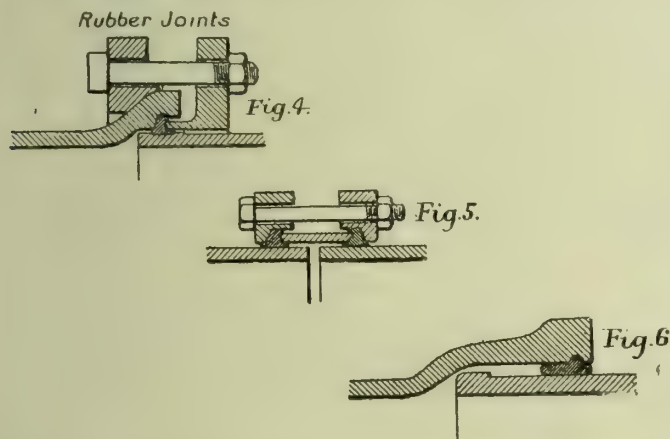
JOINTS OF LEAD OR RUBBER.

The ordinary methods employed for jointing pipes are next considered—firstly, lead and yarn; secondly, india rubber; thirdly, a combination of the two. Three types, German, English, and French, of the usual spigot-and-socket lead joint are shown in figs. 1, 2, and 3. They are unable indefinitely to resist the forces



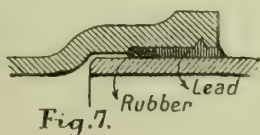
to which they may be subjected without becoming to some extent disunited. The least strain tends to cause a slight sliding or slipping of one of the two pipes. Constant repetition of this, sometimes in one direction and sometimes in another, often finishes by rolling out the lead or else by cutting off the cast-iron at its weakest point.

The movement or displacement of pipes takes place still more easily with india-rubber joints, whether with or without tightening bolts, as shown in figs. 4, 5, and 6. In these systems the rubber is not squeezed into the joint, but simply carried along on the spigot by reason of the pressure against the socket. There is nothing to prevent perpendicular, parallel, or oblique forces from producing leakage by cutting or pulling, or twisting the rubber.



Leakage can thus occur at the same time in the two rubber rings of fig. 5. Neither can the closely fitting joint of fig. 6 keep its tightness long. When the pipes are rough-cast from the foundry, the play is always sufficient to allow of displacements which the elasticity of the rubber cannot follow without allowing fissures to appear. If the pipes are turned and bored, alternative movements often dislocate them sufficiently to cause the same inconvenience. They also necessitate having special pieces for the slightest change in direction; and as they do not always allow for the necessary play in the movements of the pipes, the sockets are restrained—resulting sometimes in breaking the sockets or else lifting the pipes.

In the socket systems, it sometimes happens that the rubber, placed more or less regularly, or twisted at the moment of making the joint, dislocates the pipes after their entrenchment. On the other hand, in the bolted systems, the rubber being too tightly squeezed, does not remain tight, or the flanged-pieces become weakened or break under the pull of the bolts either during or after laying. The bolts soon become rusted, especially in acid or



wet subsoils, when they cannot be dismounted without breakages occurring. After 15, 20, or 25 years, the bolts or rubber of some joints will require renewing, which means additional expense which should be taken into account. The flexibility of these joints is, therefore, only obtained at the cost of the duration of their tightness, and such sacrifice is not to be entertained where pipes are put in the ground and are difficult to inspect.

The next series of joints examined are those in which the

rubber is compressed and held in position by lead. The joint shown in fig. 7 has the rubber squeezed by the lead which is caulked and anchored by the notch in the socket, as indicated. Nevertheless, it allows of slippings on the part of the male pipe end and thus produces similar cracks in the joint to those already mentioned in regard to wholly lead joints. Fig. 8 shows the lead



in the form of a double cone swelling, while in fig. 9 it is in the shape of an expanded square, penetrating into both the spigot and the socket. It offers, therefore, the least space for longitudinal variations, and is capable of following the movements of an elastic joint, while being conveniently fastened so as to avoid the defects of other methods of fastening previously mentioned.

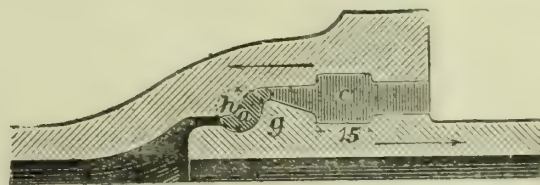
M. Gilbert remarks that a slight swelling or expansion will not be sufficient in all cases; and he proceeds to establish, by calculation, what are the requisites for the safety of a joint. His conclusion is that an expansion of 15 millimetres is required to withstand ordinary slipping. It could be strengthened by increasing the section or by using material more resisting than pure lead.

FUTILITY OF ORDINARY TESTING.

He comments on the present day necessity of redoubling precautions owing to vibration and shocks caused by heavy motor vehicular traffic; and he quotes from Mr. Foulger's evidence on the subject before the Royal Commission, comparing the 87 instances of broken gas-pipes of the year 1899 with the 800 cases of 1905. Moreover, there is the constant danger of damage to gas-mains arising from electrolytic action—such as has taken place at Alexandria, Pittsfield, Zurich, Pittsburg, and many other towns. In short, leakages soon occur; and they increase in number and importance with the age of the mains, and with the frequency and intensity of the operative forces. The repair of leakages is only a costly palliation of the evil. The testing at a more or less high pressure, after the placing of the main, is not enough to assure the continued tightness of its joints, as ordinarily the precautions taken to have a successful test are not the conditions that exist in actual work. If the tests were made by means of a hydraulic press, and blows from a ram were struck on to a line of pipe placed freely on the ground, there would be a test in some degree comparable to that actually existing in a main after it has been laid for some time; and it would be seen at once that the ordinary types of joints could not remain tight under the earth for any length of time.

M. GILBERT'S PATENT JOINT.

The close examination of the types of joints used for gas and water mains shows that too great elasticity is expected from the lead, while at the same time its resistance is imperfectly utilized; also, greater elasticity and resistance are demanded from the rubber than it has. The author, considering that these materials could be turned to better account for gas and water pipe joints, designed the method of jointing shown in fig. 10, which combines the elasticity of rubber with the resistance and inoxidibility of lead.



In his system, the joint is formed of a rubber ring which is powerfully compressed at the moment of placing the pipes in position, and is so maintained by a rim of lead run in ordinarily at the pipe ends. The rubber ring *a*, the original form of which is round, is placed in a groove at the end of the spigot. It is compressed as far as possible in its fixed position by two rounded shoulders *g h*. The form given to the parts of the pipes which hold the rubber ring prevents it from rolling and being cut or torn during the erection. Also, the outside parts of the rubber can protect the middle which is the most compressed and the most efficacious. The lead filling is kept in position by two recesses placed one in front of the other—one on the spigot and the other on the socket, and forming a key *c*, the shoulders of which offer the maximum resistance to the longitudinal slipping of the pipes. The lead key allows the necessary play for movement, and protects the rubber from contact with the air or soil. It also ensures the metal continuity of the line of pipe, and thus reduces the dangers of decomposition by electrolysis. In water-mains, the rubber prevents the water from coming in contact with the lead. The durable jointing effected by the lead grooves limits the movements of the pipes to the displacements that the elasticity of the

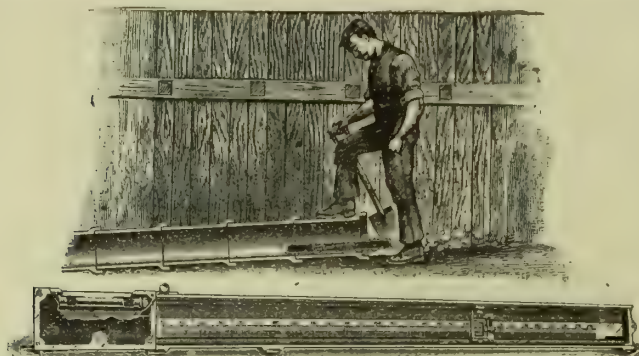
rubber can follow without permitting cracks or fissures. The system has been applied to ordinary cast-iron pipes, as well as to those in steel. The price per metre-run is about the same as that for ordinary spigot and socket pipes, by reason of the weight being slightly less, as the sockets are not so long. The laying of pipes on this system is more rapid and is not more costly than with other systems.

The old type of joint leads to leakage and breakage, and there is every reason—both from a financial and a sanitary point of view—to adopt something better, which the system described is claimed to be.

THE GRADING OF GAS-MAINS.

The "Gradiograph."

OUR readers are aware that in the laying of gas-mains a point that requires special attention is the placing of them at the proper gradient to allow the products of condensation to flow into the catch-boxes. It may be useful, therefore, to bring under their notice an instrument by which, it is claimed, both economy of time and increased accuracy may be secured in connection with this operation. Some of them may possibly remember that among the exhibits in the Mathematical and Scientific Instruments Section of the Franco-British Exhibition were to be seen samples of the drawing and surveying instruments made by Messrs. A. G. Thornton, Limited, of Manchester, for which they were awarded a gold medal and a diploma of honour. The firm have designed an instrument which has been found specially suitable for railroad construction, sewerage, and road making, but is equally adapted



The "Gradiograph" in Use for Laying Mains.

for any purpose where it is necessary to work to a given gradient or ascertain the correct inclination of any existing gradient. The instrument is called the "Gradiograph," and it is shown in the accompanying illustrations. It consists of an elongated metal casing of rectangular section made of nickel aluminium. An accurately graduated steelyard is pivoted towards one end of the casing at a point that coincides with zero, and is marked in units and half units from 30 to 305. Above the pivot, and attached to the steelyard, is mounted a sensitive hubble, which is graduated and accurately ground. It is similar to those put in all civil engineering instruments such as levels, theodolites, &c. Travelling along the steelyard is a cursor or traveller so graduated as to make it possible of adjustment to any intermediate gradient, such as 1 in 98·7 or 1 in 296·8. At the extreme end of the steelyard is

provided a notch or recess; and when the cursor is placed in this position, the instrument is converted into a very accurate level. As before mentioned, it has a range of gradients from 1 in 30 to 1 in 305; but, if desired, the graduations on the steelyard can be arranged to give different gradients.

One of the illustrations shows clearly how the instrument is used. The bottom of the cutting is formed by means of the "Gradiograph" attached to a straight-edge. When the pipe layer is getting out his socket holes, he leaves them slightly high; he then places the instrument on the invert of the pipe, leaving the bubbles in view. Now he strikes the pipe with his foot until the large bubble appears in the centre of its run; and when this is done, the pipe is at its perfect gradient. Suppose, for instance, the pipe shown in section is one of many that are being laid to 1 in 300. The "Gradiograph" can be set and fixed by means of the cursor and set-screws to 1 in 300 before leaving the office if desired; the duty of the man laying the pipes being solely to set his instrument in them as shown—the feet at the same time resting firmly on the inside surface of the two pipes.

The "Gradiograph" can be employed for the laying of any length of pipes. It is provided with case-hardened steel feet for laying pipes 2 feet and 2 ft. 6 in. long; but if longer pipes are being used, it can readily be attached by means of the lugs at either end to any length of a straight-edge, and by the same means the cutting can be excavated to the exact gradient required for the pipes. Its overall measurements are 36 in. by 3 in., and 1 inch thick; and its total weight ready for use is 7 lbs.

Poisoning by Carbon Monoxide.

At an ordinary general meeting of the South Staffordshire and Warwickshire Institute of Mining Engineers held recently in Birmingham, a paper was submitted by Drs. J. S. Haldane and C. Gordon Douglas, on "Testing for Carbon Monoxide in Connection with Fires and Explosions in Mines." Before the close of the proceedings, the audience were invited to ask questions; and, in response, the following were put and answered: (Q.) Supposing the blood of a person to be half saturated with carbon monoxide, how long would it take for that person to reach a normal condition?—(A.) Very difficult to say, as the after-effects upon persons vary; in some it takes considerably longer than others to reach a normal state. (Q.) How long would it take for a person to become affected in a percentage of 0·2?—(A.) The person would be safe for an hour if in a state of rest; but if working, half-an-hour. On a miner becoming affected, it is very necessary for him to leave the place as quietly as possible, as anything in the nature of hurry and over-exertion would be fatal. (Q.) What is the lowest percentage of carbon monoxide that can be detected?—(A.) 0·01 per cent. (Q.) What are the after-effects of carbon monoxide poisoning in a pure mixture of air and the gas?—(A.) Throbbing headache and weakness, though some people are not affected that way.

Recent Wills.—Sir John Baker, the Chairman of the Port-sea Island Gas Company and of the Woking Water and Gas Company, whose death was recorded in the "JOURNAL" for the 16th ult., left estate of the gross value of £148,792. Mr. Charles Alfred Teuten, a member of the Corporation of London, whose name, as Chairman of the Streets Committee, came prominently before our readers a few months ago in connection with the deputation to the Continent to inspect the street lighting, left estate of the gross value of £25,756, with net personality £3347. Mr. Matthew Leaf, formerly Secretary and Manager, and of late years a Director, of the York United Gas Company, whose death on the 8th of October was noticed in the "JOURNAL" at the time, left estate of the total value of £10,640. Mr. Francis Hastings Medhurst, of Victoria Street, S.W., who died on Oct. 26, at Croydon, as announced in the "JOURNAL" at the time, by his will, dated June 20, 1905, left £35,000 upon trust for a fund to be designated "The Emigrants' Colonization Trust Fund," to promote emigration to the British Colonies for deserving artisans. The testator appears to have assumed that he would have the disposition of considerably more than £100,000; but his estate is valued for probate at £3038 gross, with net personality nil.

The Gas-Engine of the Future.—The Engineering Supplement to "The Times" for the 15th inst. contained an article by an engineering correspondent on "The Present Position of the Gas-Engine." Having fully considered this subject, he took a brief glance into the future, and said: "What is really needed is an engine with a long expansion stroke, so that the gas is not liberated to the exhaust until it is far nearer atmospheric pressure than is now customary. With present-day engines, the larger proportion of the heat energy in the fuel goes to the exhaust. The lengths of the other strokes are of nothing like such importance; but an ideal engine would probably have all its four strokes of different lengths. One obvious solution is to use the exhaust gas in a second cylinder and so work 'compounded.' Another solution is the one lately suggested in Mr. Humphrey's ingenious gas-pump, where use is made of a column of water to act as piston, as connecting-rod, and as fly-wheel. In this engine all four strokes are of different lengths; and during the explosion stroke the gases expand to atmospheric pressure. The machine is, however, quite a new one, and no one can tell how it will turn out; but its promise is undeniably great, despite the apparent incongruity of bringing cold water and white-hot gases into close contact."

REGISTER OF PATENTS.

Producing Hydrogen.

CLARK, G. M.; a communication from the DELLWIK-FLEISCHER WASSERGAS, G. m. b. H., of Frankfort-on-Main.

No. 21,479; Oct. 10, 1908. No. 7849; April 1, 1909.

These applications were combined, under section 16 of the Patent Act of 1907; and a complete specification was filed on Sept. 30 last.

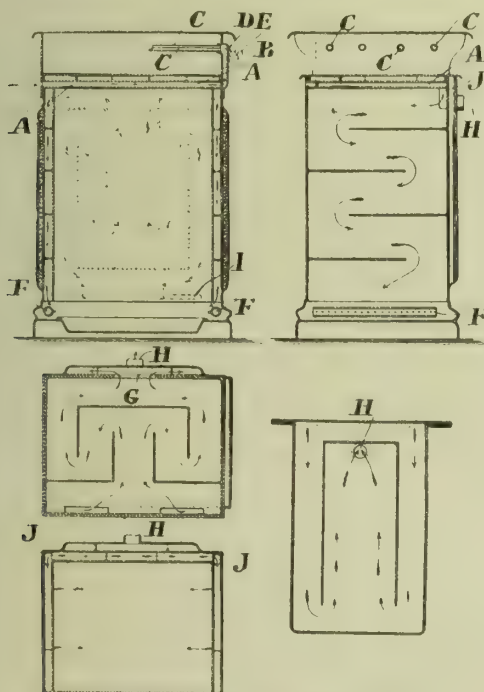
The claims made indicate the general trend of the inventions. They are: 1. The employment, in the production of hydrogen by the alternate reduction of ferric oxide by means of reducing gas and re-oxidation by means of steam, of an oxide-iron ore in a fragmentary state for the production of the spongy iron or spongy iron oxide. 2. The employment of ferric oxide obtained in a fragmentary state from iron sulphide ores (pyrites) for the production of the spongy iron. 3. The employment, in combination with the reducing gas, of a volume of steam not exceeding one-half of the combined volumes of the carbon monoxide and the hydrocarbons contained in the reducing gas. 4. Arresting the reduction when the oxide is only partly—i.e., not more than half—reduced, for the purpose of preventing the deposition of carbon. 5. The reduction of an oxide-iron ore in fragments, or an iron oxide obtained from silicious iron sulphide ores (pyrites), by means of a mixture of reducing gases and steam—the volume of the steam not exceeding one-half of the combined volumes of the carbon monoxide and hydrocarbons contained in the reducing gases—the reduction being carried out until not more than one-half of the oxide is reduced, and alternately with the oxidation by steam of the iron sponge produced in the reduction phase of the process.

Gas Cooking-Stoves.

AIRD, K. (R. & A. Main, Limited), of Queen Victoria Street, E.C.

No. 2005; Jan. 27, 1909.

This invention relates to gas cooking-stoves which have the oven surrounded by chambers provided with baffle-plates and through some of which chambers the air to support combustion at the burners in the oven travels in a circuitous manner and gets highly heated by the heat in the oven before reaching the burners. The object of the inventor is to heat the air employed for mixing with the gas supplying the burners positioned above and outside the oven, "so that a greater heat is obtained at those gas-burners than when the air for mixing with the gas in the mixing-chamber is taken from the atmosphere and used in a cold state."



Aird's Gas Cooking-Stove.

Above the oven is a chamber A, leading from one side of the stove to pipes B (at the other side) carrying the top gas-rings C and also the spits or nozzles D leading from the taps E and gas supply-pipe F. The illustrations show a gas-stove so constructed that the chamber A can be heated on both sides.

For taking the air supply to the burners over the crown of the cooker, there is interposed a plate between the upper and under crowns of the cooker, and thus a hot-air chamber A is formed, which becomes heated both top and bottom; the air being preferably taken from outside. Baffle-plates are fixed in the chamber A between the under and middle crowns in any position found requisite, so as to ensure sufficient travel for the air to become thoroughly heated before reaching the mixing-chambers of the top burners.

The waste gases or products of combustion from the oven-burners are utilized by passing them through holes in the front of the cooker and between the upper and middle crown-plate S in a circuitous manner by means of baffles; and the waste gases are caused to travel out of the hole G and down and up the back of the cooker in a circuitous manner, by means of the baffles, before reaching the flue outlet.

The back, sides, and top of the stove have two or more walls to form passages provided with baffles, and with entrances and exits to suit.

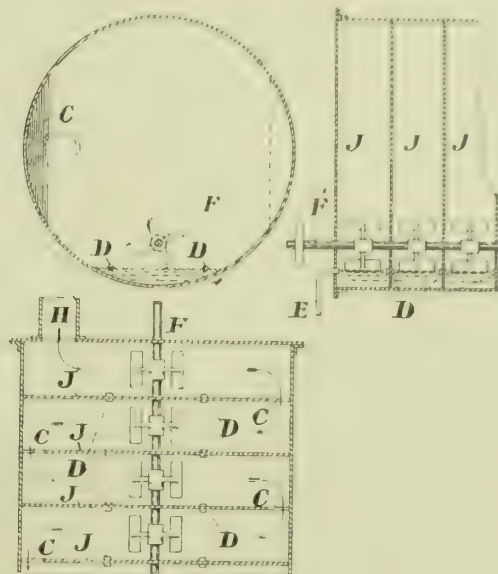
The air supply to the oven-burners is heated by taking it in at a hole I in the bottom of the back-plate and causing it to travel, by suitable channels, between baffles to the top of the back-plate and across to, and through, holes J down the sides of the cooker to the oven-burners with a circuitous travel by means of baffles.

Gas-Washers.

DAVIS, G. K., of Manchester.

No. 2113; Jan. 28, 1909.

In the process of purifying coal gas (or freeing blast-furnace gas from dust), the patentee points out, it is necessary to bring the gas into intimate contact with the washing liquor whatever this may be; and various devices are at present in use for carrying out this operation—the devices being based upon different principles. For example, the intimate contact between the gas to be washed and the washing liquor is in some cases effected by passing the gas through a chamber provided with partitions, so as to cause it to pursue a vertical, tortuous, or zigzag path, during which it meets with a spray of the washing liquor, produced (for example) by revolving blades or fanners extending transversely across the chamber and which, during their rotation, dip into a layer of the washing liquor at the bottom of the chamber and so spray it through the chamber.



Davis's Gas-Washer.

The apparatus forming the subject of this invention is of this type, and comprises a cylindrical shell of suitable dimensions for dealing with the required quantity of gas, and of a length depending upon the character of the washing operation. The shell is fixed with the axis of the cylinder in a horizontal position; and it is divided into chambers by partitions fixed at right angles to the axis. Apertures are made in the partitions, so as to cause the gas to follow a horizontal zigzag course through the washer; and openings are also made in the partitions whereby the liquor is caused to travel through the washer in the required direction—the depth of the liquor being made suitable for each individual set of conditions. Parallel to the axis of the cylinder is fitted a shaft, upon which are fixed the fanners for producing the spray; one or more fanners being placed in each of the chambers.

The casing of the washer shown is cylindrical. A series of transverse chambers are formed by the vertical partitions J, each provided with an opening C at one end; the apertures in the alternate partitions being at opposite ends, so as to cause the gas which traverses the chambers to pursue a zigzag path. The inlet pipe for the gas, H, is fitted to one end of the chamber; the outlet being at the other end (not shown). The bottom of the chamber contains a quantity of the washing liquor; and in order to permit this liquor to travel throughout the washer and remain at the same level in all the chambers, each partition J is provided with apertures D, the height of which is adjusted to the height to which the level of the liquor is to be maintained in the washer. The liquor is withdrawn from the apparatus, when required, through the pipe E. The shaft F extends longitudinally through the casing parallel to the axis thereof; G being the fanners keyed on the shaft. They are so arranged relatively to the liquor in the bottom of the casing that the tips of their blades dip slightly below the surface, whereby, when the shaft is revolved, the blades catch a portion of the liquor and throw it up in the form of spray.

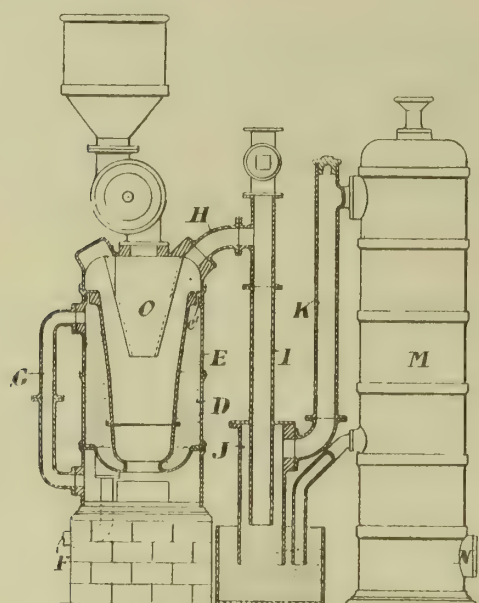
Gas-Producers.

WILLIAMS, H. W., of Abertillery, Mon.

No. 9901; April 26, 1909.

The primary object of this invention is to provide an easily transported and erected gas-producer of the type in which the combustion chamber is surrounded by a water-jacket, by building it up of inter-fitting metal sections, whereby a worn-out or otherwise damaged section is adapted to be replaced by a similar section with facility. A further object is the provision of means for utilizing the heat of the exhaust gases from a gas-engine by the producer, to assist in heating the vaporizer.

The producer has its upper end closed and fitted with a hopper,



Williams's Gas-Producer.

which supplies fuel in measured quantities by means of a rotary device, which also prevents entry of air and exit of gas through the hopper. Surrounding the entire fuel space of the producer is a water-jacket D, consisting of the annular space enclosed between the conical metal wall of the combustion chamber and the outer wall E. At the lower end of the combustion chamber, a constricted neck is provided for retaining the fuel; the neck constituting the bottom of the water-jacket. F is the feed-pipe for supplying water to the water-jacket, in which the water is maintained at a constant level by a float valve or other contrivance.

The steam generated in the water-jacket is conducted by a pipe G leading from the upper portion to an enclosed space beneath the open bottom of the combustion chamber, from which (mixed with air admitted in a regulated manner) it will rise through the incandescent fuel contained within the producer and be dissociated into its constituent elements, and enter into combination with the carbon of the fuel.

From the upper portion of the producer, the generated gas is conducted by the pipe H and down-take I to a tar-trap J, whence, by means of a pipe K, it is conducted to the purifier or washer M, constructed as described in patent No. 572 of 1908. The purified gas leaves the purifier by the pipe N.

To prevent the burning fuel from making contact with the upper portion of the combustion chamber where the latter is not surrounded by water, the fuel is introduced from the hopper through a funnel O, the lower end of which is situated beneath the level of the water in the surrounding jacket.

The apparatus is constructed in sections, to facilitate renewal; the exterior wall E of the jacket being composed of a plurality of superposed annular sections provided with flanged bosses, where required, for connection to the steam and other pipes. In the modification adapted for utilizing the heat of exhaust gases from a gas-engine, the outer wall of the water-jacket D is surrounded by a casing of larger diameter; and in the annular space so enclosed the exhaust gases from the engine served by the producer are adapted to circulate and assist in heating the water contained in the water-jacket.

Controlling Gas-Burners from a Distance.

RENKEWITZ, E., of Berlin.

No. 12,314; May 25, 1909. Date claimed under International Convention, May 27, 1908.

This invention has particular reference to apparatus by which street-lamps are turned on and off by a difference of pressure, rendered operative by two pivotally supported communicating liquid vessels or tanks, one of which is connected to the gas supply, while the other is exposed to the atmosphere.

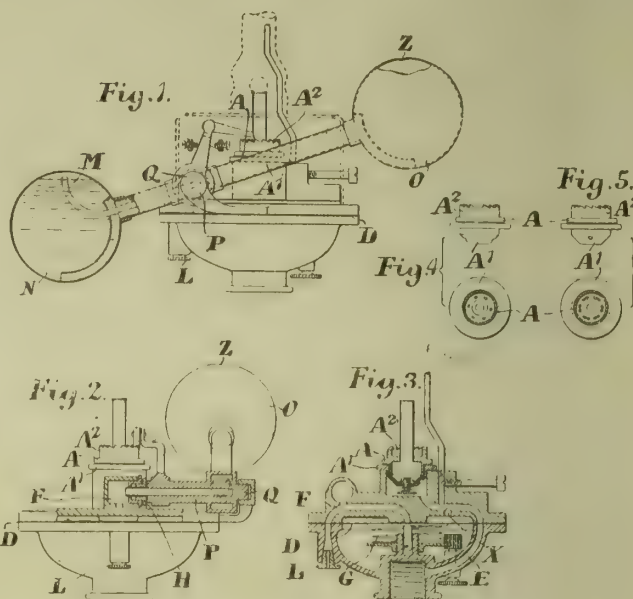
In the construction shown (applicable to vertical burners), the casing is divided by a diaphragm D into two chambers. A conduit E, passing through the two parts, supplies gas to the distributing drum A; and from it branches off a perforation X (fig. 3) establishing communication between E and the chamber above the diaphragm. The distributing drum A, forming the gas-closing valve and acting like a rotary slide valve, consists of a plug A¹, with a gas-tight drum ground into it, and provided with a toothed rim A², as well as with the gas-nozzle of the burner. The teeth of the toothed rim correspond to the perforations and to the intermediate spaces of the distributing drum between the perforations, and, on the drum being rotated, the openings of the member A¹ are opened or closed in the well-known manner.

The distributing drum A, shown in fig. 4, is intended for evening lamps, which can be extinguished by a pressure shock in the gas-pipe; the solid portions situated between the openings of the drum closing the gas supply openings of the insertion part A¹ on the drum making a partial rotation. The distributing drum shown in fig. 5 is, on the contrary, intended for night lamps, and is provided with gas-passage openings arranged in couples side by side; so that two pressure shocks in the gas-pipe are required to extinguish the lights.

The diaphragm D is pressed by an adjustable spring against the bottom of the casing; and thus closes a second conduit F, which, on the one hand, is connected through a stuffing box H to the oscillating system N O, and, on the other hand, is closed by means of a screw L provided with a fine opening. This screw is preferably filled with

porous material (say, cotton wool), to prevent it from getting choked with dust, &c.

The communicating vessels consist of two hollow balls N and O connected by pipes and intended to receive a liquid. They form, with the hollow tipping spindle P, a rigid system, rotatably mounted with its hollow spindle in the stuffing-box H and about the pin Q. Its travel is limited by an arm playing between stops. The perforation of the spindle P is in close proximity to a pipe M carried to a point beyond the highest level of the liquid in the vessel N. In this way, the pipe M establishes communication between the vessel and the conduit F; while the vessel O is in communication with the atmosphere through the opening Z. The arm mounted on the spindle P carries a pawl, the edge of which engages with the toothed rim A² of the distributing drum A.



Renkewitz's Gas-Lamp Lighter and Extinguisher.

In figs. 1 to 3, the distributing drum A is shown in its closed position. The working is then as follows: The gas, arriving at the ordinary pressure, passes through a branch of the conduit E to the constantly burning bye-pass flame; while the chamber in the upper part of the casing, which is also connected to the conduit by the perforation X, is closed by the diaphragm. In case of a temporary increase of pressure to the extent of (say) 10 mm. above the normal level, the diaphragm D will be forced back in opposition to the action of the spring G, so that the conduit F will be connected to the conduit E—that is to say, to the gas-supply pipe. The gas will pass then through the perforation of the spindle P and the pipe M, press on the liquid in the vessel N, and force it into the vessel O; the air from the latter escaping through the opening Z. The small quantity of gas escaping through the hollow screw L during the period of super-pressure does not affect the process in question. The weight of the liquid forced by the super-pressure into the vessel O brings about a rocking movement of the communicating system N O. The distributing drum is thus turned further to the extent of one tooth, and the gas can pass through the perforations of the drum A to the burner. On the pressure sinking to the normal level, the spring G will again press the diaphragm D against the mouth of the conduit F and close it. Owing to the slow escape of the gas contained in the interior of the ball N, through the perforation of the screw L, the liquid will return to the vessel N, and the system N O will be again brought into its original position.

Charging Gas-Retorts, Coking-Ovens, &c.

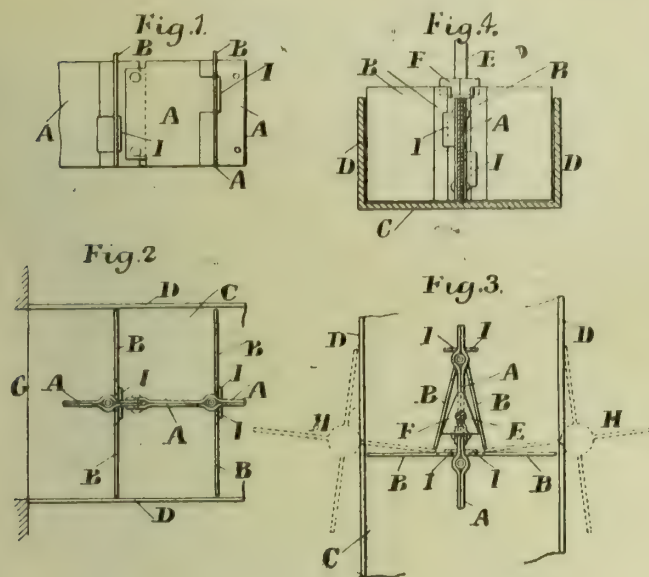
MASTERS, E., of Palace Chambers, Westminster, and HANSFORD, J., of New Barnet.

No. 14,411; June 19, 1909.

This invention relates to a combined "charging and spreading member," comprising a "pull-and-push" or reciprocating bar or frame provided with a number of laterally disposed and vertically hinged or pivoted wings or push-plates, which, as the member travels forward and approaches the mouth of the retort, are moved from a position in which they lie folded towards, and along, the sides of the bar to an extended position transverse of the bar; so that with a further forward movement they push the coal that has been deposited between them from off the charging platform through the mouth and along the floor of the retort, and (as the member is withdrawn) return to the folded position and spread laterally, to a greater or less extent, the coal that has been deposited in the retort.

Fig. 1 is a side elevation of the device showing the push-plates or wings in an extended position, transversely of the reciprocating bar, for pushing the coal along the bottom of the retort. Fig. 2 is a plan with the wings extended laterally just outside the retort ready for the charge of coal. Fig. 3 shows the wings in the position they assume as the charging member is drawn backwardly through the retort, and in which they are folded back towards the sides of the bar. Fig. 4 is a cross section of the device and of a charging platform co-operating with it.

The reciprocating bar or frame consists of a number of plates or sections A suitably pivoted to each other so that the bar may assume a curve in a vertical plane should one end of it be elevated. If, however, the bar is to be guided on a horizontal plane, the pivoting is unnecessary. It would then consist of a single plate of requisite length. At suitable distances apart on both sides of the bar are pivoted or hinged to it wings B, arranged either in pairs opposite one another on either side of the bar or otherwise. The bar is carried on the frame of a charging



Masters and Hansford's Retort Charger-Discharger.

apparatus, and any known means may be provided for pushing it into, and withdrawing it from, the retort.

The frame carries the usual charging platform C, provided with sides D to form a trough, and which register with a mouthpiece of the retort G.

Means are provided for moving the wings B from the normal position when folding back along the sides of the bar to the extended position shown in fig. 2, previous to passing below the charging shoot. These means may consist of a bar or lever E, adjustably mounted on the charging frame so that the operator may raise and lower it at will. This bar carries at its lower end a wedge-shaped member F, which, when the bar is shifted to its lowest position, will be in the path of the

wings as they travel forward. As the wings contact with the members F, they will be opened out to any desired extent. The wings have a notch at their inner top edge to allow them to clear and pass the wedge F when it has moved them into the open or extended position.

As the charging member with extended wings passes over the platform, coal is shot through the shoot into the pockets formed by the wings and the sides and bottom of the platform, and is caused to travel forward through the mouth and over the floor of the retort. The extended wings feed the coal into the retort by pushing the charges in front of them. As soon as the charging member has travelled forward the requisite distance within the retort, the bar E is lifted so that the member F will be removed from the path of the wings, which, as the charging member is drawn backwards, will fold towards and along the sides of the reciprocating bar owing to the resistance of the deposited coal behind them, and so remain until (during a succeeding operation) they again contact with the member F, which has been replaced in their path. As the charging member is withdrawn, the folded wings tend to spread the deposited coal.

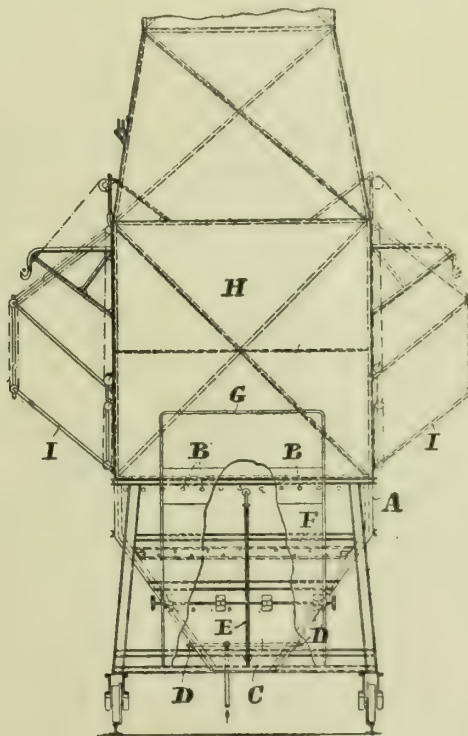
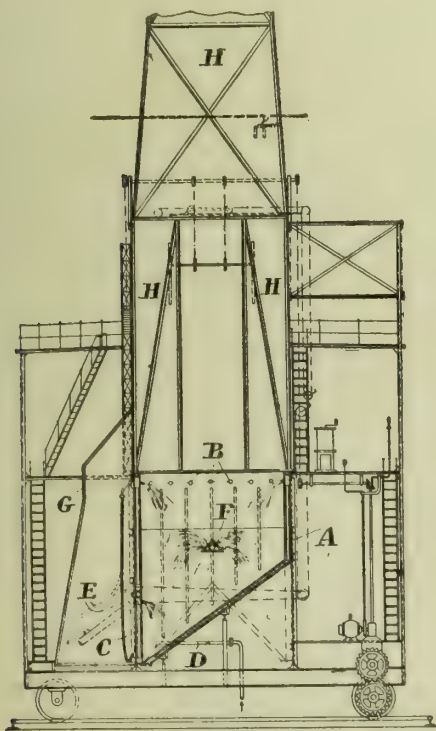
Quenching Incandescent Coke.

KRAUSE, E. H. H., of Hamburg.

No. 15,052; June 28, 1909.

This invention is particularly adapted for dealing with coke in large quantities—in retorts working with large charges—in the trough of a traveller movable on rails in front of the retorts. In such case the walls of the quenching trough are apt to be damaged by excessive heat; and it has already been suggested to make the lateral walls of the trough hollow and to cool them by water circulation—the upper walls having previously been in the form of a hood above the trough and provided with a longitudinal slot through which water contained therein could flow on to the coke in the trough. According to this invention, however, the water-jacketed quenching trough is of special construction, and one or more water-containing transverse beams are provided within the trough having openings from which the core of the coke in the trough is sprayed “so as to ensure the most thorough and rapid quenching thereof.”

In the construction illustrated, the quenching trough A is mounted in the centre of the movable traveller in front of the retorts. The lateral walls, as well as the bottom of the trough, are formed double, and adapted to have water circulated through them for cooling purposes. The lateral walls are stiffened inside by ribs, which, however,



Krause's Coke Quencher.

are of such construction that the water used for cooling the walls can freely flow through the hollow space of the walls. The trough is open at top, and openings B are formed in the upper portions of the side walls through which cooling water can pass into the interior. The wall on the left-hand side in the section is provided at its lower end with a rotatable discharge door C, which also has double walls and can be opened or closed at will from the central platform of the traveller by means of a sprocket and chain gear so as to empty the contents of the trough. Water is supplied to the walls and the bottom of the trough through a pipe D leading into the walls of the trough; while the hollow door C is supplied with water by means of a flexible pipe E connected to the upper portion of the corresponding lateral wall. The door is provided near its upper end with openings whereby the coke in the lower portion of the trough, or falling from it, is sprinkled with water.

There is provided in the interior of the trough a single hollow cross-beam F, to which water is supplied through pipes from the hollow lateral walls; this water passing through lateral openings in the beam to the heart of the mass of coke in the trough. The beam is at the same time utilized as a baffle, since it divides the coke falling on it

from the retort into the trough, and thus assists its quenching. In front of the lateral wall of the trough which has the discharge door, a partition G is provided at the required distance forming an exhaust passage for the steam or fumes, the upper portion of which opens into the usual central tower-like chimney H of the apparatus, through which steam generated during the extinction of the coke is carried upwards; “thus protecting the attendants from danger.”

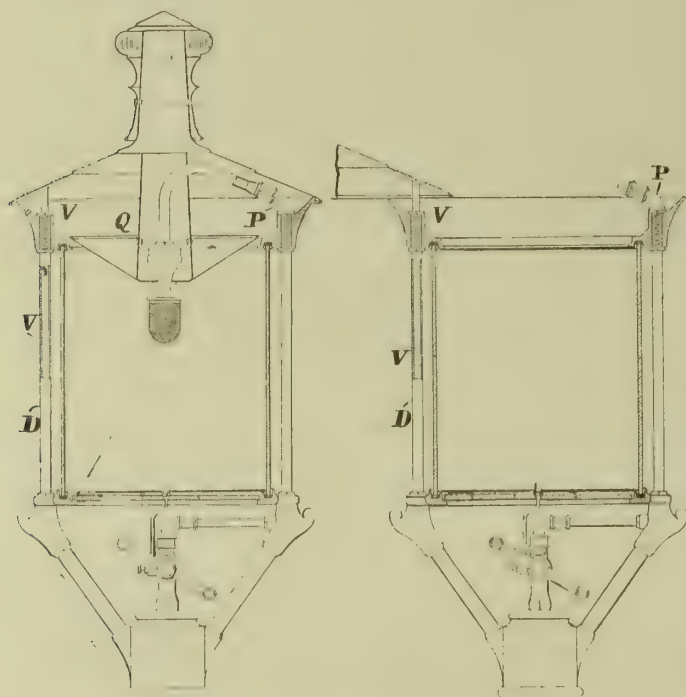
The transfer of coke from the retorts to the quenching trough is effected by means of shoots I arranged at one or both sides of the traveller and opening into the trough. In operation, the coke as discharged will be quenched all over its upper surface by water from the openings B in the lateral walls; its central portion or core being simultaneously subjected to the action of the water from the openings in the cross-beam F, and its lower portion by the water escaping through the openings in the water-cooled door C. Owing to the coke being simultaneously extinguished throughout, “quenching takes place in a rapid and thorough manner;” on the other hand, “owing to the cooling of all the walls, as well as of the bottom and discharge door of the trough, the latter is not excessively heated by the incandescent coke, and is not therefore damaged.”

Street Gas-Lamps.

WALKER, A. B., and DONALDSON, J. H., of Wallsend.

No. 11,257; May 12, 1909.

This invention relates to gas-lamps with domes or covers adapted to be raised.



Walker and Donaldson's Street-Lamp.

The lantern is provided with a dome or top which rests on the top ring, and with a flat transparent base supported by the bottom ring. The dome is furnished with a rod or shank V adapted to depend into the pillar D to form a pivot whereby, when the dome is raised to clear the flue Q, it can be turned to one side (as shown) to give access to the interior of the lantern. The burner, flue, and reflector can then be removed in one piece by disconnecting the burner-pipe from the union P. The bye-pass pipe for the burner passes through the base of the lantern. It may be of the ordinary arrangement, or it may be of the expanding flame type and be lighted by a torch inserted into the lantern through an opening in the base normally closed by a hinged flap.

APPLICATIONS FOR LETTERS PATENT.

- 29,075.—PROCKTER, F. M., "Joining pipes and tubes." Dec. 13.
 29,093.—PARKINSON AND W. & B. COWAN, LTD., and CHESHIRE, W., "Street lamps." Dec. 13.
 29,125.—JOHNSON, J. Y., "Making gas by the dry distillation of coal and the like for preventing the formation of thick tar." A communication from Maschinen und Armaurenfabrik vorm. H. Bruer and Co. Dec. 13.
 29,145.—WALLER, E. W., "Inverted burners." Dec. 13.
 29,148.—DEKKER, A., "Gas-engines." Dec. 14.
 29,149.—RADCLIFFE, J., "Purification of condensation products from producer gas manufacture." Dec. 14.
 29,162.—NEWHOUSE, W. A., "Incandescent burners." Dec. 14.
 29,166.—WHITEFIELD, F. M. & R. H., "Gas blow-pipes." Dec. 14.
 29,199.—RUSCOE, J., AND CO., LTD., and KENYON, G. H., JUN., "Connecting branch service-pipes with mains." Dec. 14.
 29,205.—STEVENS, J. H., JONES, H. A., and PUDNEY, F., "Inverted burners and mantles." Dec. 14.
 29,220.—WATTS, C. J., and BROWN, E. W., "Gas-heated radiators." Dec. 14.
 29,264.—COURT, E. J., "Mantle support." Dec. 14.
 29,313.—SMITH, A. H., and SHAW, F. G., "Vertical retorts." Dec. 15.
 29,328.—RUTHENBURG, M., "Distillation of coal." Dec. 15.
 29,358.—CHURCHWARD, S. F. C., "Connecting pipes." Dec. 15.
 29,389.—ELLIOT, E., and HAWES, A. J., "Gas-economizer." Dec. 15.
 29,426.—MEYNELL AND SONS, LTD., and MEYNELL, H., "Gas-brackets." Dec. 16.
 29,452.—KOST, K. F. M., "Inverted burners." Dec. 16.
 29,502.—SOCIETE DU GAZ DE PARIS, "Automatically controlling luminous signs." Dec. 16.
 29,536.—CRUICKSHANKS, W., and GOURLAY, J., "Making gas from petrol or gasoline." Dec. 17.
 29,562.—KENNEDY-M'GREGOR, J. A., "Gas-meter." Dec. 17.
 29,568.—ZIEGLER, M., "Production of gas from domestic and street refuse and sludge." Dec. 17.
 29,606.—RUPPERT, H., "Gas-burners." Dec. 17.
 29,607.—PEREGRINE, S. W., "Carburetted air." Dec. 17.
 29,611.—CALVERT, G., "Gas-stove." Dec. 17.
 29,624.—STILL, E. H., and STILL, W. M., AND SONS, LTD., "Gas-lamps." Dec. 17.
 29,625.—STILL, E. H., and STILL, W. M., AND SONS, LTD., "Gas-burners." Dec. 17.
 29,628.—AINLEY, L., "Padlock protector for prepayment gas-meter money-box." Dec. 17.
 29,636.—FEATHER, R., "Fastenings for the doors of gas-ovens." Dec. 18.
 29,650.—SUSSMANN, H., "Incandescent burner." Dec. 18.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Coulson's Tar Patent.

SIR,—I am at a loss to understand the value of adding sulphuric acid to the pitch in the still, as explained by Mr. Coulson in his patent, No. 7427 of 1909 (see "JOURNAL," Dec. 14, p. 757). What does it do to increase the value, and who buys the product? Will some of your readers or Mr. Coulson help?

Dec. 20, 1909.

IGNORAMUS.

The Catastrophe at the Hamburg Gas-Works.

SIR,—I am obliged to Mr. Whimster for pointing out the slip I made in my letter last week, when contrasting the size of the Hamburg and South Metropolitan gasholders. He is quite right. The 71 per cent. mentioned by me is obviously a clerical error. It should have been 41 per cent.

71, King William Street, E.C., Dec. 22, 1909.

F. S. CRIPPS.

LEGAL INTELLIGENCE.**THE CLAIM BY A FORMER GREENOCK GAS MANAGER.**

On Tuesday and Wednesday of last week, Counsel were heard by Lord MACKENZIE in the Court of Session upon the evidence recently led (see "JOURNAL" for Nov. 23, p. 548) in the action by Mr. W. Ewing against the Corporation of Greenock. The pursuer sues for £1645 8s. as due to him for services rendered outside his duties as Gas Manager.

Mr. J. B. YOUNG, for the pursuer, contended that Mr. Ewing was appointed Manager only, as was shown by the minutes, and that the engineering duties which were laid upon him after his appointment were not in contemplation when he was appointed. There was no evidence in the minutes that the pursuer exceeded the instructions given him by the Committee. Counsel went over the evidence in detail, and urged that the effect of it generally was that his client was called upon to do work which was not managerial work, and that he was entitled to remuneration for this work. If it were established that the work was outside the duties of the office, the onus would be upon defenders to show why pursuer should not be remunerated.

Mr. M'LENNAN, K.C., for the defenders, submitted that the primary question in the case was whether the work which was done by the pursuer was work which fell within the scope of his appointment as Gas Manager or did not. This question admitted of only one answer, which would be in the defenders' favour—that all the work which he did fell within the scope of his employment. This answer arose whether they considered the pursuer's own understanding or the defenders' understanding of the appointment, or the general practice on the subject. The further question was whether there was any ground for the pursuer's allegation of special employment, or whether there was room for an implied contract for special remuneration, apart from any employment under special terms. The evidence clearly established that there was no special qualification for a gas engineer—it was only a question of practical knowledge and experience. The evidence also established, he submitted, that all the work done by the pursuer was done by him in his capacity as Gas Manager, and that this was within the pursuer's knowledge.

Lord MACKENZIE reserved judgment.

UNDERGROUND WATER SUPPLIES IN AMERICA.

According to "Engineering Record," underground water supplies for New Jersey cities and towns are placed in a precarious legal condition by a decision of the Court of Errors and Appeals on the 15th ult., in a suit brought by a farmer to recover damages from the city of East Orange. The plaintiff claims that the driven-well water-works of the city lying east of his property deprive him of the use of a sub-surface and surface supply that was available before the city plant was built. In the lower Court, he was awarded nominal damages; but the Court of Appeal has decided that he is entitled to a much larger amount. Under the English precedents, the plaintiff would have no remedy; for it is held that underground waters are like stone and sand, which the owner of the land is permitted to remove wherever he pleases.

Nearly fifty years ago this view was argued at great length by the New Hampshire Supreme Court, and the true judicial rule was then held to be that, the rights of each owner of water-holding land being similar, and their enjoyment of these rights being dependent upon the action of other landowners, each owner is necessarily restricted to a reasonable exercise of his own rights and of his own property, in view of the similar rights of others. From this decision of 1862 there has developed in the United States the theory of "reasonable use" of underground waters, which has been adopted by the Courts of various Western States, but has not been upheld, as a rule, in the humid sections of the country. The decision of the New Jersey Court is therefore extremely important, because it restricts a landowner using underground waters drawn from his estate to their application for agriculture, manufacturing, irrigation, or other reasonable use on his own property, but prevents the withdrawal of ground water for distribution or sale for uses not connected with any beneficial enjoyment of the land whence they are taken, if this withdrawal interferes with the rights of owners of neighbouring land to reasonable use of ground water supplies from their property.

It is self-evident, in the light of this decision in New Jersey, and

somewhat similar decisions in New York, that the details of ground water flow under various conditions of pumping, and, indeed, the whole subject of ground water supplies, are rendered more complicated technically. The engineer called upon to design a system of water-works utilizing such a source of supply has always been confronted with many uncertainties requiring very careful judgment on his part, and the judicial opinion just rendered increases these complications by making it impossible to utilize a ground water supply by any means which interferes in any way with the percolation of waters through neighbouring lands.

A Water Company and Non-Domestic Supplies.

At the Portsmouth Police Court, on Monday of last week, the Magistrates were called upon to decide whether the Portsmouth Water Company were entitled to refuse to supply local tradesmen with water for other than domestic purposes. Mr. H. Marchmont, a butcher, was summoned for having, contrary to the Company's Act, used for business purposes water which was supplied by the Company for domestic purposes only. Up to December, 1908, defendant paid 2s. 6d. a quarter to the Company for water used by him in connection with his business; but during that month, the Company gave him three months' notice that the existing agreement would terminate. However, at the expiration of the time, defendant refused to comply with the Company's new requirements (that the water should be charged for by meter), but continued to use in his slaughter-house the water supplied for domestic purposes. He was warned that proceedings would be taken; and as he still continued to use the water, a summons was issued. Dr. Emanuel, for the Company, submitted that the Act commanded the Company to supply water for domestic purposes, but only empowered them to supply water for trade purposes upon the terms enjoined in the Act. If water was required for any other than domestic purposes, the person so requiring it had to make application to the Company, who could either grant or refuse the request. In either case, if the person took the water for business purposes when it was supplied for domestic purposes, that person would be liable to a fine. Mr. Blagg, for the defendant, urged that the Company were bound to supply any person who applied to them for water for other than domestic purposes. It was, he said, a most serious matter; for if the Bench upheld Dr. Emanuel, the Company could, if they desired to do so, by giving three months' notice, cut off any tradesman's supply of water. Dr. Emanuel said that this was a fact in point of law; but it was not feasible to imagine that the Company would cut off their nose to spite their face. The Bench upheld Dr. Emanuel on his point of law, and fined defendant 20s. and 8s. 6d. costs. Mr. Blagg asked the Bench to state a case. Prior to the hearing of this case, two summonses against another butcher were withdrawn. In addition, four informations against a pork butcher, with respect to two alleged similar contraventions of the Company's Act, were adjourned *sine die*.

Reinstatement of Roadways.

At Bow Street Police Court, before Mr. Curtis Bennett, last Wednesday, the Metropolitan Water Board were summoned by Mr. J. W. Bradley, the Engineer and Surveyor for the City of Westminster, for failing to comply with a notice served upon them to repair and make good a portion of the paving in Vauxhall Bridge Road, which had been damaged by the bursting of a water-pipe of which they were the owners. Mr. Morton Smith, who appeared in support of the summons, stated that since the Magistrate's decision in a case which was before him a few weeks ago, as to the repair of roadways after they had been damaged in consequence of water-pipes bursting (*ante*, p. 333), great difficulties had arisen in connection with repairs to the streets; and as an element of public danger was introduced, a serious view was taken of the matter. Proceeding, he stated that on Oct. 25 the Westminster City Council received notice from the Board that they had taken up the roadway in Vauxhall Bridge Road in order to repair a burst pipe. It was found, on inspection, that the whole of the woodwork from the kerb to the tramline had been damaged; and on Oct. 30 notice was served on the Board requiring them to do what was needful in the matter within 48 hours. The repairs ought to have been completed by the following Tuesday evening; but nothing was done until the Thursday morning. Meanwhile, the area affected had to be fenced round; only one side of the road being available for traffic. Eventually the work was partly done by the Water Board's contractors and partly by the Westminster City Council; there being a dispute as to the extent of the roadway which had been damaged in consequence of the burst. For the Water Board, Mr. Courthope-Munroe submitted that the proceedings were trivial and vexatious, and that the notice served on the Board was bad, principally because it was given by an official of the Council at a time when there was no authority to give it. Mr. Curtis Bennett, in giving his decision, said that a most unfortunate condition of affairs had arisen through the action taken by the Board, rightly or wrongly, in the case recently decided by him. Up to that time, there had been no trouble; but for some reason or another the Board wished to raise the question whether the ratepayers of the whole area within their jurisdiction should pay the cost of repairs of this kind in a particular district, or whether the cost should be defrayed by the local ratepayers. In the former dispute referred to between the Westminster City Council and the Board, he ruled that, according to law, the Board were right; but he expressed his opinion on the question of fact by giving no costs. In the present instance, the Council had, in accordance with that decision, given the Board notice to do the work within 48 hours, and nothing was done within that time. Both bodies existed for the benefit of the public; and it was the public who suffered through the road not being fit for use in consequence of the repairs not having been effected within a reasonable time. The defendants would have to pay a fine of £10 and 25 guineas costs. Replying to Counsel, the Magistrate said he would state a case.

The Directors of the Coatbridge Gas Company have resolved to reduce the price of gas after Jan. 1 from 2s. to 1s. 10d. per 1000 cubic feet for ordinary consumers, and for power consumers from 1s. 7d. to 1s. 6d. This makes the Coatbridge gas the cheapest in Scotland.

MISCELLANEOUS NEWS.

PROFITS FROM GAS SUPPLY IN PARIS.

In the report made to the Paris Municipal Council by the Prefect of the Seine upon the Budget scheme for 1910, some particulars are given in regard to the profits derived from the supply of gas. Under the heading "Net profits from the working of the Paris Gas Company," he proposes to put down a sum of 23,600,000 frs. (£944,000), which is an increase of 100,000 frs. (£4000) on the amount inserted in the Budget for 1909, in which allowance was made for an increase of 1,000,000 frs. (£40,000) on the revenue in 1908. The growth in the consumption of gas is about 4½ per cent. annually; and assuming that this augmentation is not checked by the competition of electricity, it is assumed that the receipts next year will increase to the same extent, and consequently reach the figure of 24,560,000 frs. (£982,400). On the other hand, the various items of expenditure which did not appear in the Budget for the present year have to be taken into account. They arise from the change in the conditions of the stokers' work, the effect on the employees in the gas-works of the advances made in the salaries to the staffs in various branches of the municipal service, the necessary outlay on manufacturing and storage plant, additional payments to the Gas Company, and expenses in connection with the loan of 38,000,000 frs. (£1,520,000) which will probably be authorized next year by Parliament. In view of this extra outlay, the Prefect deemed it advisable to estimate the gas revenue at 23,600,000 frs. only.

SOUTH METROPOLITAN CO-PARTNERSHIP SCHEME.

The Year's Work.

The "Co-Partnership Journal" of the South Metropolitan Gas Company for next month opens with the following address by the Chairman, Mr. Charles Carpenter, on the year's work in connection with the co-partnership scheme.

With the passing of 1909, the test of another twelvemonth's working can be applied to our co-partnership. Its course has been, for the first year since its inception, unguided by the Founder's hand. Have we approached or receded from the goal he set up? Happily we can answer, without hesitation or uncertainty, that we are nearer the achievement of what he prophesied than when death stilled for ever the busy brain and sympathetic heart of the great master gas worker. The co-partnership which he originated may be regarded as the association of a body of happy and contented men, with differing mental and physical capabilities exercised in various spheres of life for providing the inhabitants in a large portion (and, on the whole, the poorest) of this great Metropolis with the advantages of cheap light, heat, and power. Sir George was always proud of his connection with a work of such character and magnitude; and we may well be proud of our part in it too. But it could never have become so complete in its usefulness unless we had first arrived at a thorough accord among ourselves. Co-partnership has brought about this result with an entirety unattainable by any other means. The thousands of South London gas workers have in their Elective Committee a medium for the promotion of all the interests they have in common with the shareholders of the Company and those who purchase its productions; while methods of working are made smooth before irregularities can become grievances or even hardships. No one who has been present at these deliberations can have failed to be struck by the conscientiously fair and earnest way in which the various members of the Committee proceed with their duties.

It is well known, however, that the employees' share in the management does not end with the Co-Partnership Committee. They elect three of their number to seats at the Board-room table; and whatever misgivings may have arisen when so radical a proposal was first mooted, it can be emphatically asserted that there is not a single Director who would now regard their presence as other than a necessity for the proper management of the Company's affairs. The credit for so remarkable—yet, in the light of our present knowledge, so obvious—a result must be shared between the employee shareholders and the admirable representatives they have chosen. Nor is this experience unique. I have now been associated for more than a year with the management of another undertaking, at the Board of which I sit with two working-men Directors; and I can truthfully say I look forward to my fortnightly intercourse with them as pleasurable as with the other members elected, like myself, by the ordinary shareholders. In this connection, I should like to mention the name of my colleague on the South Metropolitan Board, the late Mr. Edward Cardwell. He was respected by everyone who knew him as a true type of a thorough English gentleman, and not least by those of us who came into contact with him during the seventeen years of his directorship. One of his most intimate friends, whom I met at the funeral, told me that he had expressed to him grave doubts as to the desirability of Workmen-Directors when they were first proposed, but that he had lived to become a complete convert to the principle, and made no secret of the change which had taken place in his views.

Reverting again to our co-partnership, this has forged ahead during the past year in material as well as moral advantage. A larger percentage of the bonus earned has been invested in shares than in any previous year, and co-partners now hold stock in the Company which at the present market price is worth something like £316,000. Nothing can conduce to the prosperity of our co-partnership more than the increasing shareholding in it by the employees. But it is not the only factor. Our business is changing in its character, and now requires a much larger proportion of skilled knowledge than was the case when its co-partnership started nearly twenty years ago. This is not only true of the mechanics of all classes, but of their mates, and other handymen also; and it is increasingly necessary for them to avail themselves of every opportunity to increase the knowledge they have of the work

in which they are engaged. They should carefully read such books and periodicals as they can obtain, besides attending evening classes whenever possible. Copies of the chief publications concerning our business are provided for the use of workmen in all their lobbies, whether on the works or district, and will be found to contain much valuable information and many useful hints on gas and its uses. May I take this opportunity to put in a word for the benefit of those young fellows, still in their 'teens, who are mates to-day, and of whom many, it is hoped, will become skilled workers in the future? Do not lock up in your headpieces that knowledge which you have bought by years of labour and experience, but share it with the mate who is working with you, that when he arrives at man's estate he may be better equipped to meet its necessities, and more able when he takes to himself the sweetheart for his wife to make her a worthy home.

Looking back, then, we are justified in our satisfaction with the year's work. It has drawn tighter the bonds of that co-partnership of heart as well as muscle which has helped to raise the Company to the proud position it now occupies. It has also set the lessons for our endeavours during another twelvemonth, which it must be our aim to make worthy of its predecessors.

In the New Year's message from Swinburne to Mazzini (you remember how proud Sir George was of quoting his prophecy) on the eve of 1871, he says that, although he knows not whether the coming year will be one of light or darkness, he does know that—

it will not part
Heart's faith from heart,
Truth from the trust in truth, nor hope
From sight of days unscaled that ope
Beyond one poor year's horoscope.

Our co-partnership inspires its participants with the same belief; and it is because of it that they can with confidence look forward to the dawn of 1910 as the beginning of what from my heart's heart I wish them all—

A HAPPY NEW YEAR.

NEW YORK PUBLIC LIGHTING.

The report of the Water, Gas, and Electricity Department of New York City for the year 1908 has lately been published by the Commissioner (Mr. John H. O'Brien); and some of the tabulated statistics in regard to the public lighting are given in the current issue of the "American Gas Light Journal." They are taken from the particulars furnished by the Bureau of Lamps and Lighting, the Chief of which is Mr. C. F. Lacombe; and we reproduce some of them below.

Expenditure on Public Lighting.

Street and park lighting	Total.
Lighting public building	\$2,783,764
Heat and power	709,137
Bureau expenses	67,201
Salaries	29,742
High pressure fire service	134,137
Testing electric meters	103,972
	1,500
Total appropriations	\$3,829,453
Revenue bond fund	2,587
Total	\$3,832,040

Public Lamps in Use since 1901.

End of Year.	Electric Arc.	Electric Incand.	Gas.	Naphtha.	Total.	Candle Power.
1901	11,991	4076	41,381	4222	61,670	6,764,612
1902	12,431	4170	41,804	4198	62,603	7,052,750
1903	12,522	4674	43,098	4158	64,452	7,102,356
1904	12,739	4684	43,009	4217	64,649	8,061,852
1905	13,391	4248	43,067	4263	64,969	8,542,590
1906	14,218	4588	42,430	4273	65,509	9,702,056
1907	14,765	4745	43,636	4352	67,498	10,950,871
1908	15,441	6532	44,057	3336	69,366	11,428,020

During 1908 there were 4478 new lamps lighted, 3880 lamps re-lighted, and 6497 lamps discontinued. More than 6000 gas lamp-posts were repaired. There were upwards of 100,000 "outages" of all kinds of lamps; the totals being given in the next table.

Public Lamp Failures in 1908.

Greater New York.	Electric.		Gas.		Naphtha.	Total.
	Arc.	Incand.	Inca'd. Mantle.	Open Flame.		
Inspectors	10,103	5269	29,271	79	14,543	59,265
Police	19,531	2388	18,209	2	6,201	46,331
Companies	3,686	82	..	..	..	3,768
Total reported	33,320	7739	47,480	81	20,744	109,364
Duplicates	2,152	136	2,354	..	1,999	6,641
Total deducted	31,168	7603	45,126	81	18,745	102,723

There are nearly 4000 miles of highways in Greater New York; and at the end of 1908 there were 3401 miles of mains in use for private and public lighting.

Length of Mains in Use during 1908.

Borough and Company.	In Use Jan. 1, 1908.		New Mains Laid.		Mains Disused.		Mains Taken Up.		In Use Dec. 31, 1908.	
	Miles.	Feet.	Miles.	Feet.	Miles.	Feet.	Miles.	Feet.	Miles.	Feet.
Manhattan	1407	4786	8	2644	6	1171	4	4666	1405	1593
The Bronx	349	1072	12	4770	1	3843	1	1868	359	131
Brooklyn	1126	4364	26	1924	2	3330	3	2321	1147	637
Queens	382	4537	26	952	..	1612	2	4530	405	4617
Richmond	81	4382	1	4945	..	..	..	..	83	4047
Grand total	3348	3301	75	4665	10	4676	12	2825	3401	465

WEST HAM GAS COMPANY.

Final Meeting.

A Special General Meeting of the Company was held last Tuesday, at the Liverpool Street Hotel, E.C.—in accordance with the intimation given in the report of the Directors which accompanied the statement of accounts to June 30 last—"to receive a report from the Directors of their proceedings during the current half year." Mr. J. LISTER GODLEE, the Chairman of the Company, presided over a substantial gathering of stockholders.

The SECRETARY (Mr. A. G. Snelgrove) having read the notice convening the meeting, The CHAIRMAN said that, in accordance with the promise made at the time of the last half-yearly meeting, the Directors had asked the stockholders to attend that day in order that they might lay before them a statement as to their proceedings during the present half year—though there were, of course, no accounts to present.

PROGRESS IN THE PRESENT HALF YEAR.

The Directors had assumed that the stockholders would be prepared to take a verbal statement from him, as there was hardly sufficient material out of which to construct a printed report; and it was impossible to lay before the meeting anything in the nature of accounts. But he might say here that it was proposed that the half-year's accounts should be worked out by the officers who had been employed over them during the half year; and the Gaslight and Coke Company would distribute copies of the balance-sheet, &c., among those who were stockholders in this Company, with a statement of the dividend to be paid. The immediate imminence of the amalgamation had, of course, confined the duties of the Directors to watching over the working of the concern and over the arrangements for carrying out the change. It had not been for the Board to make provision for next year's working, which would be in other hands. But the business of the Company had shown steady and satisfactory progress throughout the five months that had elapsed. It would not be satisfactory to place before the stockholders any statement of expenses and income for a period of this sort; but from figures supplied to him by the Engineer, he anticipated that the accounts would show a material saving in coal and oil, though larger quantities of each had been used, and satisfactory increases in sales of residuals, except sulphate of ammonia, in which there was a considerable falling off. The sales of gas during the five months showed an increase of 5.98 per cent. over those for the same period of 1908. The increase of consumers by automatic meters had continued; and since the system was introduced in 1902, there had been installed about 52,500 of them, of which more than 48,000 were now actually in use by consumers. The work of the Company had gone steadily forward; and the arrangements made by the Board a year ago, after Mr. Clark's death, for dividing his duties among other officers, had worked quite satisfactorily. Great credit was due to the officers for making this possible.

THE AMALGAMATION ARRANGEMENTS.

The arrangements for the taking over of the business by the Gaslight and Coke Company were nearly complete; and he anticipated no difficulty in carrying them out. He thought the few figures he had given the stockholders would satisfy them that the half year that was coming to an end was likely to show results as satisfactory as those that had gone before it, and that the approach of the amalgamation had not led to any slackening in the energy with which the business had been conducted in the past. On Dec. 31, the Company would cease to exist, except to this extent—that there would still exist for a period of three months a something bearing its name whose powers could, he supposed, be exercised by the present Directors, who would be able, if occasion should arise, to take proceedings against the Gaslight and Coke Company to enforce any of the terms of the agreement entered into between the two Companies a year ago. But he did not see any probability of occasion arising for the exercise of these powers.

A GLANCE AT THE PAST.

An occasion like this inclined one to look a little at the past; and he would be excused for reminding the stockholders that the Company had been in existence since the year 1846. There was a supply of gas of some sort in West Ham prior to that time; but the price that was charged for it—8s. per 1000 cubic feet—and other matters connected with the supply, having caused some dissatisfaction, a public meeting of parishioners of West Ham was held in November, 1845, when it was decided to form an independent Company, regulated by a Deed of Settlement, which, under the name of the West Ham Gaslight and Coke Company, was registered in May of the following year. Within eighteen months, there were 84 shareholders in the Company, almost all of whom were residents in the parish. It called itself a Consumers' Company, having as its object to supply pure gas at the lowest price consistent with a fair return for the capital invested; and in pursuance of this object, the price of the gas was at once reduced to 6s., and shortly afterwards to 5s. per 1000 cubic feet—which those present would compare with the 2s. 8d. now charged by the Company. In the year 1856, an Act of Parliament incorporated the Company under the name it now bore, and confirmed an agreement by which the Company purchased the mains and other property in the parish of the Company who had been supplying gas before the new Company was formed. At that time, the capital of the Company amounted to £13,985; and a further £13,000 had been borrowed—£3000 upon the security of a mortgage of the leasehold property of the Company, and £10,000 upon the promissory notes of the Directors—a class of security which the stockholders would hardly expect the Directors to give at the present day. From these small beginnings, the Company had gone on increasing, until the 84 shareholders, with the holders of the mortgage and promissory notes, were now (sixty-four years after the formation of the Company) represented by 1770 stock and debenture holders. The capital of £13,985 had grown to £1,441,000; and, to take a somewhat later figure, the amount of gas sold in a year, which in 1860 was 53,000,000 cubic feet, would in the present year probably amount to over 2,007,000,000 cubic feet. He would venture to give them a few more figures of which

he thought it might be interesting to have some record; and for this purpose, he would take an intermediate year, near the middle of the life of the Company. He would fix upon the year 1874, because this was the year when he first sat among the Directors at a general meeting of the Company; and he had the figures at hand. At the time of which he was speaking, Mr. Thorman, who was the Engineer of the Company when it first set to work, still occupied this position; and he continued to do so for seventeen years longer. It took more than one man to do his work now. Then there was one collector for the whole district; now there was a small army of them. The two large gasholders—one at West Ham and the other at East Ham—were not then dreamt of. The paid-up capital was less than one-tenth of what it was now. The half-yearly rental was about £13,000; whereas last half year it was about £140,000. The total charge for wages and salaries was about £2300; while last half year it was nearly £18,000. Last, but not least, the charge for rates, taxes, and rent was £608; whereas in the past half year, without any rent, the rates and taxes cost the Company £6500. Add to this that for many years past the full amount of the statutory dividends had been divided or added to the Company's reserve fund, and he claimed to have placed before the stockholders a very satisfactory history of progress and success. And this progress still went on. In the nine years that had elapsed since 1900, the actual paid-up capital had more than doubled; and the annual make of gas had risen from 1100 million to 2037 million cubic feet. These figures, he supposed, never presented themselves as possible to the man of the liveliest imagination who attended the meeting that was held in Stratford, under the chairmanship of Sir John Pelly in November, 1845.

FEELINGS OF PRIDE AND REGRET.

He had put these facts and figures before the proprietors, because he wanted them to feel proud of the Company, and to feel that in entering upon an amalgamation with the Gaslight and Coke Company, though the West Ham was a very small concern compared with the other, they were taking with them a business of which they had not the slightest cause to be ashamed. ("Hear, hear.") The time of this amalgamation was now close at hand. It must bring with it some regret at the loss of a name with which they had long been familiar, and at the breaking up of associations with men with whom the Board had worked in hearty co-operation for many years, and with many whom one had been led to respect and admire for their steady and loyal work in the interests of the Company. Perhaps they would allow him for a moment to allude to himself. After having been a Director of the Company for no less than 35 years—more than half the life of the West Ham Gas Company, and somewhat more than half of his own—and after presiding over the meetings of proprietors and of the Board of Directors for over seventeen years, he naturally shared these feelings to the full. It closed for him a chapter which for a long time had been a very interesting one. But these regrets would, for most of them, be only temporary. This was no funeral. The West Ham Company was hale and hearty, and in full possession of its powers, with no suggestion of faintness or disease. He would call it rather the entering into a partnership between two men—a big one and a little one, he agreed, but both strong men—a partnership which he believed would be to their mutual advantage, which would give increased satisfaction to those who were concerned in the West Ham Gas Company, and which would increase their power of supplying to their consumers what was now and here one of the necessities of life.

GRATUITIES TO OFFICERS.

Of course, the proprietors did not expect a long speech from him; and he had done. Before, however, he sat down, his colleagues had asked him to announce the way in which they had decided to deal with a sum of £5000 out of the undivided profits, which the agreement with the Gaslight and Coke Company specially authorized them to expend in making gratuities to any salaried officers whom they might consider specially deserving thereof. The Directors had decided to hand to Mr. Snelgrove, who had been Secretary of the Company since the year 1888, and who had since Mr. John Clark's death last February taken over such part of the duties formerly entrusted to Mr. Clark as did not come strictly within the Engineer's department, 1000 guineas. To Mr. Wright, who, having been previously employed by the Company, was appointed Assistant-Engineer in 1894, and who since Mr. Clark's death had taken over a large part of his duties in the post of Acting-Engineer, £1000. To Mr. G. T. Gwinn, the son of the first collector of the Company, who was himself appointed a collector in 1881, and who in 1906, on the institution of a separate rental department in the Company's offices, was appointed head of that department, with the organization of which he had the main responsibility, £750. To Mr. E. Madge, a son of the Mr. Madge who was Secretary of the Company for 22 years, who became a clerk in the Company in 1881, and was now Assistant-Secretary, £600. To Mr. H. N. Clark, who entered the Company's service as an Engineer's Assistant in 1894, and had been largely responsible for the distribution work of the Company, £600. To Mr. Bull, who was Mr. Gwinn's principal assistant in the rental department, £300. To Mr. J. S. Thorman, who was appointed an assistant to the Engineer in 1896, and who had had to do with the water-gas plant of the Company, £250. To Mr. H. Lethbridge, a clerk in the Engineer's department, after 22 years' service, £200; and as a small recognition of their services for several years, to give to Messrs. Logue, Inder, and Biggs, who were cashiers in the Secretary's office and the rental department, £50 each; and to five of the collectors who had been in the Company's service for more than ten years—namely, Messrs. Parsons, Wilson, A. L. Gwinn, Stevens, and Clarke—£20 each. These payments all gave expression to the feeling of admiration for service to the Company over long series of years, well done, and deserving of such recognition at the hands of the proprietors at the time when this service to the Company came to an end. The Directors anticipated that the stockholders would approve of their action in this matter. It had been a great satisfaction to the Board to have the power to do this placed in their hands.

THE SERVICES OF THE CHAIRMAN.

The DEPUTY-CHAIRMAN (Mr. H. Cecil Pelly) remarked that on an occasion like the present, when they were holding their last general meeting with the stockholders in the Company, one could not help

to some extent looking back and reviewing the past. In doing so over the eighteen years during which the proprietors had entrusted him with a seat on the Board, there were one or two features which were prominent in his mind. First of these was the happy relationship that had always existed between the stockholders and the Directors. He could not recall any occasion at any meeting which one could look back to with any regret; but, on the contrary, the meetings had always been of the most cordial and pleasant nature. For this, and for the support that the proprietors had always extended to the Board, his colleagues and he would like to take this opportunity of tendering them their most cordial thanks. Then, again, one looked back on the progress the Company had made. The Chairman had dealt with this in his speech; and he need not quote any figures. The enormous strides the Company had made were well known to all; but what had been the cause? No doubt, principally it had been the large developments in building and increase in population in the district that the Company had served. But if it had not been for the officers in all departments, they would never have been able fully to utilize these developments. He would like to confirm every word the Chairman had said about the officers, and to add his own personal thanks for assistance and advice they had so often rendered in the management of the Company's affairs. Once again taking a retrospective view, reminded him of another feature he wanted to mention, though it was perhaps unusual to do so from that side of the table. But the present occasion was exceptional. He referred to the Chairman, Mr. Godlee. There was no need to say anything with regard to the way in which he had presided over the general meetings—the proprietors were well aware of this. But he did desire to say publicly how his colleagues had appreciated his clear-sighted judgment upon the Company's concerns, his genial and patient forbearance at the Board meetings, and, above all, his close attention to business—for he believed he was right in saying that he had never missed a general meeting during his chairmanship, and only on one or two occasions had he been absent from the Directors' meetings. It was satisfactory to all of them to feel that they were represented by him on the Board of the Gaslight and Coke Company. In thus briefly mentioning one or two matters which the occasion justified, he would express the hope that the cordial relationship which had existed between the Directors and the stockholders of the West Ham Company might be continued with the new Board—that of the Gaslight and Coke Company—and that many of the proprietors (and he would be with them on the shareholders' side of the table) would meet twice a year at Horseferry Road to support Mr. Godlee and the other members of that Board. In conclusion, so that those stockholders who were unable to be present at the meeting that day might have the benefit of the interesting sketch of the history of the Company given in the Chairman's address, he would move that the speech be printed and circulated among the proprietors.

Mr. FRED. NICHOLSON seconded the proposition, and thoroughly endorsed every word Mr. Pelly had said about the Chairman. He believed that Mr. Godlee would prove a source of strength to the Board of the Gaslight and Coke Company.

The CHAIRMAN then invited questions; but as there were not any forthcoming, he put the resolution to print and circulate his speech, and it was at once carried unanimously.

A VOTE OF THANKS.

Mr. R. L. CARTER proposed a hearty vote of thanks to the Chairman and Directors for their attention to the Company's affairs during the time they had presided over them. There were some regrets in making the change; but, at the same time, it was all, he felt sure, for their good.

Mr. WIGLEY, who seconded, said that, along with their regrets, they should be pleased that they were going over to a gigantic Company who would look after affairs in the interests of every one of them.

The CHAIRMAN, in acknowledgment, remarked that the Board regarded the resolution as something more than those usually passed at the half-yearly meetings, inasmuch as it was an expression of thanks for work extending over many years. His own position was perhaps a little exceptional. He had been on the Board for 35 years; and there came a gap between that and the next senior, Mr. Pelly, of 17 years. Therefore a good many men had passed out of the Company, who had sat with him, besides his present colleagues. In fact, he had sat with nine other men as members of the Board. It had been to him work which was very interesting, and work which he had thoroughly enjoyed; and it was a great satisfaction to him to hear the kind words which had been said that day upon the manner in which he had performed his duties. All the Directors had devoted much care, time, and attention to the work; and they were extremely glad that it was appreciated. He had had from his colleagues all that assistance without which his work could not possibly have been done. Within the last few months, he had had from the Vice-Chairman great help in matters which Mr. Pelly, having offices in London, was able to attend to, and which were not easy for him (the Chairman) to look after now he lived away from town. Ever since he had known it, the Board had been a cordial and hard-working one; and he hoped that they might reflect that this had had some influence on the satisfactory and comfortable working of the Company. He hoped at Horseferry Road to meet the proprietors, and to shake hands with many old friends. He could not sit down without saying that the Board wished to give their heartiest thanks—in which he felt sure the proprietors heartily concurred—to the officers, who had kept the undertaking going, and worked it so satisfactorily as to bring out the results which had placed the Company in the position it now occupied. "Gentlemen," he said, in conclusion, "I bid you good-bye."

Bingley and the Wilsden Gas Supply Rights.—At a meeting of the Bingley District Council on Monday last week, the Gas Committee reported that the Bradford Corporation had named £20,000 as the price they required for the rights of gas supply in Wilsden; and on the recommendation of the Committee, it was decided that a statement should be prepared showing the annual cost in the event of the offer being accepted and a new main being laid for the supply of Wilsden from the Bingley Gas-Works.

BUENOS AYRES AND ITS GAS SUPPLY.

Amalgamation of the Buenos Ayres (New), the River Plate, and the Primitiva Gas Companies.

A series of meetings was held last Tuesday of the debenture holders and shareholders in the Buenos Ayres and River Plate Gas Companies and of the shareholders in the Primitiva Gas Company, to pass resolutions to effect the carrying out of the provisional agreement, to which reference has been made in the "JOURNAL," for the amalgamation of the concerns.

Buenos Ayres Debenture Holders.

The first meeting was that of the debenture holders in the Buenos Ayres (New) Gas Company, held at the London Offices, No. 1, East India Avenue, E.C.—Mr. JOHN CONRAD IM THURN presiding.

The CHAIRMAN said those present would no doubt expect him to explain briefly the facts of the case as regards the security of the debentures, and also why the three Gas Companies in Buenos Ayres were now amalgamating. Their trust deed of July 8, 1907, gave the debenture holders a floating charge on the assets of the Company; and for this it was now proposed to ask them to accept a floating charge on the assets of the combined Companies, which, in the Directors' opinion, and in that of the Trustee, improved the security of the debentures. There were many reasons why it had become necessary to amalgamate the three Companies. For a good many years now, there had been a recurrence of difficulties with the municipal authorities, which had always been a source of trouble, and sometimes anxiety, to the Board. It was felt it was time to make an effort to come to some terms with the Municipality; so that the gas industry might feel that it was no longer to be hampered by unnecessary and unreasonable terms. In the year 1895, what was thought by the Directors to be a definite scheme was agreed to by the Municipality. A sliding-scale of charges was then arranged, based upon the fluctuations of the gold premium; and for a period of about ten years, this seemed to answer fairly well. But in 1906, an agitation was started in the Press, and also by certain members of the Municipal Council, demanding a reduction in the charges; and although the Directors resisted any alteration to the agreement made in 1896, they were again forced to negotiate with the authorities. In 1906, the agitation recommenced; and a proposal was put forward which would have entailed the handing over of the whole three Companies, free of cost and charge, to the Municipality at the end of fifty years. Even this did not satisfy the extremists; and the negotiations proved abortive. Ever since then the Board had taken endless trouble to come to a satisfactory arrangement; and at the general meetings the shareholders had been told exactly what was going on. Things came to a head in 1906, when the Municipality promulgated an ordinance or decree fixing, in the most arbitrary way, the selling price of gas, at figures which would have ended in the ruin of the Companies. The Company might have earned their debenture interest; but there would certainly have been no dividends to the ordinary shareholders under the impossible prices and conditions demanded by the ordinance. Those present could imagine that this was a serious state of things; for the ordinance was to commence in 1908. The Board, in conjunction with the Boards of the other two Companies, working in perfect harmony, tried every possible means to induce the authorities to give them time to arrange the question; and, finally, consent was given to a reduction of 2 cents per cubic metre from Sept. 30, 1908, pending further negotiations with the Lord Mayor and the Municipal Council. At that time, it so happened, and very fortunately happened, that the authorities were anxious to obtain possession of the land at Retiro on which the Primitiva Gas Company's works were erected. This land immediately adjoined a site on which a very large new station was being built by two of the greatest Railway Companies in Argentina. It therefore came about that the Primitiva Company were in a position to negotiate under favourable circumstances with the Municipality, and secure for the gas industry a fair agreement. The best method seemed to be to amalgamate all the Gas Companies; so that the Primitiva Company might secure for the whole gas industry in Buenos Ayres the most favourable terms. This was what brought about the proposed amalgamation. The Directors had given the greatest consideration to the position of the debenture stockholders. In order that it might be understood how careful the Directors had been of the debenture holders' interests, he should like to read an extract from a letter from the Chairman of the Trustees (the River Plate Trust Loan and Agency Company), which was written to Mr. Bowen, the Chairman of the River Plate Gas Company. Two proposals were brought forward; and this was what Mr. Anderson said:

First Proposal.—That the fusion of interests be carried out by the Primitiva Company acquiring the shares of the two other Companies, keeping them alive, and taking from them leases of their properties. This would not affect the rights of the debenture stockholders, and, in consequence, it would be carried out without requiring their assent.

Second Proposal.—That the Primitiva Company purchase the properties of the River Plate and Buenos Ayres New Gas Companies, subject to their respective debenture stocks, which would retain their existing specific security; but the guarantee of the Primitiva Company would be substituted for those of the River Plate and New Gas Companies respectively. Further, that, in addition to assuming the responsibility for these two debenture stocks, the Primitiva Company would undertake to set aside a sinking fund of 1 per cent. per annum, to be employed annually in the purchase and cancellation of the respective debenture stocks, while they could be purchased on the market within the redemption prices—viz., 105 in the case of the River Plate Gas Company, and 102½ in the case of the Buenos Ayres New Gas Company. This plan would require the assent of the debenture stockholders of both Companies, in view of the substitution of the guarantee of the Primitiva Company for those of the two other Companies.

I have carefully considered the alternative proposals, and am of opinion that the second would be the more advantageous of the two to the stockholders. My reasons for so thinking are, firstly, that the security at present enjoyed by the debenture stockholders would not be diminished; and, secondly, because the creation of such a substantial sinking fund as 1 per cent. applied in the manner above mentioned would tend to substantially

increase the market prices of the stocks. I think the difference in market price might not unfairly be put at four or five points, as compared with the stocks as they now stand without any provision for repayment.

The fact that the security now held by the debenture stockholders of the two Companies would not be diminished will, I think, be appreciated, when one considers that the whole debenture stock of the Primitiva Company, capital as well as interest, is provided for out of the balance of the purchase-money of the electrical part of the property sold some years ago to a thoroughly responsible purchaser. The charge for this debenture stock, therefore, is provided so to speak from an outside source, and would not be a burden on the earnings of the combined Companies. It follows, therefore, that all the earnings of the Primitiva Company would come in as additional collateral to the security now enjoyed by the debenture stockholders of the two other Companies; thereby increasing their marginal security.

Of the two alternatives, it was therefore decided to accept the latter, as both Mr. Anderson and the Directors thought it was the best in the debenture holders' interest. If they agreed, the specific security on the properties of this Company would not be in any way affected; and though they would lose the floating charge on the assets of the Company, they would receive, in lieu, a floating charge on the assets of the combined Companies, subject to only the Primitiva Company's charge in favour of their debenture stock holders. The debenture stock of the Primitiva Company was provided for out of the balance of the purchase-money of the electric section of their property, sold some years ago to the German Electricity Company. This Company was a very strong one in every way; and they had undertaken to repay the debentures of the Primitiva Gas Company by half-yearly instalments, terminating in 1943. The German Company, however, had the power to pay off at any time, on short notice, the balance outstanding; so as a fact the floating charges, if the debenture holders accepted the proposition, and the River Plate Gas Company debenture holders did likewise, would really be a first charge on the whole of the assets of the combined Companies. In addition to this floating charge, the Directors had arranged with the Primitiva Company that they should set aside a cumulative sinking fund of 1 per cent., to be applied to the purchase of the stock in the market, or annual drawings at 102½. He (the Chairman) thought the market that day reflected the favourable position of the debenture holders. He would next read a copy of a letter written by the Trustees to one of the debenture holders, in reply to a letter from him.

In reply to your favour of yesterday's date, I beg to say that this Company [River Plate Trust Loan and Agency Company], as Trustees for the holders of the above stock, does approve of the proposal now before the stockholders, under which the guarantee for the payment of interest and capital of the stock will be transferred from the Buenos Ayres New Gas Company to the Primitiva Gas Company. Our reasons for so doing are, firstly, that we consider the stock will be better secured under the new arrangement; and, secondly, that the market price will be improved by the provision of a sinking fund for redemption of stock at a premium. Our opinion as regards the latter point has already been confirmed by the price having advanced 3 per cent. immediately after the publication of the proposed arrangement.

As regards your questions as to the value of what the debenture stockholders are asked to give up, and of what is proposed to be substituted for it, I would point out that the specific charge on the real estate and fixed plant of the Buenos Ayres New Gas Company now held under the trust deed will remain unchanged, and that what is proposed to be given up is simply the charge on the floating assets and the general guarantee of payment of capital and interest, which will be transferred from the Buenos Ayres New Gas Company to the Primitiva Company. The best way of arriving at an opinion as to whether the security will be improved or otherwise by the proposed change appears to me to depend on whether the margin of profit arising from the ordinary business of the Company, after payment of the debenture charge, will be increased or diminished. From the last published accounts of the Buenos Ayres New Gas Company (for the year 1908), the trading profits amounted to £67,000, as against a debenture charge of £10,000, showing a margin of £57,000, or 570 per cent. Now if we were to assume that the arrangement proposed had been carried into effect on Dec. 31 last, the trading profits of the River Plate Gas Company, the Buenos Ayres New Gas Company, and the Primitiva Company, which would have been available for the payment of the interest on the debenture stocks of the River Plate Gas Company and the Buenos Ayres New Gas Company (a charge together amounting to £22,500) would have been £200,000. There would thus have been a margin of profit, after payment of the interest on these two debenture stocks, of £246,500, or over 1000 per cent. on the debenture interest. The margin of security therefore is, in round figures, almost double, so that I think there cannot be any doubt that the arrangement is one which it is to the interest of the debenture stock holders of the Buenos Ayres New Gas Company to fall in with.

Finally, he would read the opinion of Sir Francis Palmer, the eminent Counsel on Company matters:

Then as regards the debenture stockholders, the New Gas Company's liability in respect of the debenture stock is to be transferred to the Primitiva Company, which will take the place of the New Gas Company, and become liable in respect of the debenture stock. The specific security which the debenture stockholders have is to be preserved, and a floating charge on the undertaking of the Primitiva Company is to be substituted for a floating charge on the undertaking of the New Gas Company, which will be absorbed in the undertaking of the Primitiva Company. Besides this, the Primitiva Company is to be bound to establish a sinking fund for the redemption of the stock, and to carry thereto each year £2500, plus interest on the stock from time to time redeemed by the operations of the fund, and to apply the fund each year in redeeming stock by purchase in the market, or by drawings, and thus gradually reduce and extinguish the stock. Thus it seems that the position of the debenture stockholders will be considerably improved and their security, regarded as a whole, largely enhanced in value.

The CHAIRMAN moved, and Mr. ROSS PINSENT seconded, the adoption of the resolutions. The first provided for the confirmation of the provisional agreement, dated Dec. 2, 1909, and made between the Company and the Primitiva Gas and Electric Lighting Company of Buenos Ayres, Limited, for the sale of the Company's undertaking and assets [excepting only £150,000 nominal value in shares of the South Barracas (Buenos Ayres) Gas and Coke Company, Limited] subject to the outstanding £250,000 debenture stock, for shares in the Primitiva Company. The second resolution sanctioned an arrangement between the Company and the debenture stockholders, to take effect on completing the sale: (a) The floating charge created by the trust deed of July 8, 1897, securing the Company's debenture stock to be released; and the shares in the Primitiva Company to be allotted under the provisional agreement; and the £150,000 in shares of the South Barracas Gas

Company to be distributed among shareholders of the Company, provided that this arrangement shall not affect the specific charge created by the trust deed. (b) The Primitiva Company to undertake to pay all principal money and interest payable under the trust deed of July 8, 1897, and also forthwith to give as additional security for the Company's debenture stock a floating charge upon the Primitiva Company's undertaking and uncalled capital, subject to the specific and floating charges by which its own debentures are secured, and to the specific charges by which the debenture stock of the Buenos Ayres Company and the debenture stock of the River Plate Gas Company are now respectively secured. (c) The Primitiva Company to covenant or agree with the trustees of the trust deed of July 8, 1897, to establish a cumulative sinking fund of 1 per cent. per annum for the redemption of the debenture stock of the Company by purchase in the market under 102½ per cent., or, that failing, by annual drawings at 102½ per cent. (d) The Primitiva Company to be at liberty to create a floating charge on their undertaking (ranking *pari passu* with the floating charge to be given as above mentioned), to secure the £350,000 debenture stock of the River Plate Gas Company, with a cumulative sinking fund of 1 per cent. per annum for its redemption.

Moved by Mr. A. B. BOSHER, a vote of thanks was passed to the Chairman and Directors.

Meeting of the Buenos Ayres (New) Ordinary Shareholders.

An Extraordinary General Meeting of Shareholders of the Buenos Ayres (New) Gas Company was subsequently held—Mr. JOHN C. IM THURN again presiding.

The CHAIRMAN, in his address, described the difficulties and the events that led up to the securing of an *ad referendum* contract in much the same way as he did at the meeting of debenture holders. The contract, he said, did not give the Company all they wanted; but at all events it gave them all they could get, and they were very much indebted to the Local Committee and their Manager, Mr. Obarrio, for the constant and unremitting labour and skill which they had given to the work. Clause after clause of the contract had been a matter of long and difficult negotiations; and only at the very last moment were they sanguine of getting it passed by the Municipal Council. Mr. Samuel Hale Pearson, of the Primitiva Company, was the immediate negotiator of the contract; and to him also they were greatly indebted for getting it passed. By the contract, the Primitiva Company had to give up their works in 1910; and, of course, the Buenos Ayres and the River Plate Gas Companies had to take up the burden of making the whole of the gas for the amalgamated concerns. He might mention here that the amalgamation had been sanctioned by the contract. The basis of the amalgamation of the Companies was investigated by the well-known firm of Chartered Accountants, Messrs. Deloitte, Plender, Griffiths, and Co.; and this basis was arrived at, as far as possible, on the profits made by each Company for the last few years—endeavouring as far as possible to secure to the shareholders at least the same dividends as they had been having previously. Taking that day's market price of the shares (over £14 for a £10 share) as an indication, the Directors thought the shareholders would be satisfied with the terms arranged. This compared with 11½, which was the price in December last year before the negotiations were made public. The value of the shares would roughly be 14½ to 14½ on present market value. It would be readily understood that there must be fractions, and that these must be paid in cash. The reason why this Company and the River Plate Gas Company were being absorbed by the Primitiva Company, was that the Primitiva Company was the only one of the three in a position to make a bargain with the Municipality. He thought the shareholders would agree with him that, in the past, the Company had been conducted successfully. It was registered over 35 years ago, during the whole of which time he had been a Director, and had taken a leading part in the affairs of the undertaking; and he might add that he was the largest shareholder. He was convinced, in his own mind, that the terms of the amalgamation were as good as they could have made, and that the future of the amalgamated Companies was a bright one. The amalgamation would take effect as from the first day in the New Year. Three of the Directors would join the Board of the Primitiva Company. The Manager in Buenos Ayres would continue in the management of the combined Companies; and their Secretary (Mr. Macmorran) was to be the Secretary of the amalgamated Company. The Directors were glad to announce that Mr. A. E. Bowen, the Chairman of the River Plate Gas Company, had consented to become Chairman of the amalgamated Company. It had been further arranged that Mr. H. E. Jones and himself (Mr. Im Thurn) should be Vice-Chairmen. It had not been possible to decide which of the officers of the old Companies would be retained. Of course, one of the great advantages of an amalgamation like this was the reduction of expenses, which included a reduction of staff; but the servants of the Company whose services were dispensed with would be compensated by the Primitiva Company. He should, in conclusion, like to read extracts from the opinion of Sir Francis Palmer:

It seems to me that the scheme will, if adopted, benefit all parties. It will unite and continue the undertakings of the three Companies into one strong concern, and so will minimize the cost of administration, avoid needless competition, and add largely to the security of all who are interested in the concerns.

First as to the shareholders in the New Gas Company. They will receive in respect of every £7 of shares in the New Gas Company £2 10s. in ordinary fully-paid-up shares of £5 each in the Primitiva Company, and £5 in cumulative fully-paid-up preference shares of £5 each in the Primitiva Company; and beyond this they will receive their proper proportion of the paid-up shares in the South Barracas (Buenos Ayres) Gas and Coke Company, Limited, which carries on a successful and promising business to the south of the River Riachuelo.

In addition to this, the shareholders in the New Gas Company will receive a dividend to the close of the current year at the same rate as they received for 1909, and what is more three of the Directors of the New Gas Company will join the Board of the Primitiva Company, thus securing continuity of action and experience.

The CHAIRMAN, replying to a shareholder, said the South Barracas Company was an entirely independent Company, owned hitherto by the Buenos Ayres Gas Company. Shares would now be distributed, as

soon as convenient, as South Barracas shares. The nominal value of the shares was £150,000; and they would be distributed *pro rata*, according to the holding of the shareholders in the Buenos Ayres Company. What it really amounted to was the distribution of the reserve fund in the Buenos Ayres Company. The business in the South Barracas district was a growing one, and the district was developing rapidly.

Moved by the CHAIRMAN, seconded by Mr. ROSS PINSENT, a resolution was passed in the same terms as the first one adopted at the meeting of the debenture holders.

Proposed by the CHAIRMAN, and seconded by Mr. NESHAM, other resolutions were passed providing for the voluntary winding up of the Company, appointing Mr. Frederick Charles Im Thurn and Mr. Ross Pinsent Liquidators for the purpose of the winding up, and authorizing them to carry into effect the provisional agreement. Finally, the shareholders approved of "the draft instrument or instruments submitted to this meeting, whereby the Primitiva Gas and Electric Lighting Company of Buenos Ayres, Limited, is to take the place of the Buenos Ayres (New) Gas Company, Limited, in regard to the debenture stock of the said Company, and is to pay the two outgoing Directors of the said Company £1000 each, and is to compensate those members of the Argentine Committee and other servants of the Company whose services are not continued, by way of compensation and in full satisfaction."

A vote of thanks was passed to the Chairman and Directors and the staff, on the motion of Mr. BOSHER, seconded by Mr. M'DOWELL.

The CHAIRMAN responded for all, and added that the Directors had always wished to see one united Company to serve the big city of Buenos Ayres, which had a population (he thought it was now) of 1,300,000. It must clearly be more advantageous to work with one Company than to have three Companies competing with each other all over the city.

River Plate Debenture Holders' Meeting.

Early in the afternoon, a meeting of the holders of the debenture stock in the River Plate Gas Company, Limited, was held under the chairmanship of Mr. A. E. BOWEN.

The CHAIRMAN, in his address, traversed the ground, at perhaps somewhat greater length, covered by the speech of Mr. Im Thurn at the debenture holders' meeting of the Buenos Ayres Company. He explained why it had become necessary to amalgamate the three Companies; and why the Board asked the debenture holders to release the floating charge on the assets of the Company—created by the deed of Nov. 3, 1897, and accept in lieu thereof a second floating charge on the assets of the combined Companies. As to the troubles with the Municipality, his recollection went back more than twenty years; and he thought it was quite that time since they first made an effort to come to terms with the Municipality. The climax was reached when the Municipality promulgated an ordinance, in 1908, fixing the selling price of gas at figures which would have meant, practically, the ruin of the Companies. It would have meant that it would have been impossible to earn any dividend for the ordinary stockholders; and, if the Directors had been compelled to accept the prices stipulated in the ordinance, he doubted very much whether they would have been able to pay even the debenture interest. This was, of course, a most serious state of things. The ordinance was to take effect on Jan. 1, 1908. But, after exhausting every possible argument, they succeeded in inducing the authorities to give them a little more time; and, finally, they agreed to make a reduction of 2 cents per cubic metre, as from Sept. 30, 1909, pending further negotiations with the Lord Mayor. It happened, however, fortunately for the Company, that the authorities were exceedingly anxious to get hold of the land upon which the Primitiva Gas Company's works stood. The Companies took advantage of this to formulate a definite contract with the Municipality. In order to be able to cede this land to the Municipality, the Primitiva Company had to arrange with the other two Gas Companies for the necessary supply of gas; and the best way of doing this seemed to be by the amalgamation of the three Companies, or really the purchase of the two Companies on terms with which those present were acquainted. The Chairman then read the letter from the Chairman and Managing-Director of the Trustees for the debenture holders, as quoted in the report of the proceedings at the meeting of the Buenos Ayres debenture holders. The opinion expressed in the letter had almost been borne out by the fact that since the proposals became known, the stock had gone up about three points. If the debenture holders agreed to the more advantageous proposal, their specific security on the properties of the Company would not be in any way affected; but they would lose their floating charge on the assets of the Company, and accept, in lieu, a floating charge on the assets of the combined Companies, subject only to the Primitiva Company's charge in favour of their debenture stockholders. The Primitiva debentures were, however, provided for out of the balance of the purchase-money of the electrical part of the property sold years ago to the German Electricity Company—a great corporation and one of undoubted responsibility. So, really and truly, the floating charge of their own debenture holders, and that of the Buenos Ayres (New) Gas Company's debenture holders, would be a first charge on the whole of the assets of the combined Companies. That this statement was correct was proved by the following letter, which had been received from the Solicitors of the Primitiva Company:

As arranged, we beg to state that the position of the Primitiva Company *vis-à-vis* the German Electricity Company is as follows: In the year 1903, negotiations for the disposal of the electrical portion of the Primitiva Company's undertaking to the German Company were completed; and an agreement between the two Companies, dated Aug. 12, 1903, was entered into. This agreement provided for the payment to the Primitiva Company, as the consideration for its electrical business, land, buildings, and electric installation, of 81 half-yearly payments—the first 80 of £15,000 each, and the last payment of £19,234; the payments being calculated to represent the principal sum of £600,000, with interest in the meanwhile on the amount unpaid at 4 per cent. per annum, with half-yearly rests. The whole of the money is paid into the joint account of the Primitiva Company and the Trustees for the holders of its debentures. The titles remain vested in the name of the Primitiva Company until the last payment has been made, but the

German Company has the right of entering into free use of the property, subject to an undertaking that it would not create any mortgage or charge until the last payment has been made. The German Company has also the option of paying off on any May 31 or Nov. 30 (on notice) so much of the £600,000 of principal moneys as may remain unpaid, together with interest at 4 per cent. per annum to date of payment, or any portion of such principal moneys, being not less than £10,000, such payments and advance being taken on account of the yearly sums payable at the end of the period, subject to an allowance for compound interest at the rate of 4 per cent. per annum with half-yearly rests, so as not to interfere with the regular half-yearly payments. The resolutions duly passed by the debenture holders of the Primitiva Company sanction the arrangement. The whole of the payments above-mentioned are applied or set aside for payment of principal and interest in respect of the debentures of the Primitiva until the whole are redeemed. The total authorized debentures were £60,000, of which £558,100 are now outstanding.

As the debenture holders knew, they were entitled under the trust deed to be paid off at 105 in case the Company were liquidated; but, if they insisted upon this, they would, of course, adopt the other alternative of keeping the Company alive. In order, however, to make the proposition more favourable, they had arranged with the Primitiva Company that there should be set aside a cumulative sinking fund of 1 per cent., to be applied to the purchase of the stock in the market, or by annual drawings at 105. The Directors had every confidence that this sinking fund would considerably improve the market value of the security.

On the motion of the CHAIRMAN, seconded by Mr. OGILVIE, all the necessary resolutions were unanimously passed. Deleting the portions referable to the South Barracas Company, altering the date of the deed to Nov. 3, 1897, the resolutions were in effect the same as those passed by the Buenos Ayres debenture holders, excepting sub-section *d* of the second resolution, which read:

(*d*) The Primitiva Company to be at liberty to create a floating charge on its undertaking (ranking *pari passu* with the floating charge to be given as above mentioned) to secure the £250,000 debenture stock of the Buenos Ayres (New) Gas Company, with a cumulative sinking fund of 1 per cent. per annum for redemption of the same.

A further resolution was passed, modifying certain sections of the deed of Nov. 3, 1897.

A cordial vote of thanks to the Chairman and Directors terminated the proceedings.

River Plate Shareholders' Meeting.

An Extraordinary General Meeting of the Shareholders in the River Plate Gas Company, Limited, was subsequently held, Mr. BOWEN again presiding.

The CHAIRMAN again went over the history of the troubles with the Municipality of Buenos Ayres, and of the proceedings leading up to amalgamation, in connection with which, he subsequently said, they were all very thankful indeed to their representatives in Buenos Ayres (Messrs. Woodgate, Gabarret and Rowbotham), for the immense amount of labour and skill they had given to the work. They also owed a great deal to the hard work and popularity of Mr. S. Hale Pearson, of the Primitiva Company, who, of course, was the immediate negotiator. The idea at the base of amalgamation was to give each Company, more or less, the same dividend that had been received—indeed, if the receipts kept up to their present level, of which there was little doubt—the shareholders should get a little more than they had had for the last few years. Before the amalgamation became known, the Company's shares stood at about £13 to £14, and they had since advanced to £16 or £17; so evidently the market thought that a good business had been done for the shareholders. He did not wish to say for one moment that the Company had obtained any undue advantage; but he thought he might safely say that the *ad referendum* deal they had made was an absolutely fair one for all parties concerned. The proposal was to give, for each £10 share, £10 in 5 per cent. cumulative preference shares of the Primitiva Company, and one £5 ordinary share. Some of the shareholders, no doubt, would ask why they, the largest of the three Companies, could not absorb the others. But their machinery would not allow of their benefiting the shareholders by increasing their nominal holding, and the Primitiva Company was the only one of the three which was in the position to make anything like a fair deal with the Municipality. He believed all would agree with him when he said that the River Plate Company had been a very successful one. He remembered, when he made the amalgamation of the Argentine Gas Company with the Belgrano Gas Company, in 1896, many people thought and said that the new Company—the present one—was over-capitalized. He knew that was not the case; and his opinion had been proved, by the results year after year, to be correct up to the hilt, and by the very favourable position in which they found themselves, for negotiating the business which the shareholders were now asked to approve. He said now, as he said in 1896, that, in his opinion, the new Company would not be over-capitalized; and given the same conditions which had obtained in the gas industry in Buenos Ayres during his long connection with it, he was certain the shareholders could look forward to the same prosperity and the same good dividends that they had enjoyed during the last twelve years. He was the largest holder of ordinary shares in the Company; and he always thought that what suited him must suit his constituents. He might add that he had not bought or sold a share of the Company for many years. The Directors would join the Board of the Primitiva Company; the Manager in Buenos Ayres would continue in the management of the combined Company; and, if he might refer to a personal matter, he would add that the Joint Board had done him the honour to ask him to be Chairman of the combination. Although he was very loth indeed to add to his responsibilities, he had felt it incumbent upon him to accept the invitation. The shareholders had all been very good to him during the thirteen years he had presided over the Company; and he felt he owed it to them to see that their interests were thoroughly protected—though, in any case, they would be by the new Board, even if he were not upon it. They had not yet fully decided which of the officers of the old Companies would be retained, and, of course, some of them would have to go, because, in order to cope with the reduced selling prices of gas stipulated for in the contract, everything possible to effect economies would

have to be done. There was no doubt these economies would be very considerable, as they would only have two works instead of the present four—it being their intention to suppress the Belgrano works. Any officers they had to dispense with would, of course, be properly compensated by the new Company. The contract was a definite and legal one; and it lasted for twenty years, which was about as long as they need look forward to.

The CHAIRMAN, replying to a question, said the contract entered into fixed the price of gas for twenty years.

On the proposition of the CHAIRMAN, seconded by Mr. OGILVIE, resolutions were passed approving of the provisional agreement made between the Company and the Primitiva Company for the sale of the Company's undertaking, subject to its debenture stock for shares in the Primitiva Company; agreeing to wind up the Company voluntarily; appointing Mr. A. E. Bowen and Mr. J. Murray Tulloch as Liquidators; and conferring upon them the necessary powers.

On the motion of Mr. H. E. JONES, a hearty vote of thanks was passed to the Chairman and Directors—the proposer, speaking from personal knowledge, bearing testimony to the arduous and anxious times through which the Board had been passing.

Meeting of the Primitiva Gas and Electric Lighting Company, Limited.

The last Meeting was an extraordinary one of the shareholders of the above Company—Mr. H. E. JONES presiding.

The CHAIRMAN, in the course of his remarks, said that those shareholders who had attended the annual meetings of the Company would be aware that for some long time past he had thrown out intimations that, from the point of view of the Primitiva Directors, the amalgamation of the interests of the three Gas Companies supplying Buenos Ayres was of the very first importance, and that his Board were anxious to, at any time, enter into negotiations for the purpose. The necessity for amalgamation became accentuated very much by the pressure put upon the Companies by the Municipality for reducing the price of gas. At one time this became so acute—that was, in 1906—that the Municipality actually suggested and passed an *ordenanza*, having the effect of reducing the price by such a large proportion that he was not exaggerating when he said that it would have resulted in great injury to the dividends. At that time, various propositions were considered, one of which he was glad to say now did not go through—that was, for the amortization of the shareholders' interests, and handing over to the Municipality the whole of the undertaking at the end of fifty years. Subsequently there came an opportunity for the negotiation of terms ending in the agreement now before the shareholders. He did not hesitate to tell the shareholders that these terms were very hard; but they were the best obtainable. The Company had never had the position of an English Gas Company as confirmed by Act of Parliament, or even of a Continental Company, as confirmed by a concession continuing (say) thirty or forty years under express conditions. They were trading in Buenos Ayres more or less as ordinary traders at their own risk, although they might have resisted in the High Courts any determination to carry out any *ordenanza* such as he had referred to. But it would have been costly and anxious litigation. The terms now made, hard as they were, could be met, and, he thought, met without injury to the shareholders' interests, if they could effect the economies that, on considering the matter, were easily appreciated. They had seen amalgamations of great gas companies in London, and the ensuing beneficial effects. In the negotiations that were carried on in Buenos Ayres, their Local Manager (Mr. Hale Pearson) was careful to make a point of the condition that the amalgamation should be adopted by the Municipality. How much they were indebted to Mr. Pearson he could hardly describe, because the negotiations had been going on now for two or three years. It so happened that their Company were able to accept a suggestion from the Municipality which eased the way to their getting the terms that had been secured, and even a modification in their favour to a very important extent. The Chairman then referred to the question of the site of the Company's works being required, as explained in the report of the proceedings at the meeting of the Buenos Ayres debenture holders. This, he remarked, put the Company in a better position for negotiating and making terms. He was bound to say that, as soon as the terms were ascertained, Mr. Bowen, the Chairman of the River Plate Company, in the frankest and fullest manner, expressed his view that the amalgamation was necessary for the safety and economy of the future supply. From Mr. Bowen's declaration in that way, the matter went forward very rapidly. Reference was next made by the Chairman to some of the difficulties, and to how they were composed. One of the factors that rendered amalgamation necessary was that, if the Company handed over their land, they would have to provide for the making of gas elsewhere; and within the period allotted, it was quite impossible to find a fresh site and erect upon it new works. So that the gas hitherto made at their works would in future be produced upon the spare land at the works now possessed by the other two Companies, and a large part of the plant at the Primitiva Company's Retiro works would be transferred to the works of the other Companies. Such was the progress now in Argentina, and such the sale of gas in Buenos Ayres, that they would have to make provision for the future. It would be seen in the scheme of capital that they were providing for an amount greater than was necessary for the shares of the two other Companies; but the excess money would only be spent as the demands for gas increased in Buenos Ayres, and so necessitated the expenditure. Looking at the amalgamation from the technical point of view of a gas engineer, he saw nothing but advantage in it. Before concluding, he praised the work of his colleague, Mr. Sanford (who is a large shareholder), and who had taken a prominent part in working out the financial side of the amalgamation scheme.

There was a little discussion of details of the scheme by Mr. Humphreys, to which the Chairman replied. One interesting matter alluded to was as to what the Company were to receive for the land they were surrendering. The Chairman replied that they got power to charge an additional 6d. per 1000 cubic feet of gas for twenty years as compensation. They considered this was sufficient compensation.

With regard to the reduction of the price of gas, that had been considerable. They used to charge 24 c. per metre, with a tax of 2 c. They were now going to charge 21 c., with a tax of 10 per cent., which was a little in their favour. Taking these figures together, it worked out that, whereas they used to get about 11s. per 1000 cubic feet, they would now receive rather less than 10s. net, after allowing for the tax. But they looked to obtaining an increase in business by the adoption of the use of gas in many directions.

Proposed by the CHAIRMAN, and seconded by Mr. W. W. PHIPPS, resolutions were passed to the following effect: (1) Confirming agreements. (2) Authorizing the Directors to give a floating charge upon the Company's undertaking (subject only to the existing charge securing £558,100 first debentures of the Company) in favour of the holders of £350,000 4 per cent. debenture stock of the River Plate Company, and £250,000 4 per cent. debenture stock of the Buenos Ayres Company, and to undertake the obligations of these Companies under the deeds securing their respective debenture stocks, and to provide a cumulative sinking fund of 1 per cent. per annum upon each of the amounts of £350,000 and £250,000 for the redemption of the debenture stocks at 105 per cent. and 102½ per cent. respectively, with power to apply the sinking fund by purchase in the market below such figures respectively.

A special resolution was—"That the capital of the Company be increased to £4,000,000 by the creation of an additional 340,000 5 per cent. cumulative preference shares of £5 each, ranking *pari passu* with the existing preference shares of the Company, except that such new shares shall not be entitled to participate in any dividend that may be declared in respect of the financial year of the Company ending Dec. 31, 1909, and 220,000 ordinary shares of £5 each, ranking *pari passu* with the existing ordinary shares of the Company, except that such new shares shall not be entitled to participate in any dividend that may be declared in respect of the financial year of the Company ending Dec. 31, 1909, and that the Board be authorized to issue the said shares or any of them upon such terms at such times and carrying dividends from such dates as the said agreements may require or as the Board may think fit."

Various alterations in the Articles of Association were also agreed to.

The CHAIRMAN later referred to the remarkable manner in which the stocks of the three Companies had appreciated since the rumour got afloat as to the amalgamation. The increase amounted to a considerable one all round—practically an increase of 20 per cent. on the three Companies. He thought this was very satisfactory.

On the motion of Mr. HUMPHREYS, a cordial vote of thanks was passed to the Chairman and the Directors.

BRITISH COALITE COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at Salisbury House, E.C., under the presidency of Sir W. H. PREECE, K.C.B., F.R.S., the Chairman. There was a very large attendance of proprietors.

The SECRETARY (Mr. A. Phillips) having read the notice convening the meeting, and the Auditors' report,

The CHAIRMAN addressed the shareholders at length. In the course of his speech, he said that the unpaid calls by Coalite Limited would be liquidated early next year. From the general expenditure and sundry receipts statement during experimental development and constructional period, it seemed as though a loss had been made on sales of coalite and bye-products. It was not, however, a profit and loss account; it was simply an expenditure for experimental and constructional purposes. In established industrial concerns, expenditure of this nature was usually met by a reserve account for experimental work. Owing to their distilleries not being in full working order, they had not been able to take credit for the real value of their tar; and until their arrangements were finally completed for the utilization of the gas made, they were prevented from crediting themselves with the full benefit to be derived from this bye-product. The position, if looked at fairly and dispassionately, was not unfavourable. They had spent £153,000 upon buildings and machinery, which had commenced to earn a living. The other assets in land and patent rights more than covered the commitments and responsibilities. They had plenty of cash in hand to complete their programme—and especially to carry out the work in hand at Barking, which would directly supply coalite to the Metropolitan area. They had £171,000 still due from calls in arrear; and they had not had to borrow one single penny.

POSITION AND PROSPECTS.

He would explain the present position and prospects of the Company. It was, of course, disappointing to appear before the shareholders with negative cash results; but theirs was a new industry, based on novel scientific principles, demanding considerable experiment and much practical detail—operations that occupied time and required great care and caution. Since the meeting a year ago, the continuous working of the process, and the accumulated experience thereby gained, had satisfied him and everyone on the Board that the Company were on absolutely safe ground, and that a great future awaited them, not only from a scientific, but also from a commercial, point of view. They had spent two busy years in developing their industry. They had made mistakes. It had not always been a clear course; but there had never been anything approaching disaster or exciting fear. No difficulty had arisen that had not been easily surmounted. The difficulties had been mechanical; and there had been none fundamental or disheartening. Their effect had been only delay. It would have been better on their part if they had not started four works simultaneously, before determining the standard patterns of stills, settings, conveyors, and furnaces, for it meant quadrupling the cost of improvements. This was one reason why they delayed the progress of the large works at Barking—a delay that was answerable for many wild conjectures in the minds of those who desired disaster. They had now turned the corner, and were about to enter the profit-making stage. The pioneer work always awaiting those who attempted to found a new industry had been accomplished. They had had to rely upon themselves for everything, and for every step in advance that had been taken. They might

say, without fear of contradiction, that they owed nothing to any other section of the industrial world for their advancement. This was what had had to be done: (1) To take in hand the erection and running of a large foundry for the manufacture of the patented coalite plant. (2) To erect tar-distilleries for the refining of the tar, and other bye-product plants. (3) To design and standardize every detail of plant, and to negotiate with existing gas-making concerns for its introduction into their works—since the Company could not supply their gas direct to the public in any area in which an existing gas company had statutory rights. These were a few of the pioneering labours which had faced the Board; and the work had entailed no small amount of worry for Directors and management alike. They had had to push their way to the front against tremendous odds; and though the energy of the staff had effected much, their work—strenuous as it had been—would have been entirely unavailing, were it not that it was based on scientifically and commercially solid ground. The Board had had the great satisfaction of finding their proposals and results verified to the letter by the leading Continental experts sent over to examine the process and figures. No one had found a flaw in the processes, nor expressed a doubt of the accuracy of the estimates. Dr. Knublauch, the leading expert on gas and tar in Germany, was sent over to inquire into the working, and everything was placed unreservedly at his disposal. He spent three weeks in Wednesfield, personally testing and examining everything; and his report was most satisfactory. It not only verified all their own conclusions, but it went "one better." It was not from coalite alone that they hoped to earn dividends. It was also from the rich tar—the richest tar ever produced—from which coaline (so valuable for motors), rubber solvents, tar acids for disinfectants and for wood preservation, bitumen of very high electrical qualities, and other valuable products, were derived. Sulphate of ammonia for fertilizing was also manufactured; and all these had valuable markets open to them.

ONE OF THE CHIEF ASSETS—GAS.

One of their chief assets, however, was gas, which could be, and was being, used by gas-works to augment the supply of their ordinary coal gas, and which they were using themselves in Wednesfield for power purposes. They could offer to supply gas companies with gas into their holders at 25 per cent. less than the price they could produce it themselves. It was very satisfactory to find that the gas interest—so inimical to the Company's birth—had recognized that there was something in the process, and were now looking more kindly on the proposals. The Board were at present negotiating with several very important companies in different parts of England for the erection of coalite plants. The coalite process in no way competed with the gas companies; but it was a very valuable auxiliary for enabling them to improve the value and quality of their gas, and to lower their prices. The satisfactory contracts made with the Gas Companies at Plymouth and at Hythe were being carried out. The plants in both places were giving steady returns. The gas was rich in illuminating power; and there was a great demand for coalite in both neighbourhoods—in fact, there was a large accumulation of orders. The tar produced was dealt with by the Coalite Company, and would in future be shipped to the central distillery at Barking for distillation. They would be able to produce at Barking sufficient gas to develop power, and hoped to supply local consumers with gas for the enrichment of their own gas. The Company would have a large power station erected, which would enable power to be supplied at a price cheaper than that charged anywhere in Europe. Niagara even could not touch them in price. There was thus an excellent market for the gas when converted into power. Within a month from now, they would be making about 1,000,000 cubic feet of gas per day at the Barking works alone, to be shortly increased to 3,000,000 cubic feet; and this gas could be treated in the same way as the gas at Wednesfield—converted, by means of huge gas-engines and dynamos, into electrical power. They had over 300 acres of freehold land at Barking available for their works—electro-chemical and mechanical—and they had a river frontage of a mile. Works could be erected on this land and receive either gas or power from the Company without any legislative restrictions. The process had a national and a hygienic value; for coalite was *par excellence* a smokeless fuel. As regarded the patents, they were in an impregnable position. Patents had been granted in 38 foreign countries and British Colonies and dependencies. Every foreign expert who had investigated the process acknowledged the essential novelty of the claims. Mr. Kitching, Sir A. Cory-Wright, and Mr. Pugh had retired from the Board, and Mr. Parker had joined it. He concluded by moving the adoption of the report and accounts.

Mr. THOMAS PARKER, J.P., seconded the resolution.

A VISIT TO WORKS.

Mr. JAGO said some months ago he made an application to the Company asking for permission to see some of the Company's works in progress. This was granted readily; and he had made a visit alone to Plymouth, and spent some considerable time inspecting the works of the Company there. He had also interviewed to his heart's content the Gas Manager and the authorities of the Company. He had seen the coalite plant in operation, working perfectly smoothly and regularly, and affording no difficulties whatever, but steadily supplying large quantities of gas of 20 or 21 candle power into the holders of the Gas Company. With regard to the coalite made by the Company, it was bought up at prices quite as high as the best coal, as soon as it was made. Indeed, it might have been disposed of several times over. So far as the tar was concerned, they were not handling it at Plymouth; and he understood that the tar question would be dealt with by the Company themselves at Barking. He had gone very carefully into the question of the terms on which the Plymouth Gas Company had the coalite plant erected; and it seemed to him that from the Gas Company's point of view only this was a bargain which would not fail to be of the utmost advantage. Bearing this fact in mind, one was mystified at not finding that an offer of this kind, made by a Company having a substantial backing, such as the Coalite Company had, had not been more widely considered and adopted by gas companies generally. It had also occurred to him that this was one way in which they as shareholders might do something very material in the way of improving the value of their own property. It was possible that many of them had

among managers of gas companies, boards of gas companies, and shareholders of gas companies, some personal friends ; and thus one way in which they might do yeoman service to the Company was by telling these friends that this offer was still open to all gas companies. By this means they might be assisting the British Coalite Company in finding an outlet for their gas. He had also taken an opportunity of visiting the works at Wednesfield. Here one saw coalite under totally different auspices. The parent Company had first of all established a foundry which was now turning out retorts and other appliances necessary for the manufacture of coalite and gas, all to a standard pattern. The coalite manufactured there was also sold as rapidly as it could be made. The tar was being worked into various residual products. What was of more particular interest to him was the question of the use of the gas which was being produced at Wednesfield. It was being used by the Company partly for the heating of their own furnaces ; the surplus was employed generating electrical power by the ordinary methods of gas-engines and dynamos.

QUESTIONS AND ANSWERS.

General MILLER asked why difficulty was experienced in making coalite, for which there appeared to be such a great demand. People who wanted a clean fuel were using carbo, because they were unable to get coalite.

Mr. BROOMHEAD said he had visited the works at Wednesfield. He went there prejudiced, but came away quite satisfied. He took many samples, and made many investigations and tests. He removed the samples to an independent laboratory in London ; and as the result of an article which he subsequently wrote, many of the large firms who used such bye-products were interested, and asked if they could see the coalite bye-products. He showed them to the chief chemists and managing-directors of several undertakings, who expressed the opinion that they had never seen bye-products of such superior quality. They mentioned the prices they were willing to give for them ; and these were much higher than those they were giving for the ordinary gas products. With the completion of the tar distillery at Barking, they would be in a position to supply the bye-products, and he believed that the Company would thereby realize enormous profits.

Mr. GIDEON wished to know why carbo was allowed to be made, if it was so much like coalite. Moreover, if carbo could be supplied, why could not coalite ?

Mr. JANAU said that after a fortnight's use of coalite, he came to the conclusion that unless he was compelled he would not burn coal again. He had experienced considerable difficulty in keeping to this resolve ; but he had done so by ordering his supply some weeks ahead of his requirements. There were several things which had pleased him in the use of coalite. It burned without smoke ; it did not give forth sulphur fumes ; it was light to carry, and cleanly to use. He had on two or three occasions, however, reported to the Secretary the stony character of the coalite supplied to him ; and he was glad to say that since then this defect had been to a great extent removed. He had one suggestion to offer—that the Directors should publish the relative heating power

of coalite, coal, and coke ; and in this connection he wished to inquire whether there had been any change in the heating power of coalite since it was first introduced.

Sir ANNESLEY DE RENZY said he had been using coalite for some years ; and so far from noticing any deterioration in its heating power, his impression was that it was as good to-day as ever. He could speak with entire approval of coalite. Some time ago he noticed the tendency to issue splinters ; but he was glad to say that this had practically disappeared within the last six or eight months.

Mr. RICHARDSON desired to know if a profit was being made at Plymouth.

Mr. DEWAR said he had visited Wednesfield and seen the plant at work ; and he came away impressed by the fact that there was a great future before coalite—given proper and economic handling.

The CHAIRMAN, in reply, said he was glad to hear the remarks made by Mr. Jago ; and he could not help wishing that many more shareholders would apply for permission to visit the works. They would thus gain a great deal of knowledge as to the proceedings of the Company, and the reasons for the delay which had taken place. Of their 3500 shareholders, not 1 per cent. had shown a personal interest in the active proceedings of the Company. The question of carbo had been raised, and the ease with which it could be obtained ; but this carbo was only sold by the largest Gas Company in the United Kingdom, who had spent millions of capital and were simply, with their existing plant, able to obtain something that was not very unlike coalite when burned as a fuel, but which was infinitely inferior. The Directors of the Company did not know what their fuel cost to produce. The Board were very glad that carbo was in the market. It was creating an appetite for smokeless fuel ; it was creating an appetite for something which the Company would be able to supply of a very much better quality. As to the difficulty of supplying coalite, it must not be forgotten that they had not done as others had done ; they had not spent their capital. As they saw little difficulties arising, they conserved their capital. But, as he had already stated, they had now turned the corner, and were commencing to pay. They were going on regardless of the attempt to rush them. They were going to do their duty ; and they were doing it with their eyes open. They knew what they were about, and were perfectly certain they would succeed. They were going ahead slowly, and were now turning out over 400 tons a day. They had demands for quite 4000 tons a day. With regard to the question of heating power, there was no doubt that there had been considerable variation in the quality of the coalite manufactured ; but this was due quite as much to the difference in the quality of the coal as to the difference in the mode of carbonizing it at the various works. They were gradually finding out all these defects. He was asked if they were making a profit at Plymouth ; but the fact was they had not yet made a profit and loss account in connection with any of the works.

The motion was then put, and carried with one dissentient.

The re-election of the retiring Directors and the Auditors, and a vote of thanks to the Chairman brought the proceedings to a close.

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PRESENTATION TO MR. T. PALIN, OF DONNINGTON.

A meeting of the staff and workmen of Messrs. C. & W. Walker, Limited, of Donnington, Salop, was held on the 17th inst., for the purpose of presenting an illuminated address and a purse of gold to Mr. Thomas Palin, on his retirement from the position of Works Manager. Mr. R. J. Milbourne, who presided, said they had met for the purpose of presenting an old friend and comrade with a small token of their esteem and regard. Mr. Palin entered the service of the firm in his early boyhood days, and had established a record of fifty-one years, which few of those present could hope to reach or surpass. During the whole of the time that Mr. Palin had been engaged at the Midland Iron-Works he had always been ready with a kind word and helping hand in any movement for the benefit of those who were associated with him in business. He was sure he expressed the wish of all present, as well as of all absent friends, that Mr. Palin might have very many years of health and happiness before him. He asked Mr. Hugh F. Wright to make the presentation. In complying with the request, Mr. Wright expressed his great pleasure in doing so. He said that, as one of the youngest members of the staff, he felt it an honour to speed the oldest member on his way to a well-earned rest after so lengthy and creditable a term of service with the firm. He hoped Mr. Palin would be spared many years, and that health and happiness would be his constant companions. On behalf of the subscribers, he had pleasure in presenting Mr. Palin with the address and purse of gold. The address was worded as follows:—

To Thomas Palin, Esq. Dear Sir,—On your retirement from the post of Works Manager, after a period of 51 years' faithful service, we, the undersigned, on behalf of the staff and workmen of C. and W. Walker, Limited, Donnington, Salop, desire to place on record our regret at your departure, and our appreciation of your ability and energy, which have contributed in no small degree to the growth and prosperity of the Midland Iron-Works. The impartial manner in which you have always discharged the duties of your office has commanded the respect of all who have worked with you. In asking your acceptance of the accompanying purse of gold, as a small token of our esteem and regard, we assure you that all who have had the pleasure of association with you in business earnestly hope that you may be blessed with long life, good health, and true happiness in the enjoyment of the rest that you have so well earned.—We are, Dear Sir, yours faithfully, Hugh F. Wright, B. Franks, J. Bachelor, W. Clarke, H. Teague, T. Mansell, W. Weaver, E. Howell, W. Pownall, W. Chaffer, R. J. Milbourne, J. Monk, J. Franks, R. Hill, C. S. Smith, J. Vaughan, William Jones, H. W. Tranter. Donnington, Salop, December, 1909.

The address was most beautifully illuminated, and mounted in an English gold frame. In responding, Mr. Palin thanked the donors one and all for their very generous and whole-hearted gift, and for the kind feeling that prompted it. The beautiful testimonial would enable him to recall the friends of his earlier days as well as the newer friends who had always stood by him in all matters connected with the pro-

sperty of the firm. Looking back to the time when he was invited by the previous owner of the Midland Iron-Works—Mr. C. C. Walker—to take command with the crude machinery they had in those days to work with, and the many devices they had to construct in order to do the different work, and compared them with the methods, tools, and machinery they now had at Donnington, it made him wonder how the work used to be got through. He was just 22 years of age when he was first appointed foreman at Donnington in the boiler shop, with a matter of fifty men and boys under him; and in a few years the number increased to 150. To say there was no uphill work then would be untrue; but by perseverance and hard work they managed to pull through. As time went on, by increasing and adding to the works, they were built up to the magnificent establishment they had to-day. During all this time he had the united assistance of the heads of all departments, as well as the whole of the workmen; and it was because of this that he felt the parting most. He could not forget to tender his thanks to the Directors for their generosity to him at the close of his career. In conclusion, he expressed his heartfelt gratitude to all for their self-sacrifice and good wishes. His chief desire was that the Midland Iron-Works might long continue to flourish and prosper, finding good employment for the many workmen there, and be a source of prosperity to all the surrounding neighbourhood. Three cheers were called for Mr. and Mrs. Palin, and given with musical honours.

Serious Charge against a Gas-Works Clerk.—George Hepworth, a young man until recently employed as accounting clerk at the gas-works of the Pontefract Corporation, for whose arrest on a charge of embezzlement a warrant was issued about a month ago, surrendered to the police at Pontefract on the 19th inst., and next day was brought before the Magistrates at the Town Hall. Mr. Harold Kaberry, the Assistant Town Clerk, asked for a remand for fourteen days—there not having been sufficient time since prisoner's arrest to complete the case against him. Mr. J. R. Green, on prisoner's behalf, asked for bail. He pointed out that prisoner had hitherto borne an excellent character, as did his father. The Bench ordered the remand, and agreed to accept bail—the accused in £25, with one surety of a like amount.

Incandescent Gas Lighting in Bloomsbury.—The Holborn Borough Council, at their meeting on Wednesday, adopted a report presented by the Works Committee with regard to the lighting of the new street from Torrington Square to Montague Place. The report set out that, owing to the great width of the street, it was necessary that the lamps should be more powerful and of a greater height than those in streets of the average width. The Committee had come to the conclusion that it was necessary to have the standards at least 16 feet high and about 65 feet apart. The total number required was 16; and the Committee proposed that 10 should have double and six single lanterns, so arranged that there should be a double lantern and a single lantern alternately, and double lanterns at the intersection of the side streets. Inverted incandescent burners will be fitted to the lamps.

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MUNICIPAL SUPERANNUATION.

A Suggested System.

At a Meeting of the Institution of Municipal Engineers held at Caxton Hall, Westminster, Mr. JOHN T. PEGGE, the City Engineer and Surveyor of Durham (and President of the Institution), read a paper on the subject of "Municipal Superannuation," of which the following are the main portions.

The passing of the Workmen's Compensation and Employers' Liability Acts has definitely affected the relationship between all authorities exercising powers of municipal government and their workpeople and officers alike; and, accordingly, most authorities have had to insure against the liabilities thrust upon them by these Acts. The conditions laid down are such that frauds may be practised by the employee or injustice done to the poorer worker by the authority, with the public purse behind it. At any rate, it seems to me that some extension of the above Acts is necessary by simplifying them and making them the basis of a system: (1) Of provision against sickness while in employment. (2) Of pension in cases of incapacitation while performing duty. (3) Of superannuation on attaining a certain age (being the completion of a life's duty, faithfully and well performed). (4) Of a bonus to dependants if life is cut short, due to performance of duty. This may seem a "tall order;" but by means of deductions from pay and a slightly lower wage at commencement, the cost to the rates need not be so serious as at first sight it seems—very probably not more than the premiums paid under the Acts already in force.

Of course, in any scheme provision should be made for an employee's continuance of service from one authority to another (with a minimum of service in each case counting for pension, as in the police force). This system would have to be national, with a registrar at headquarters to allocate to the various authorities their proportions under an all-round rate. A similar system works well with the police service; and the financial adjustments are by no means insuperable. The inauguration of a system of pensions should have some greater influence than that arising merely from the monetary point of view. A scheme such as would be most desirable would do away with a somewhat general custom where, after a man has served a ratepayer until overtaken by old age, he is quietly ousted by the younger and more vigorous man in the procession of life, and may then next be found in the ranks of municipal employees—being put there by the great influence always at work in local self-government. Still, it will be asked, as a matter of course, What do you want?

My suggested system is that the employee should begin at (say) twenty-one years of age and continue in municipal service until sixty-five years of age; and that all posts in the chosen branch of work should be open to the qualified and deserving, free from the trammels of Trade Unionism. This would ensure all employees being properly trained to their work; and as a consequence the ratepayers would gain

in effectiveness, and thereby in economy of work, the little extra they might (on paper) be called upon to pay.

The following is an outline scheme, which, no doubt, needs a financial expert to revise as to rates and terms; but the principle of the thing is what I suggest:—

- (a) Full-wage during certified illness up to sixty-five years.
- (b) Half-wage during life after sixty-five, unless previously retired.
- (c) Half-a-year's wages at death, paid to the legal dependants.

To provide this, take as a basis—other wages being *pro rata*. A man starting at twenty-one years old, paying 12½d. per week per pound of wage, would be entitled to the benefits named. Now, a deduction of 4 per cent., or 9½d. in the pound, from the weekly wages, and a contribution from the authority of 3½d. in the pound, or 1½ per cent., would be a fair allocation of the cost; and in considering this statement, the increments of salary occurring at intervals nearer the time of retirement would have to be taken into account. I would not be inclined to suggest the payment of pension except to those officials and workers solely and permanently engaged in the municipal services. I favour a scheme like the one suggested as being less of a tax on the ratepayers. Assuming that the average cost of all salaries and wages paid by local authorities, including all departments, be 3s. 6d. in the pound per annum, the increase would be barely equal to ¾d. in the pound rate beyond the present insurances. A system such as this would conduce to a very reasonable form of security of tenure, because a council would only then newly appoint men of twenty-one years or under, as, if they newly appointed a man of thirty-one years, the total contribution per pound of wage would be 1s. 6½d., or at (say) forty-one years, 2s. 5d.

We are not attempting any innovation, as the following cases will show: The police service is premiated (as should be all other public services with fixed rates of pay). Their system is a maximum and minimum one. The general and maximum one is on completion of fifteen but under twenty-one years' service, one fiftieth of the pay for every completed year; twenty-one to twenty-five years, two fiftieths of the pay for each year; and an addition of one twenty-fifth for every completed year above twenty years. If twenty-five years' service, further additions for every completed year—the pension not to exceed two-thirds of the last annual pay. The whole of this pension fund is provided by the rates. It is quite true that the police run serious risks, and have night duty to perform; but special conditions are laid down as to compensation in case of disablement, and pensions to widows and children if their breadwinners are killed while on duty. The Army pension after twenty-one years' service ranges in the ranks from sergeant-major at 2s. 6d. a day to a private at 1s. 1d.; and in paying what is apparently a labourer's wage of about £1 a week to a sergeant, it must not be lost sight of that to this has to be added clothing, housing, food, medical attendance, travelling expenses, &c., making this service fairly well pensioned after some eighteen years' work, for which no contribution is levied. Again, in the whole of the forty-one departments of the Government service, under the new rules, the pension is looked upon as deferred pay, and no contribution is levied. In system,

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it is simplicity itself. Each employee may retire at sixty, the higher officials at sixty-five, when one full year's pay is given on retirement, and half-pay continued till death. Many big municipalities have such a system, which has been approved by the Local Government Board. Of course, there are differences in *minutia*; and in most cases these apply only to corporation officers and chiefs of departments, and not to the workpeople. I do not think this is fair to the humbler and no less conscientious worker; but that, of course, is only a matter of opinion.

One system I will quote: Three per cent. of the salary or wages is to be deducted, and the interest thereof added *pro rata* to the credit of the officer contributing, who, after serving for twenty-five years, and being not less than sixty, shall be entitled to a pension equal to half-salary, with an additional two-fifteenths of his salary for each year after twenty-five years' service, but not to exceed two-thirds of his last year's salary. If he has served fifteen, and less than twenty-five, years, and has become incapacitated while in the performance of his duties, he shall be entitled to a pension of fifteen-fiftieths of his salary, with an added one-fiftieth of his salary up to twenty-five years, and over the twenty-five years shall be entitled to the full rates. In case of leaving or death before becoming entitled to a pension, the whole of the amount (*plus* interest) standing to his credit is returnable to him or his representatives; and even if he dies after having qualified for, and taken, a pension, if the sum paid does not total 75 per cent. of the amount to his credit, a money payment may be made to his widow or children. Of course, special powers are reserved to grant contributions to a lesser degree according to circumstances. Any deficiency in the fund is to be made good by the authority. This, of course, is a necessary provision; but I have not yet been able to get further details as to the rate necessary for the working of such a system.

By an Act of Parliament, 1896, it is provided that "every officer and servant of guardians of a union or parish (1) becoming permanently infirm, (2) attaining the age of sixty and having completed forty years' service, (3) or attaining the full age of sixty-five, shall be pensioned as follows: There must be a full ten years of service to qualify. This entitles him or her to ten-sixtieths of the average of the last five years' wages, with an addition of one-sixtieth of such average for every completed year until the completion of forty years' service, when a maximum allowance of two-thirds average salary or wages is granted.

In addition to the pensions granted to the afore-mentioned public employees, the great bankers and other high financial companies apply systems of pensions to their employees.

It was stated in the course of an inquest at Chester on the body of a woman who was found suffocated by gas, that the tap to the bracket was very loose; and it was quite possible that deceased, in turning the gas out, had turned the tap on again accidentally. At any rate, when the body was discovered the room was full of gas, and the tap was on, but not lighted.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, Dec. 23.

All supplies continue to be readily taken up as they become available, although the bulk of the buying is for the purpose of executing contracts made previously for December shipment, and new direct orders are rather scarce. There has been no further advance, but values are well maintained at £11 6s. 3d. to £11 7s. 6d. per ton f.o.b. Hull, and at £11 8s. 9d. to £11 10s. per ton f.o.b. Liverpool and Leith. For delivery in the first half of next year, another first-hand sale is reported at £11 10s. per ton f.o.b. Leith; but most makers refuse to trade at less than £11 12s. 6d. per ton, and buyers prefer waiting to paying the latter figure.

Nitrate of Soda.

The position of this article is unaltered; the tone of the market continuing quiet, but holders declining to reduce their price below 9s. 3d. per cwt. for 95 per cent. quality and 9s. 6d. for refined, on spot.

Tar Products.

LONDON, Dec. 24.

Owing to the holidays, business all round has been very quiet during the past week; and as many of the works will be closed a good part of next week, very little will probably be done until after the New Year. Pitch is still very firm, with a tendency to advance in price, and a fair disposition on the part of consumers on the Continent to meet the market. Creosote is quiet and prices low, although large quantities are still being shipped. Benzols are steady; and toluol is scarce. Solvent naphtha is in good demand, with makers unwilling to commit themselves further. Carbolic acid is weak; and crystals are very difficult to sell. Naphthalene is dull; but salts are in demand. Tar is fetching good prices in nearly all quarters.

The average values during the week were: Tar, 13s. 6d. to 17s. 6d., *ex* works. Pitch, London, 27s. 3d. to 27s. 9d.; east coast, 27s. to 27s. 6d.; west coast, 26s. 6d. to 27s. 6d. f.a.s., 27s. 6d. f.o.b. Benzol, 90 per cent., casks included, London, 6½d. to 7d.; North, 6d. to 6½d.; 50-90 per cent., casks included, London, 7½d.; North, 6½d. Toluol, casks included, London, 9½d. to 10d.; North, 9d. to 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3½d. to 4d.; solvent naphtha, casks included, London, 1s. 1d. to 1s. 1½d.; North, 1½d. to 1s.; heavy naphtha, casks included, London, 10½d. to 11½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2½d.; North, 2½d. to 2½d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east coast, 10½d.; west coast, 10½d. Refined naphthalene, £4 10s. to £8 10s.; salts, 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article has been very firm throughout the past week, with prices hardening all round; and some of the dealers appear

BEFORE FITTING ABNORMALLY WIDE FIRES



Test the efficiency of our

NEW FUEL

as fitted to our

"GAINSBOROUGH"
"WORCESTER," & "MALVERN"
FIRES.

This Fuel is a

DISTINCT DEPARTURE

from any other Fuel on the Market, and our Fires will give **BETTER RESULTS** than would be believed for their consumption. Do not take our word, but

LET US SEND YOU ONE TO TEST.

"GAINSBOROUGH" Fire. Price 24s. subject.

R. & A. MAIN, Ltd.,

Gothic Works, EDMONTON, LONDON, N., & Gothic Works, FALKIRK, N.B.

to be decidedly short for near delivery. In London, the principal Gas Companies quote £11 8s. 9d. to £11 10s. for prompt, and £11 12s. 6d. for January-June. In Hull, best makes have been sold at £11 7s. 6d.; and in Liverpool at the same figure. In Leith, £11 10s. is quoted for prompt, and £11 12s. 6d. to £11 15s. for forward; but for the former, the makers are practically out of the market.

COAL TRADE REPORTS.

Northern Coal Trade.

The Northern coal trade has been very active; but stormy weather has interfered with the regular arrival of some steamers, so that the shipments have been rather irregular. The steam coal trade has shown a little ease, partly on this account and partly because the uncertainty as to the working of the mines under the new Act has been removed by the agreement between the coalowners and miners. Best Northumbrian steams are now about 11s. per ton f.o.b., second-class steams about 10s., and steam smalls from 5s. 3d. to 6s. 6d. The output is now expected to be limited for a week or so. In the gas coal trade, the demand is at its fullest, and the shipments have so far been stimulated by a full production at the mines; so that the deliveries on the long contracts have been heavy. Prices have been very firm, more especially for forward delivery. For the usual classes the quotations have been from 9s. 6d. to 11s. 3d. per ton f.o.b.; and for "Wear specials" up to 11s. 9d. There have been few contracts placed this week; but in view of the additional cost through the lower production when the new Act comes into force in January, there is a decided inclination on the part of coalowners to ask advanced prices for forward sales of good gas coals. Coke is firm. Gas coke is in good demand; being quoted from 13s. to 13s. 6d. per ton f.o.b.

Scotch Coal Trade.

Trade is active, on account of an improved demand, which is at least partly attributable to the miners' holiday season being on, in consequence of the approach of which there was a disposition to stock fuel. The prices now quoted are: Ell, 10s. 6d. to 11s. 6d. per ton f.o.b. Glasgow, splint 10s. 9d. to 11s., and steam 9s. 3d. to 9s. 6d. The shipments for the week amounted to 311,161 tons—an increase of 26,375 tons upon the previous week, and of 12,787 tons upon the corresponding week of last year. For the year to date, the total shipments have been 14,917,154 tons—an increase of 675,111 tons upon the corresponding period.

POCKET-BOOKS, CALENDARS, &c.

Acknowledgement has to be made, as is usual at this period of the year, of various useful articles for the office and the pocket. There is a handsome pocket-book from the Gas-Meter Company, of Kingsland Road, N.E., containing a diary and removable self-opening pages for memoranda, and including a coupon for £1000 accident insurance. In the centre there are pockets for cards, stamps, &c.; and some pages of helpful information include tables giving prices and particulars of Croll's patent dry gas-meters and showing the price of gas per 1000 cubic feet at varying quantities per penny and shilling for prepayment meters. Messrs. Parkinson and W. & B. Cowan, of Cottage Lane, E.C., send a blotting pad with an engagement diary at the side; and Messrs. Thomas Cash and Co., of Birmingham, a rough notepaper pad for placing on the desk. A quarterly diary is to hand from Messrs. J. E. Williams and Co., Manchester; and wall calendars from the same firm and from Messrs. Joseph Taylor and Co., of Bolton, and Messrs. Bale and Church, of No. 5, Crooked Lane, E.C.

Illuminating Power of London Gas.—At the close of the notice issued by the Gaslight and Coke Company in regard to the reduction in price that will come into operation with the New Year, to which reference was made in the "JOURNAL" last week (p. 836), it is mentioned that the standard illuminating power of the gas supplied will in future be 14 candles. The standard is now the same all over London.

The British High-Power Gas-Engine Company, Limited, has been registered with a capital of £4000, in £1 shares, to purchase or otherwise acquire any interests in any patents, &c., conferring a right to use any invention in relation to the manufacture, treatment, or dealing with high-power gas-engines, and in particular to acquire from D. Neustadter designs for the manufacture of large gas-engines, &c.

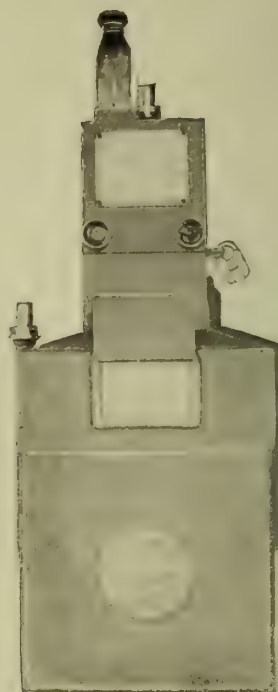
New South Wales Coal Strike and the Sydney Gas Supply.—It was mentioned in the paragraph on this subject in the "JOURNAL" last week (p. 830) that a threatened failure of the gas supply in North Sydney was averted by the Railway Companies furnishing a supply of coal to the North Shore Gas Company. Unfortunately it turned out to be unsuitable for making gas; and the result was that the district was in darkness on Monday night last week, to the great inconvenience of everybody. According to a telegram dispatched on Tuesday, a supply of coal from the Western district was expected in two days; and a telegram dated Thursday brought the news that the supply of gas had been resumed.

Inadequate Electric Street Lighting at Hastings.—An inquiry was held at Hastings, on Monday last week, into the circumstances attending the death of Mr. John Thomas Bray, which occurred as the result of being thrown from a cab when driving down the Linton Road. A verdict of "Accidental death" was returned; but the occurrence gave rise to some correspondence in the local paper. It appears that there were some mounds of stone in the road; and though these were not actually the cause of the trouble, a writer points out that the danger arising from their presence has recently been made worse by the taking away of the old incandescent gas-lamps, which "gave a respectable light," and substituting an electric lamp that gives "just about half the amount of illumination formerly given by the gas." He adds that this is a state of things that the Corporation ought not to allow to remain any longer.

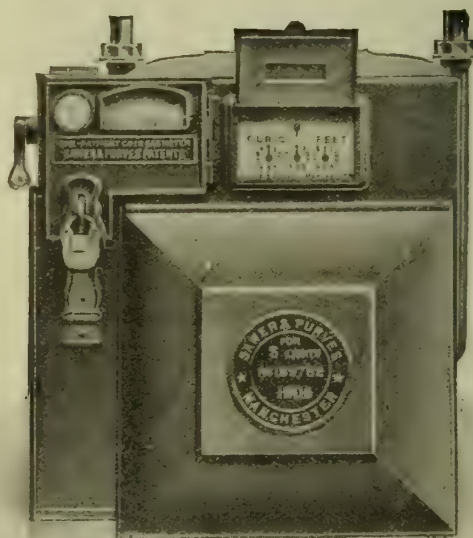
ALWAYS FIRST

THE

"POSITIVE" PREPAYMENT METER.



FIRST 20 YEARS AGO.



FOREMOST TO-DAY.

SAWER & PURVES, MANCHESTER & NOTTINGHAM.

Agent for Scotland: J. D. GIBSON, 2, Causeyside St., PAISLEY.

Alleged Falsification of Time-Sheets.

At the East Ham Police Court last Thursday, Alfred Carter, 38, a clerk, of 22, Gillett Avenue, East Ham, was charged, on a warrant, with wilfully making false entries in the books of the Gaslight and Coke Company, with intent to defraud. Mr. R. Humphreys, who prosecuted, said the allegation against the prisoner was that he put wrong times on the time-sheets, and men were paid too much money. Afterwards he went to the men and obtained the cash from them. Detective-sergeant Ball gave evidence of the arrest, saying that when he told Carter he would have to go to the police-station he said, "All right;" and when charged he made no reply. On this evidence a remand was ordered, and Mr. Humphreys said he did not oppose bail, as the prisoner had worked a number of years for the Company, and he had known of these proceedings for the past five weeks. Bail was allowed.

Quality of Coventry Gas.—It was decided by the Coventry Town Council, at their last meeting, to agree to the proposal of the Gas Committee to obtain expert opinion as to the prevalence of so much sulphur in the gas. Attention was also called to the need of some improvement in the illuminating power; and the Committee and Gas Engineer are to look into the matter.

The Quality of Truro Water Supply.—A report on the subject of the water supply was submitted by the Sanitary Committee to the Truro City Council at their last meeting. Samples of the water had been forwarded to the Chemical Research Association, whose report on the analysis was accompanied with the remark that the results were only moderately satisfactory, and an expression of the opinion that more efficient filtration is necessary. The Mayor (Mr. T. H. Beard) suggested that the report should be forwarded to the Water Company, with a request that they should make provision to supply the city with pure water. Mr. Crews thought there ought to be no suggestion that the Company were supplying impure water. They were doing their best to give a satisfactory article. The Mayor replied that the Council had to consider the health of the city. It was decided to communicate with the Company.

Thefts from Morecambe Gas-Works.—At the Lancaster County Police Court, a few days ago, Fred Coleman, a painter and gas-fitter, was charged on remand with stealing a large quantity of brass fittings, gas-mantles, lead, copper, &c., value £18 13s. 4d., the property of the Morecambe Corporation, between Oct. 20 and Dec. 10. Mr. E. G. Clark, on behalf of the prisoner, said he had hitherto borne an excellent character. He had returned all the articles, and was under the impression that he would be given another chance. He asked the Bench to deal with the prisoner under the First Offenders Act. This, however, they declined to do. The Chairman said men working for corporations had temptations; and for the sake of others they could not give the prisoner the benefit of the Act. There might have been an excuse if he had been one of the poor unemployed; but for a man receiving regular wages, there was nothing to excuse. He would have to go to prison for six weeks, with hard labour.

Increased Storage at Buckhaven.—On Thursday of last week there was inaugurated a new gasholder and other plant introduced by the Buckhaven Gas Company. Bailie Gillespie presided, and in the course of the evening was presented by the Contractors with a souvenir rose bowl; Mr. Barker making the presentation. Bailie Gillespie, in reply, referred to the developments in the Company since he joined the Board; the consumption being now nearly ten times what it was then.

Water Supply of Instow.—It was reported at the last meeting of the Barnstaple Rural District Council that the Instow Parish Council had considered the two schemes for the supply of water to the parish, and were of opinion that the one proposed by the Barnstaple Water Company was the most feasible and satisfactory. The Chairman (Mr. G. C. Davie) said one advantage of the scheme was that it took in the parish of Fremington, and would provide for a supply of water in future to that district. Mr. Buckingham feared the scheme would be very expensive, and would impose a heavy burden on the people of Instow. It was decided to send the scheme to the Local Government Board.

Shop Fire Through Gas at Herne Bay.—Owing to the globe of a gas-bracket being smashed, the Christmas decorations in the window of Messrs. Skinner and Sons, drapers, William Street, Herne Bay, were ignited last Thursday night; and in an instant the whole of the contents of the window were on fire. The assistants had to run for their lives, and the wife of the proprietor and some of the young ladies were rescued by a ladder from a window at the rear, while three children, who were ill, were removed from the building only just in time. The brigade with their steamer were soon at work, and the position was sufficiently serious for assistance to be summoned from Whitstable. After some hours of hard work on the part of both brigades, the progress of the flames was checked; but the extensive premises were completely destroyed.

Value of the Land for the Carlisle Water Scheme.—Some weeks ago, Sir Benjamin Scott, the Chairman of the Water Committee of the Carlisle Corporation, made the statement that Lord Carlisle claimed £33,000 for land for the Geltsdale scheme valued at £3000 by the Corporation's valuers, and that this was an instance of the need for legislation such as was proposed in the Budget. Lord Carlisle, replying through the Press, said that, in talking of "a small piece of moorland" Sir Benjamin was misstating the Corporation's claim. At the meeting of the Town Council last Tuesday, Sir Benjamin said the land acquired was a little more than 5 acres in Geltsdale, and a little more than 1 acre at the end of Castlecarrock reservoir, together with 7359 yards of underground pipe easement, 15 manhole air-valves, 3 scours, and 15 posts to indicate the line of underground telephone. The Council could judge whether the ground was moorland. He denied that Lord Carlisle offered to settle the claim for £10,000; his agent asked £15,000. The Corporation offered £5000, and Lord Carlisle then asked £15,000, with conditions which the Corporation could not accept. Lord Carlisle was begging the question when he said he did not claim £30,000; his principal witness at the arbitration claimed for £32,797, of which upwards of £22,000 was for water. The Arbitrator awarded £18,738. The Corporation sought to contest the award; but it was confirmed.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 872.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Oct 4	10	Alliance & Dublin 10 p.c.	17-17½	..	5 14 3	195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
298,955	10	"	7	Do. 7 p.c.	11½-12½	..	5 14 3	561,000	Stk.	"	10	Liverpool United A.	223-225	..	4 8 11
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	718,100	"	"	7	Do. B	166-168	..	4 3 4
200,000	5	Oct. 28	6½	Bombay, Ltd.	5½-6	..	5 8 4	306,083	"	June 25	4	Do. Deb. Stk.	104-106	..	3 15 6
40,000	5	"	6½	Do. New, £4 paid.	48-48½	..	5 6 8	75,000	5	Nov. 26	6	Malta & Mediterranean.	4½-5	..	6 8 8
50,000	13	Aug. 26	5	Bourne- 10 p.c.	28-28½	..	5 5 3	560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	99-102	..	4 18 0
311,810	13	"	7	mouth Gas B 7 p.c.	16½-17	..	4 3 7	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
75,000	10	"	6	and Water 4 p.c. Pref. 6 p.c.	15½-15¾	..	3 16 2	541,920	20	Nov. 11	3½	Monte Video, Ltd.	12½-13	..	5 7 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	253-256	..	4 17 8	1,775,892	Stk.	July 29	4½	Newcastle & Gt. Tesh'd Con	106-108	..	4 3 4
300,000	"	"	5½	Do. New	189-191	..	4 19 6	518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	93-94	..	3 14 6
50,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13-13½	..	5 3 8
206,250	"	June 11	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	309,000	Stk.	Nov. 26	8	Oriental, Ltd.	137-139	..	5 15 1
220,000	Stk.	Sep. 10	1	Brighton & Hove Orig.	217-20	..	5 0 0	60,000	5	Sep. 10	8	Ottoman, Ltd.	6½-8	..	5 5 6
246,320	"	"	8	Do. A Ord. Stk.	153-156	+3½	5 2 7	31,800	53	Aug. 26	13	Portsea Island A.	137-139	..	4 19 0
460,000	20	Oct. 14	10	British	42½-43½	..	4 11 11	60,000	50	"	13	Do. B.	129-131	..	4 19 3
109,000	Stk.	Aug. 26	15	Bromley, A 5 p.c.	118-120	..	5 0 0	100,000	50	"	12	Do. C.	120-125	..	4 17 7
165,700	"	"	4½	Do. B 3½ p.c.	88-90	..	5 0 0	114,800	50	"	10	Do. D and E.	101-103	..	4 7 1
82,278	"	"	5½	Do. C 5 p.c.	106-108	..	5 1 10	398,490	5	Oct. 28	7	Primitiva Ord.	7-7½	..	4 16 7
55,000	"	June 25	3½	Do. 3½ p.c. Deb.	88-90	..	3 17 9	796,980	5	July 29	5	Do. 5 p.c. Pref.	58-60	..	4 13 0
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	14-14½	..	4 16 7	488,903	100	Dec. 1	4	Do. 4 p.c. Deb.	97-99	..	4 0 10
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	99-101	..	3 19 3	1,000,000	10	Oct. 14	8	River Plate Ord.	17-17½	+½	4 11 5
100,000	10	"	—	Cape Town & Dis., Ltd.	3-4	..	—	312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	10-102	..	3 18 5
100,000	10	"	—	Do. 4½ p.c. Pref.	52-52½	..	—	250,000	10	Sep. 29	8	San Paulo, Ltd.	14½-15	..	5 6 8
50,000	50	Nov. 2	8	Do. 6 p.c. 1st Mort.	47½-48½	..	6 3 9	62,500	10	"	6	Do. 6 p.c. Pref.	11½-12½	..	4 18 0
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82-84	..	5 7 2	125,000	50	July 1	5	Do. 5 p.c. Deb.	51-52	..	4 16 2
157 150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	108½-110½	..	4 10 6	135,000	Stk.	Sep. 10	10	Sheffield A.	233-235	..	4 5 1
1,493,280	Stk.	Aug. 26	5½	Commercial 4 p.c. Stk.	109-111	..	4 13 8	209,984	"	"	10	Do. B.	235-235	..	4 5 1
560,000	"	"	5	Do. 3½ p.c. do.	103-105	..	4 15 3	523,500	"	"	10	Do. C.	235-235	..	4 5 1
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	70,000	10	Oct. 14	10	South African.	12½-12½	..	7 16 11
800,000	Stk.	Dec. 10	5	Continental Union, Ltd.	95-97	..	5 3 1	6,429,895	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	119-121	..	4 8 1
200,000	"	"	7	Do. 7 p.c. Pref.	137-139	..	5 11 9	1,895,445	Stk.	July 14	3	Do. 3 p.c. Deb.	82-84	..	3 11 5
492,270	Stk.	"	5	Derby Con. Stk.	121-123	..	4 1 4	209,823	Stk.	Aug. 26	8	South Shields Con. Stk.	160-162	..	4 18 9
55,000	"	Oct. 2	5	Do. Deb. Stk.	103-105	..	3 16 2	605,000	Stk.	Aug. 12	5½	Sth Suburb'n Ord. 5 p.c.	119-121	..	4 10 11
448,995	"	July 14	12	East Hull 5 p.c. Ord.	97-99	..	5 1 0	60,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
48,090	10	"	12	European, Ltd.	24½-25	..	4 16 0	117,058	Stk.	July 14	5	Do. 5 p.c. Deb. Stk.	122-124	..	4 0 8
354,060	10	"	12	Do. £7 res. paid.	18-19	..	4 14 0	109,111	Stk.	Nov. 11	5	Southampton Ord.	109-111	..	4 10 1
15,141,545	Stk.	Aug. 12	4½	Gas 4 p.c. Ord.	103-104	+½	4 9 8	120,000	Stk.	Aug. 12	6½	Tottenham A 5 p.c.	133-135	..	5 1 9
2,600,000	"	"	3½	light 3½ p.c. max.	87-89	..	3 18 8	453,940	"	"	5½	and B 3½ p.c.	111-113	..	4 15 3
3,799,735	"	"	4	and 4 p.c. Con. Pref.	103-105	..	3 16 2	149,470	"	June 25	4	Edmonton 4 p.c. Deb.	100-102	..	3 18 5
4,193,975	"	June 11	3	Coke 4 p.c. Con. Deb.	82-84	..	3 11 5	182,380	10	June 11	8	Tuscan, Ltd.	9-9½	..	8 8 6
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	92-94	..	5 6 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	10-102	..	4 18 8
88,500	"	"	6½	Do. do. 5 p.c.	117-119	..	5 9 3	236,476	Stk.	Aug. 14	5	Tyne mouth, 5 p.c. max.	110-112	..	4 18 3
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	17½-18	..	6 2 3	256,616	Stk.	Aug. 26	6½	Wands- B 3½ p.c.	159-161	..	4 14 0
131,070	Stk.	Sep. 10	6½	Ilford A and C	144-146	..	4 9 0	79,416	"	June 25	3	worth 3 p.c. Deb. Stk.	73-75	..	4 0 0
65,780	"	"	5	Do. B	108-110	..	4 10 11	895,872	"	Aug. 12	5½	West Ham 5 p.c. Ord.	—	..	—
65,500	"	June 25	4	Do. 4 p.c. Deb.	102-104	..	3 16 11	210,000	"	"	5	Do. 5 p.c. Pref.	—	..	—
4,940,000	Stk.	Nov. 11	8	Imperial Continental	175-177	..	4 10 5	253,300	"	June 25	4	Do. 4 p.c. Deb. Stk.	—	..	—
1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	94-96	..	3 12 11								

Prices marked * are "Ex div."

Complaint was made at the last meeting of the Redruth Urban District Council of the unsatisfactory lighting of the main streets; and the Clerk was instructed to arrange for an interview between representatives of the Council and of the Urban Electric Supply Company. The Chairman of the Council (Mr. Trestall) said the system of lighting was entirely wrong, and ought to be altered.

The members of the Gas Committee of the Brighthouse Town Council, having considered the wages of several of the grades of workmen employed at the gas-works, recommended that the retort-house men be paid time-and-a-half for Sunday labour, and that in response to the application of the yardmen their request for an advance be met by increasing their wages from 23s. to 24s. per week.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ASSISTANT FOR DESIGNING AND COMPILING CATALOGUES, &c. No. 5166.

GAS ENGINEER AND MANAGER. Colwyn Bay and Colwyn Urban District Council. Applications by Jan. 10.

GAS TESTER. No. 5167.

Situation Wanted.

IN LARGE FIRM OR GAS-WORKS (DESIGNING APPARATUS, &c.). No. 5168.

Financial Assistance Wanted.

INVENTION RELATING TO THE GAS INDUSTRY. No. 5164.

TENDERS FOR

Meters.

CLACTON URBAN DISTRICT COUNCIL. Tenders by Jan. 12.

Fire-Clay Goods.

BURY CORPORATION. Tenders by Jan. 8.

Tar.

HARWICH GAS AND COKE COMPANY. Tenders by Jan. 10.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

Subscribers who desire to avail themselves of the reduction in the Subscription by paying in advance for the Year 1910, are reminded that this can only be done during January.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

LUX'S GAS PURIFYING MASS.

See Advertisement on p. 910.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEEDS.
Correspondence invited.

KRAMERS AND AARTS WATER-GAS PLANT.

K. & A. WATER-GAS COMPANY, LTD.

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GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

METER INDICES

WITH AND WITHOUT DIALS.

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MOVEMENTS FOR CLOCKS, PHOTOMETERS AND BAROGRAPHS, WHEELS, PINIONS, AND WORMS.
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AMMONIACAL Liquor wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers.
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J. & J. BRADDOCK (Branch of Meters

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WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.

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OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

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BENZOL

CARBURINE FOR GAS ENRICHING.

ALSO

THE MAXIM PATENT CARBURETTOR.

For Prices, &c., apply to

THE GAS LIGHTING IMPROVEMENT CO., LTD.,
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FOR REALLY RELIABLE

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HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.

Gives no back Pressure.

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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.

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SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.

We guarantee promptness, with efficiency for Repairs.

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"GAZINE" (Registered in England and

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The one Machine which Discharges and Charges
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Advertiser, who is Shipping Agent to several Gas
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would be glad to undertake SHIPMENT OF GOODS
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40 YEARS' REPUTATION.

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Represent the Strongest Independent Re-
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Apply to **HENRY ELLISON, LIMITED,** Cleckheaton,
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THE G. J. EVESON Coal and Coke Com-
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receive OFFERS of GAS COKE free into Trucks on
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for Disposal.

GAS Manager, having Patented a good
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Sell Readily, Requires FINANCIAL ASSISTANCE
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ADVERTISER, a thorough Practical
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A Good Organizer and used to the control of a large
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BAY AND COLWYN.

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THE above Council invite Applications
for the Position of GAS ENGINEER AND
MANAGER.

Candidates must possess Engineering Qualifications,
and be thoroughly Conversant with the Manufacture
and Distribution of Gas in all its Branches.

The person Appointed will be required to devote the
Whole of his Time to the Duties.

The Salary will be £250 per Annum.
The make of Gas for the past Year was 72,400,000
Cubic Feet.

Applications, stating Age and Experience, must be
accompanied by copies of not more than Three Recent
Testimonials, and be delivered to the undersigned, en-
dorsed "Gas Manager," not later than Twelve o'clock
at Noon on Monday, the 10th day of January, 1910.

Canvassing in any form will disqualify.

By order,

JAMES AMPHLETT,
Clerk to the Council.

Council Offices,
Colwyn Bay, Dec. 21, 1909.

CAST-IRON Pipes. Spigot and Socket
or Flanged. Special Quality—9 feet or 12 feet
Lengths. When buying, Write us.
A. LOWCOCK, Limited, SHREWSBURY.

GASHOLDERS—Splendid, 45 feet dia-
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to Plan and Specification. Also 50 feet Single Lift
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Can be seen temporarily erected.
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MANUFACTURERS.

THE Corporation of Bury are prepared
to receive TENDERS for RETORTS, FIRE-
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Works.

Forms of Tender may be obtained from Mr. H. Sim-
monds, Engineer and Manager, Gas-Works, Bury.
Sealed Tenders to be sent to the TOWN CLERK, BURY,
not later than Saturday, Jan. 8, 1910.

HARWICH GAS AND COKE COMPANY.

TENDERS are invited for the Surplus
TAR produced at this Company's Works for the
Year ending Dec. 31, 1910.

The Tar will be delivered Free into Railway Tank-
Wagons or Tank-Barges at this Works.

Probable Quantity, 120 Tons.

The Directors do not bind themselves to accept the
highest or any Tender.

Sealed Tenders to be delivered addressed to me not
later than the 10th day of January, 1910.

GEO. BAINES,
Secretary.

CLACTON URBAN DISTRICT COUNCIL.

GAS-METERS.

THE above Council are prepared to re-
ceive TENDERS for the Supply of Prepayment
and Ordinary Dry GAS-METERS.

Full Particulars and Form of Tender may be obtained
from Mr. Sydney Francis, A.M.I.M.E., the Council's
Engineer, Town Hall, Clacton-on-Sea.

Tenders, Sealed and Endorsed "Tender for Meters,"
to be delivered to the undersigned not later than
Twelve o'clock noon on Wednesday, the 12th day of
January, 1910.

The Council do not bind themselves to accept the
lowest or any Tender.

GEO. T. LEWIS,
Clerk to the Council.

Town Hall Buildings,
Clacton-on-Sea, Dec. 20, 1909.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the

TRANSFER BOOKS of this Company, so far
as they relate TO CAPITAL STOCKS, WILL BE
CLOSED at Four o'clock p.m., on Tuesday, the 4th
day of January next, and WILL BE RE-OPENED
immediately after the HALF-YEARLY ORDINARY
GENERAL MEETING of the Company to be held on
Friday, the 4th day of February next.

By order,
HENRY RAYNER,
Secretary.

Chief Office: Horseferry Road,
Westminster, S.W., Dec. 22, 1909.

SALES BY AUCTION OF GAS AND WATER
STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to
notify that their SALES BY AUCTION OF NEW
CAPITAL ISSUED UNDER PARLIAMENTARY
POWERS, and of STOCKS and SHARES belonging to
EXECUTORS and other PRIVATE OWNERS in LON-
DON, SUBURBAN, and PROVINCIAL GAS and
WATER COMPANIES, take place PERIODICALLY
at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including
other Gas and Water Stocks and Shares in these Periodi-
cal Sales, will be forwarded on Application to Messrs.
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INCLINED CHAMBERS.

Sole Agents and Licensees for Great Britain
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The Coke Ovens & By-Products Co.,
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MIRFIELD GAS COAL.
UNEQUALLED.

Sperm Value 878·85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

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FURNACE & BLAST-FURNACE BRICKS, LUMPS,
TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative
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SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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HEATHCOTE GAS COAL
from the

GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality
of Coke.

Maintains a High Standard in Residuals.

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STOURBRIDGE,
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FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED
FOR SHIPMENT.

THOMAS TURTON
AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
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NOW READY.

Price, Bound in Cloth, 5s. 6d., Post Free.

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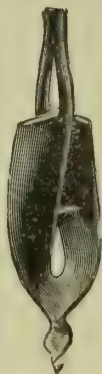
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NEW EARTH BORERS.

15 Patents. Highest Awards.

Work easily and quickly. Reliable.

For Earth-Working, Boring, Soil-
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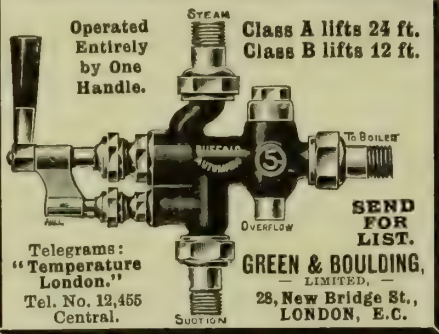
Borers from 60 to 400 mm. (2½ in.
to 16 in.) diameter.

Great Saving of Labour. Low Prices

Catalogue Gratis.

E. JASMIN,
Hamburg 30, Lehmweg 30.

'BUFFALO' INJECTOR



NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

THOMAS DUXBURY & CO.,

16, DEANS GATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illu-
minating Power, Large Yield per ton, and
reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."

Telephone 1806.

* **BRASS AND STEEL**

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any lengths.

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Rawfolds Wire Mills,
CLECKHEATON.

Head Office & Works:

Adelphi Wire Mills,
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Also IRON and STEEL WIRE of all descriptions.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

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Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works
(also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches
in diameter, and make and erect to order
RETORTS, PURIFIERS, and TANKS, with
or without planed joints, COLUMNS,
GIRDERS, SPECIAL CASTINGS, &c., re-
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Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS.
These are cast in one piece, without Chap-
lets; doing away with Bolts, Nuts, and Covers,
and rendering Leakage impossible.

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Gas Purifying Material

is now used in many Gas-
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Telegrams: "GASLUX, EDINBURGH"

Descriptive Pamphlet on Application.

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ARTESIAN BORED TUBE WELLS,

Norton's Patent "Abyssinian" Tube Wells.
Deep Well Pumps and Patent Air Lift Pumps.

LE GRAND & SUTCLIFF,

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PATENT
"FLUXITE"
FIRE
CEMENT

For
STOPPING CRACKS
IN GAS RETORTS.

Makers: JOHN E. WILLIAMS & CO., Lower Moss Lane, MANCHESTER, S.W.

S. S. STOTT & CO.,

ENGINEERS,

HASLINGDEN, nr. MANCHESTER.

LIME & OXIDE ELEVATORS & CONVEYORS.

COAL AND COKE STORAGE PLANTS.

Coal and Coke Elevators and Conveyors.

STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.

DETACHABLE CHAINS AND SPROCKET WHEELS.

HIGH-CLASS STEAM ENGINES. BEAM PUMPING-ENGINES, &c.

GRAETZIN LIGHT

Important Improvements.



BURNERS.

- 1. 20-Candle Power more light without increase in the consumption of gas.
- 2. Patent Gas Adjuster; cannot get out of order.
- 3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
- 4. Accurate Regulation of the Air Supply.
- 5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
- 6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

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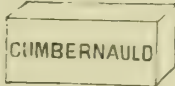
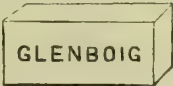
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

THE GLENBOIG UNION FIRE-CLAY CO., LTD.

GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

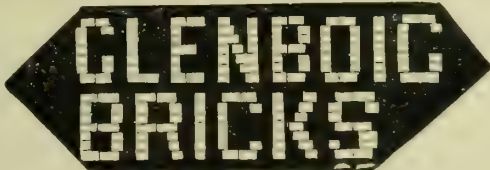
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MARKS.



The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.
The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

GAS-RETORTS, FIRE-BRICKS,
BLOCKS, &c., &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.



Works: GLENBOIG, LANARKSHIRE.
Offices: 48, West Regent St., Glasgow.

56 Prize Medals and Diplomas of Honour.

Highest Award wherever exhibited.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undertaken we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.
THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET, LONDON, E.C., September 21st, 1909.

DEAR SIR,
I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3.03	3.49
Silica, combined	43.20	49.77
Alumina	36.55	42.10
Ferric oxide	1.80	2.08
Titanic oxide	1.30	1.50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0.92	1.06
Loss on Ignition	13.20	—
	100.00	100.00

PHYSICAL RESULTS.

Density	2.65
Volume weight	1.90
Porosity	15.4%
Linear shrinkage at 100° C.	3.70%
" " " 1050° C.	4.76%
" " " Total	8.46%
Volume shrinkage at 100° C.	10.7%
" " " 1050° C.	12.6%
" " " Total	23.3%
Plasticity	20.0%
Fire Stability	1850° C. equiv. to 3362° F.

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,
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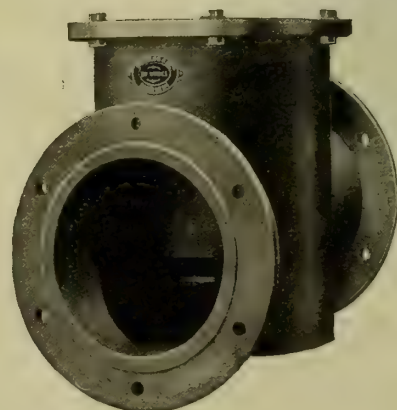
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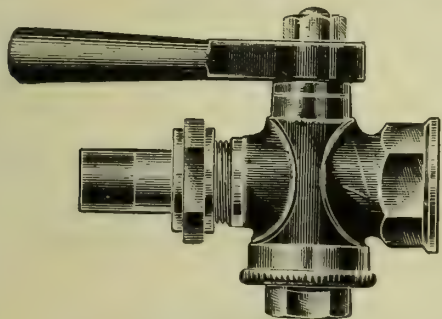
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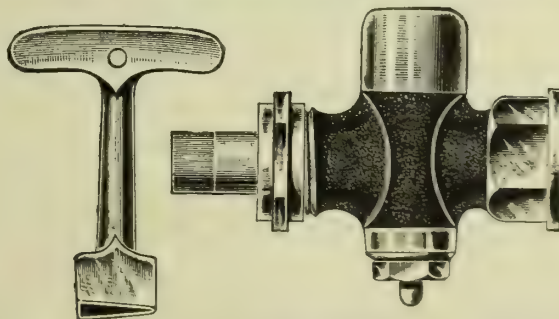
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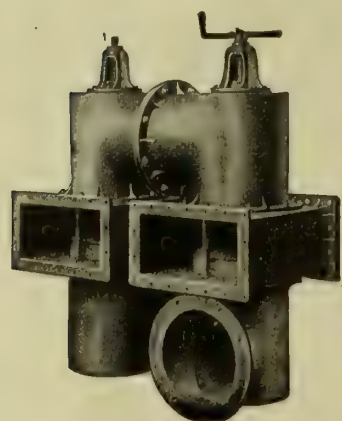
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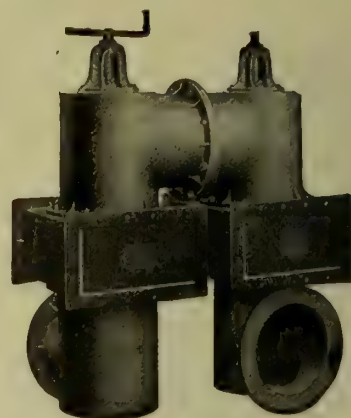
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Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

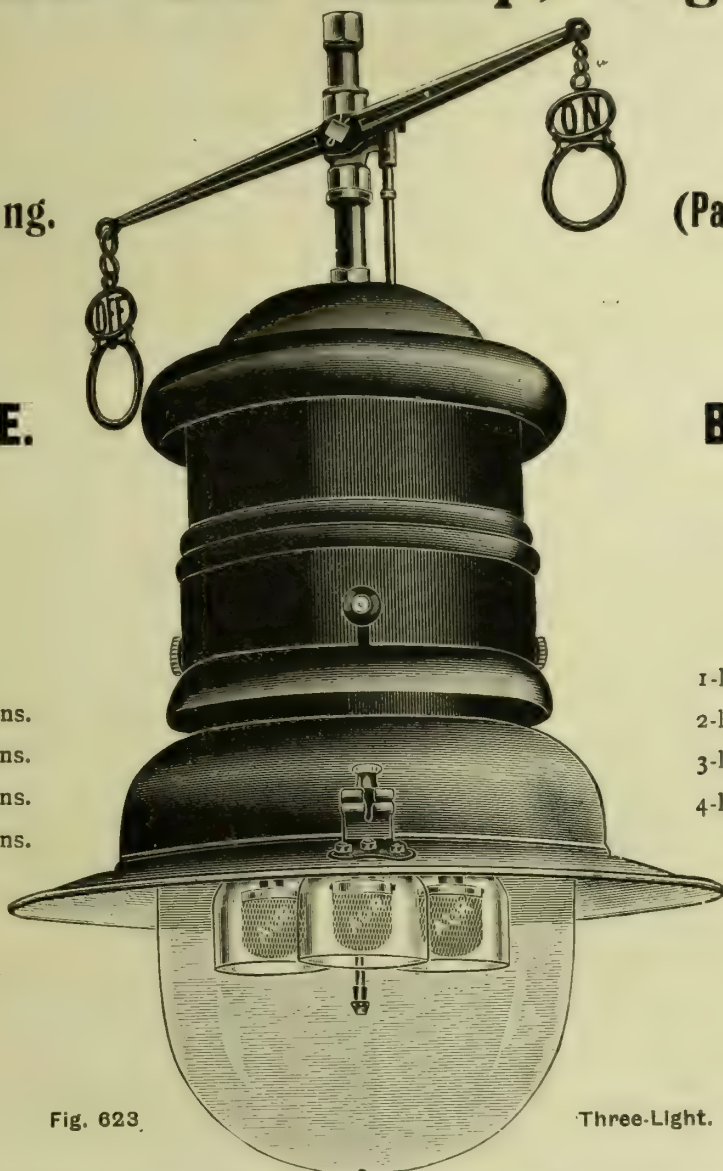


Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52 6	6/- extra.
2-light	8 feet	260	47 6	6/- extra.	4-light	16 feet	550	72 6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3 6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3 4 1/2 per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2 3	5 9	5 9	9/-	Wired Globes, extra	each	2/-	2/-	2 9 3 6
" " " In Case lots per dozen,	19 6	57 9	57 9	93/-	Parabolic Reflector, extra	"	3 6	6/-	7 6
Case contains	80	18	18	12	Welsbach Mantles, each	6d.	subject as usual.		

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4 1/2 d. each.

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2000 WORKMEN.

ENQUIRIES AT ONCE ATTENDED TO.

MAIN LAYING.

Paper by PERCY GRIFFITH, M.Inst.C.E., and BRUCE MCGREGOR
 GRAY, Assoc.M.Inst.C.E., before the Association of Water Engineers.

A. The Authors used *Flanged Pipes* for the Rising Main up the Steep side of the Barff, and their experience proved that this was not an advantage, as the rigidity of the Joints involved considerable difficulty in regard to the depth of the Trench, and a good deal of Cutting to make the final Connections at each end of the Pipe-Line.

B. In the case of the Delivery Main, the Joints were *Ordinary Socket Joints*, but made with Lead only. The only difficulty met with here was the necessity for pouring the Lead in at a suitable temperature to prevent it melting the Solid Lead Fillet, and running through into the Pipe.

C. In some of the Smaller Branch Connections, Lead Wool was used, and proved highly successful.

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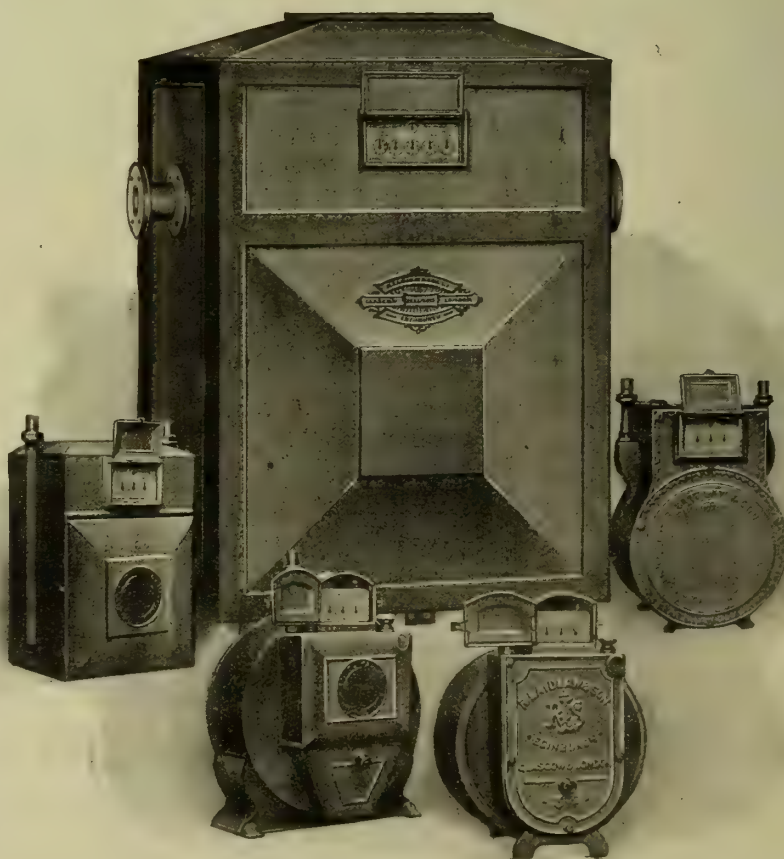
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